

Pioneer Fire effects on hydrology and water resources



Brian Anderson – Boise National Forest



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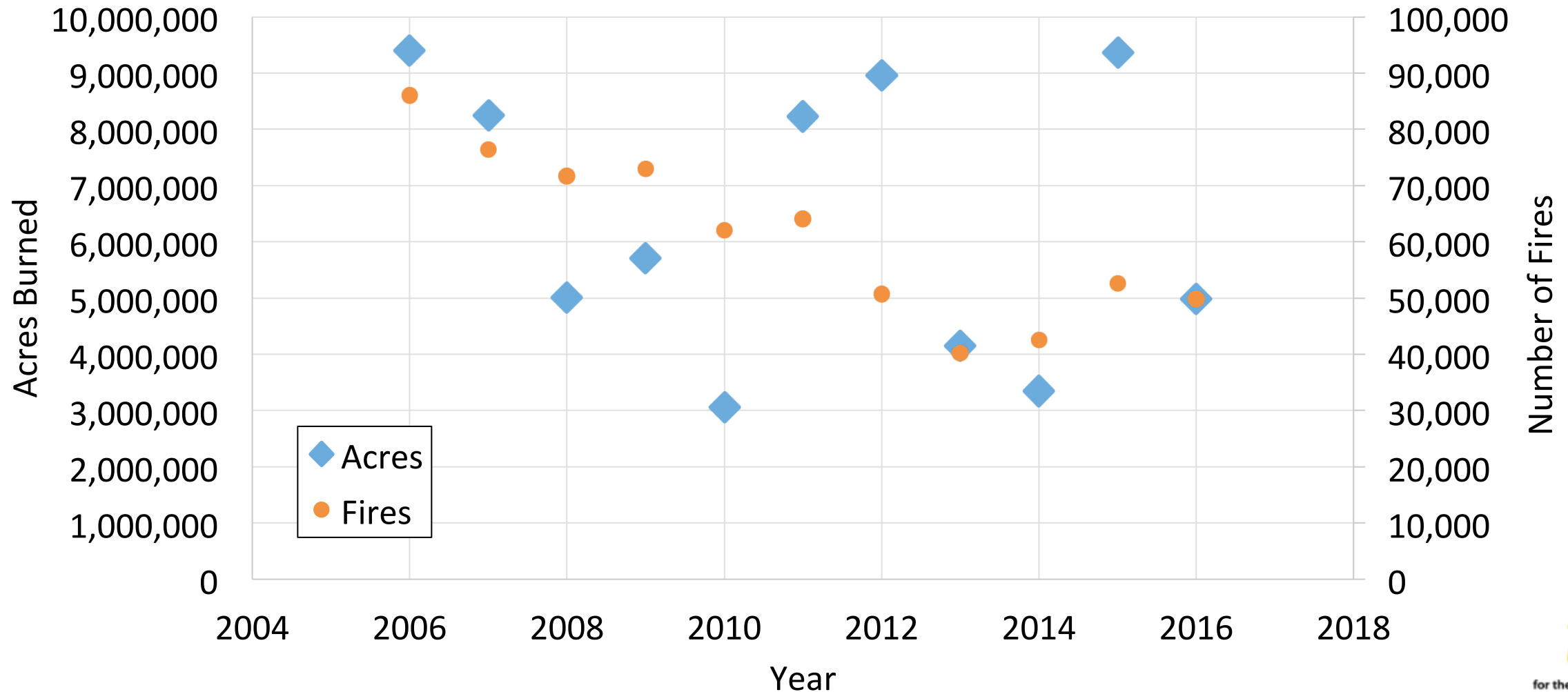
Overview

- 2016 Fire Season - Pioneer Fire Background
- Burned Area Emergency Response (BAER)
- Fire Effects on Watersheds
- Forest Service Response
- Anticipated watershed effects



