

Using BAER Reports to Investigate Recreation Impacts of Fire Events¹

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In 2000 and 2002, the U.S. experienced two of the worst fire seasons in 50 years. In 2000 there were 122,827 recorded fires that burned 8.4 million acres and destroyed 861 structures and in 2002 there were 88,458 fires that burned roughly 7 million acres, destroyed more than 800 structures, and took the lives of 23 firefighters (National Interagency Fire Center, 2002). This pattern is likely to increase because past land management has left abundant fuels, especially in the wildland-urban interface (Bogue, 1985; Cortner, Gardner & Taylor, 1990; Daniel, Meitner & Weidemann, 1997; Gardner & Cortner, 1985). It is estimated that 190 million acres of public lands are at elevated risk of severe wildfires (USDA, 2003). U.S. forests are important because they provide benefits to urban and rural communities in the forms of recreation, wood products, clean and adequate water, wildlife habitat, scenic quality, and jobs (Jensen, 2003).

After the devastating fires in 2000, the National Fire Plan was implemented in order to protect communities, resources, and lives of both firefighters and the public (www.fireplan.gov). The plan included an agenda to better understand the human dimensions of wildland fire. Several social science research studies have been implemented, but most of this research has examined how communities can better prepare for fire events. Few studies have examined the impact of fire on outdoor recreation, which can affect fire management, visitor behaviors and preferences while altering the physical landscape used for outdoor recreating. However, resource managers could use the information those types of studies could provide. For example, are there impacts to outdoor recreation participation due to prescribed fire activities? Are there negative consequences to recreation visitors from seeing smoke? How do recreation visitors react to the imposition of changed regulations, such as ones disallowing campfires? How many recreation visitors are evacuated in a given year and does this change their future participation? What perceptual changes occur for recreation residences owners when their recreation residences are threatened by fire or are burned? Are there long term impacts when trails are closed? There are far more questions than answers, thus, a gap of knowledge exists when it comes to fire's effects on recreation visitors.

One potential way to investigate the impact of wildfire on outdoor recreation is to use Burned Area Emergency Response (BAER) reports. BAER reports are produced by National Forests after fire events to identify immediate and future threats to life, property and natural resources (e.g., water quality). The information in BAER documents provide the support needed to acquire funding to rectify the problems caused by fires. Recreation, *per se*, is not included within BAER reports because the loss of recreation-related facilities/amenities is not generally considered an emergency; indeed, recreation managers cannot access the funds used by forests to respond to fire events. Our goal was to investigate how much useful information about outdoor recreation and fire event impacts could be found in BAERs, and what kind of information BAERs provide regarding recreation impacts. Documenting these impacts and risks can aid in understanding the effects of wildland fire on outdoor recreation opportunities.

Methods

All BAER reports dated between September, 2001 and October, 2003 were gathered for evaluation. The documents were collected from the Forest Service's Correspondence Records Database. Each region was searched by fiscal years 2002 and 2003 in order to identify all documents filed within the two-year timeframe. Two hundred twenty BAER reports were examined in total, covering 175 fires. Some fire events had more than one BAER on file because the evaluation team had filed interim reports in order to document rehabilitation progress, request additional funds and/or make other needed adjustments to the initial report. Also, final reports were filed in order to notify of the completion of the project. See Table 1 for a breakdown on the number of each kind of reports examined.

All reports were reviewed in order to document the different types of damage to facilities due to fire and the potential problems that face recreation facilities in the future without intervention. Interim and final reports were included in the investigation because new impacts may have been discovered after the initial report was filed and thus included in subsequent versions of the report. For a list of impacts and risks associated with various recreation facilities and amenities, see Table 2.

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Table 1 - Number of BAER Reports Examined by Region and Type of Document

| Region | Initial | Interim | Final | Total |
|--------------|---------|---------|-------|-------|
| 1 | 27 | 12 | 3 | 42 |
| 2 | 21 | 14 | 1 | 36 |
| 3 | 6 | 3 | 5 | 14 |
| 4 | 22 | 22 | 5 | 49 |
| 5 | 35 | 13 | 10 | 58 |
| 6 | 10 | 2 | 0 | 12 |
| 8 | 2 | 2 | 3 | 7 |
| 9 | 2 | 0 | 0 | 2 |
| Total | 125 | 68 | 27 | 220 |

Note: No BAER reports were found for Region 10.

Table 2 - Direct Impacts and Potential Risks Identified in BAER Reports

| Facility | Impact | Direct | Potential Risks |
|----------------------------------|---|--------|-----------------|
| FS Campgrounds | Closure | X | X |
| | Drinking water source damage | X | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Improvements burned | X | |
| | Landslide | | X |
| | Loss of soil productivity | | X |
| | Loss of water control | | X |
| | Noxious weed infestation | | X |
| | Tree stands severely damaged | X | |
| Unstable hillsides | X | | |
| Picnic Areas | Damage to facilities | | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Improvements burned | X | |
| Hiking Trails | Closure | X | X |
| | Damaged, needs resurfacing | X | |
| | Drinking water source damage | X | X |
| | Facilities burned (e.g., restrooms) | X | |
| | Fallen snags/hazard trees | X | X |
| | Falling rock | | X |
| | Flooding, water erosion | | X |
| | Improvements burned | X | |
| | Increased accessibility to off-trail activity | | X |
| | Landslide | | X |
| | Loss of water control | | X |
| | Noxious weed infestation | | X |
| | Plugged culverts | X | X |
| | Sign/guardrail damage | X | X |
| Stranding people | | X | |
| Stump burnout | X | | |
| Unstable trail conditions | X | | |
| Off-Highway Vehicle Areas | Brush cleared—increased trespass | X | |
| | Closure | X | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Increased accessibility to off-trail activity | | X |
| Noxious weeds | | X | |

Table 2 (continued) - Direct Impacts and Potential Risks Identified in BAER Reports

| Facility | Impact | Direct | Potential Risks |
|---|---|---------------|------------------------|
| Recreation Areas | Debris flow | | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Improvements burned | X | |
| | Increased accessibility to OHVers | | X |
| | Loss of soil productivity | | X |
| | Loss of water control | | X |
| | Noxious weed infestation | | X |
| | Soil compaction | | X |
| | Stranding people | | X |
| | Tree stands severely damaged | X | |
| | | | |
| General Use/Dispersed Recreation Areas | Closure | X | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Increased erosion due to unlawful OHV use | | X |
| | Landslide | | X |
| | Loss of soil productivity | | X |
| | Tree stands severely damaged | X | |
| | | | |
| Riparian Areas | Closure | X | |
| | Degraded water quality for recreation purposes (e.g., debris floating in water) | | X |
| | Flooding, water erosion | | X |
| | Landslide | | X |
| | | | |
| Wilderness Areas | Flooding, water erosion | | X |
| | Noxious weed infestation | | X |
| | | | |
| Recreation Residences | Blocked access | X | X |
| | Damage to utilities | X | |
| | Drinking water source damage | | X |
| | Flooding, water erosion | | X |
| | Loss of water control | | X |
| | Stranding people | | X |
| | Structures burned | X | |
| | | | |
| Camps | Drinking water source damage | | X |
| | Flooding, water erosion | | X |
| | Landslide | | X |
| | | | |
| Privately-owned Lodges/Resorts | Closure | X | |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | | | |
| Heritage Resource Sites | Damage due to equipment used in other rehabilitation treatments | | X |
| | Damaged by fire | X | |
| | Destroyed by fire | X | |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| Increased accessibility | X | | |

Table 2 (continued) - Direct Impacts and Potential Risks Identified in BAER Reports

| Facility | Impact | Direct | Potential Risks |
|--|---|--------|-----------------|
| Heritage Resource Sites (continued) | | | |
| | Increased visibility | X | |
| | Noxious weed infestation | | X |
| | Vandalism/theft (due to increased accessibility/visibility) | | X |
| | Wind erosion | | X |
| | | | |
| Roads (providing access) | Closure | X | X |
| | Debris flows | X | X |
| | Falling rock | | X |
| | Falling snags/hazard trees | | X |
| | Flooding, water erosion | | X |
| | Landslide | | X |
| | Loss of water control | | X |
| | Noxious weed infestation | | X |
| | Plugged culverts | | X |
| | Restriction of access to forest | | X |
| | Road washout | | X |
| | Sign/guardrail/cattleguard damage | X | X |
| | Stranding people | | X |
| | | | |
| Bridges | Debris flows | | X |
| | Flooding, water erosion | | X |
| | Structures burned | X | |
| | | | |
| Support businesses/facilities | Flooding, water erosion | | X |
| | | | |

Results

Direct Impacts

Direct impacts of fire on outdoor recreation, as mentioned in the BAER reports, were found in campgrounds, picnic areas, hiking trails, off-highway vehicle areas, recreation areas, general use or dispersed recreation areas, riparian areas, recreation residences, privately-owned lodges/resort areas, heritage resource (historical/ archeological) sites, roads providing access to recreation opportunities, and bridges.

Direct impacts to campgrounds included closures, burned improvements, tree stands that were severely damaged, unstable hillsides, and damage to drinking water sources. There were also burned improvements within picnic areas (such as picnic tables). Like the impacts in campgrounds, hiking trail impacts included closure and burned improvements (such as waterbars), however, there were also burned signage and guardrails, facilities burned (such as restrooms), fallen snags, damaged trails in need of resurfacing, unstable trail conditions, plugged culverts, and damage to drinking water sources. Direct impacts to off-highway vehicle (OHV) areas included closure and the reduction of brush (which increased the potential for trespass by OHV riders). Recreation area impacts included burned improvements and tree stands that were severely damaged. In general use/dispersed use recreation areas the impacts included closure and tree stands that were severely damaged. Riparian areas (rivers, streamside areas) also had closures. Recreation residence impacts included structures that burned and damage to utilities. Privately-owned lodges/resort areas were impacted by closure, while heritage resource sites were damaged or destroyed by fire, and the fire caused increased visibility and accessibility to the sites. Roads providing access to recreation opportunities also had impacts, including closure, signs, guardrails and cattleguards that burned, and debris on the roads. Bridges were also burned.