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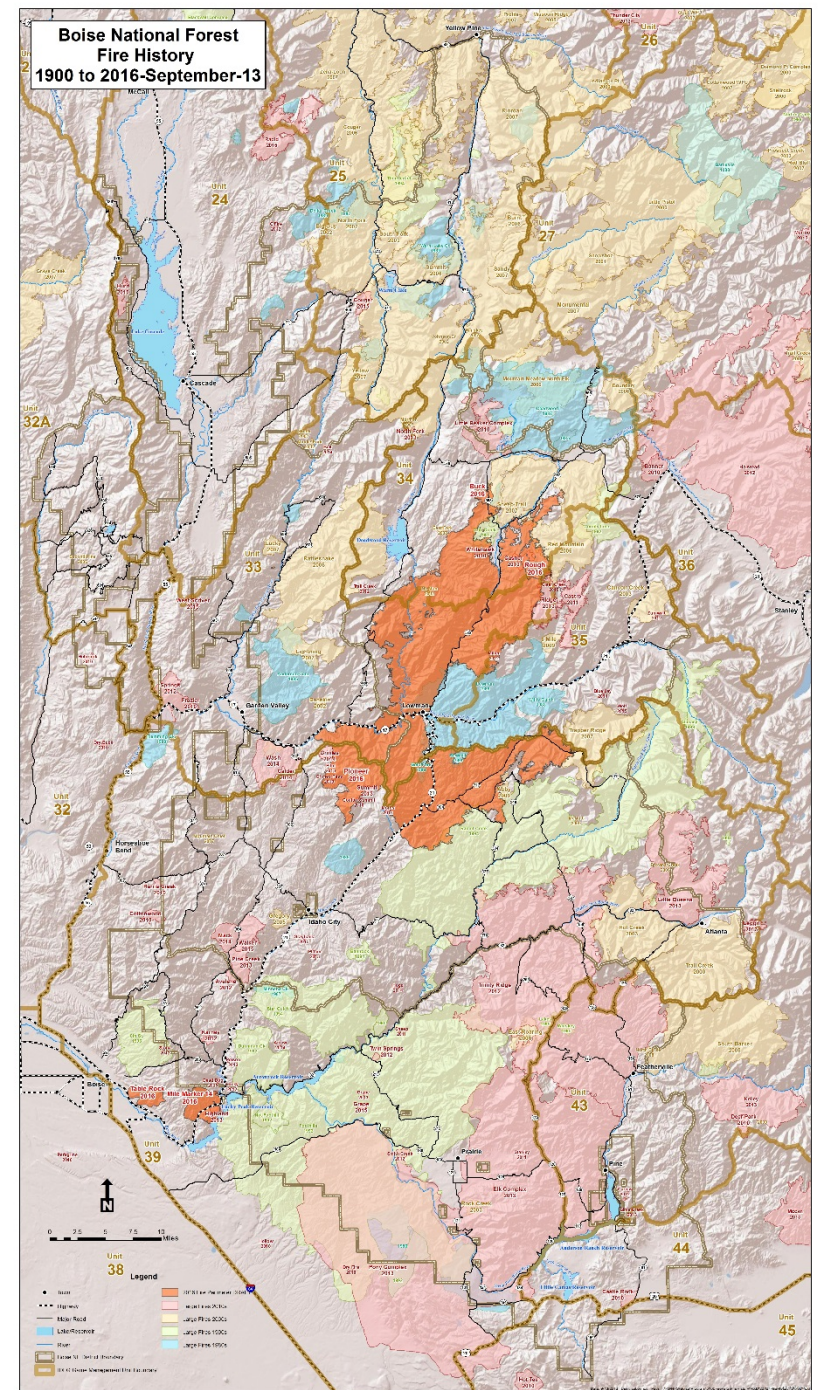
2016 Fire Season