Three BAER reports mentioned the evacuation of recreation visitors. The Williams fire burned 38,184 acres and destroyed recreation residences and bridges, while causing the evacuation of approximately 2,200 visitors. The Mustang

fire also caused evacuations but no figures were provided in the BAER report. It was noted that it occurred in a region that was very popular for its recreation opportunities and was extremely crowded due to the upcoming 4th of July holiday. Campgrounds, cabins, and a nearby community were all evacuated due to fire activity. All told, 19,861 acres were lost. Finally, the BAER report for the Johnson fire offered no specifics as far as number of evacuees was concerned, but mentioned that cabins, a campground, and dispersed camping areas were evacuated due to risks associated with this 1,844-acre fire.

Potential Risks Due to Fire

There were also potential risks related to outdoor recreation identified in the BAER reports. These included risks to campgrounds, picnic areas, hiking trails, OHV areas, recreation areas, general use or dispersed use recreation areas, riparian areas, Wilderness areas, recreation residences, camps (Boy Scouts), privately-owned lodges/resorts, heritage resource sites, roads providing access to recreation opportunities, bridges to recreation areas or residences, and support businesses/facilities (such as stores).

Potential risks in campgrounds included closures, falling snags and other tree hazards, flooding, erosion, loss of water control, damage to drinking water sources, landslides, and noxious weed infestation. Within picnic areas some of the risks identified were damage to facilities, falling snags and other tree hazards, as well as potential flooding and erosion. Potential risks to hiking trails included closure, loss of signage and guardrails, fallen snags and other tree hazards, falling rock, noxious weed infestation, increased accessibility to off-trail activities, flooding, erosion, stranded people, loss of water control, plugged culverts, and landslides. Within OHV areas, the potential risks included closure, falling snags and other tree hazards, noxious weeds infestation, increased accessibility to off-trail activity, flooding, and erosion. Potential risks in recreation areas included falling snags and other tree hazards, soil compaction, noxious weed infestation, flooding, erosion, loss of water control, stranded people, and debris flow. Potential risks to general use/dispersed use recreation areas included closure, falling snags and other tree hazards, flooding, erosion, landslides, and increased erosion due to unlawful OHV use. Riparian areas (rivers, streamside areas) had the potential for flooding, erosion, degraded water quality for recreation purposes (such as debris floating in the water) and landslides. Wilderness areas could be at risk from noxious weed infestation, flooding, and erosion. For recreation residences there was potential for flooding, erosion, stranded people, loss of water control, damage to drinking water sources, and blocked access to recreation residences. Within camps the potential risks included flooding, erosion, landslides, and potential damage to drinking water sources. Privately-owned lodges/resort areas were subject to falling snags and other tree hazards, flooding and erosion, while potential risks to heritage resource sites included vandalism or theft (due to increased accessibility/visibility), falling snags and other tree hazards, flooding, erosion, spread of noxious weeds, and erosion caused by wind. Potential risks to roads (provide access to recreation opportunities) included closure, signs, guardrails, falling snags or other tree hazards, noxious weed infestation, restriction of access to the forest, falling rock, flooding, erosion, landslide, plugged culverts, road washout, loss of water control, debris flow, and stranding people. Bridges could be at risk from flooding, erosion, and debris flows. Potential risks to support businesses/facilities (such as stores) were flooding and erosion.

Discussion

BAER reports from Forest Service regions across the U.S. provided some insight into the direct impacts on and future risks to recreation due to the resource damage caused by fire. The BAER reports suggested substantial direct impacts of fire on outdoor recreation opportunities and substantial risks to recreation opportunities in the future.

The impacts found in the BAER reports nationwide ranged from closures to burned improvements, to damage to drinking water sources, to the potential for flooding. The BAER reports indicated numerous direct impacts to hiking trails and campgrounds, and many potential impacts to roads and hiking trails. While the direct impacts were from fire damage itself (e.g., improvements burned and tree stands that were severely damaged), quite a few of the potential risks were related to flooding after the fire event (e.g., landslides, stranding people, and plugged culverts).

Our initial goal was to investigate how much useful information about outdoor recreation and fire event impacts could be found in BAERs, and what kind of information BAERs provided regarding recreation impacts. While we found evidence of many impacts for outdoor recreation opportunities, we found little evidence of direct impacts to recreation visitors, with the exception of the BAER reports that addressed evacuation of visitors. BAER reports, then, offer limited utility for understanding direct impacts to recreation visitors.

Documenting direct impacts and risks can aid in understanding the effects of wildland fire on outdoor recreation opportunities. Though these reports do not offer evidence about behavioral impacts or perceptions of recreation visitors, they do assist in understanding impact to outdoor recreation settings and opportunities immediately after fire events and risks to recreation at those burned areas.

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