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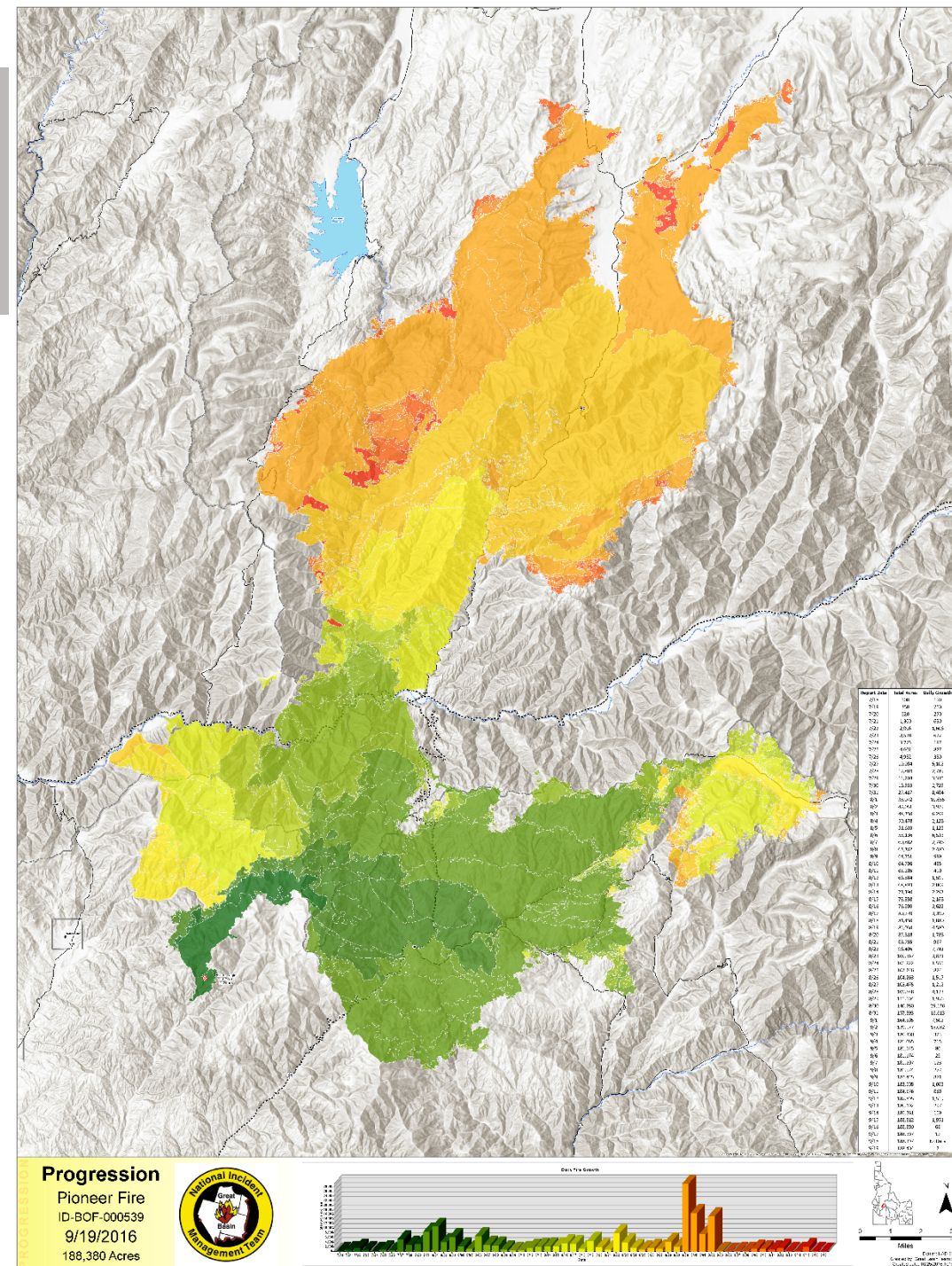
Boise National Forest Fire History

- Between 1990-2016, 51 percent of Boise National Forest has burned — 1,287,779 acres



Pioneer Fire

- Started July 18 2016, contained November 4 2016
- Approximately 189,032 acres
- Largest Fire of 2016
- 2 Counties, 3 Ranger Districts
- 400 mile perimeter
- Seven Incident Management Teams



Primary BAER (Burned Area Emergency Response) Objectives



- Identify post-wildfire threats to **human life and safety, property and critical natural or cultural resources** on NFS lands
- Take **immediate actions** to manage unacceptable risks within 1 year

Burned Area Conditions



Values at Risk



Risk Assessment



Treatment Recommendations



Values at Risk

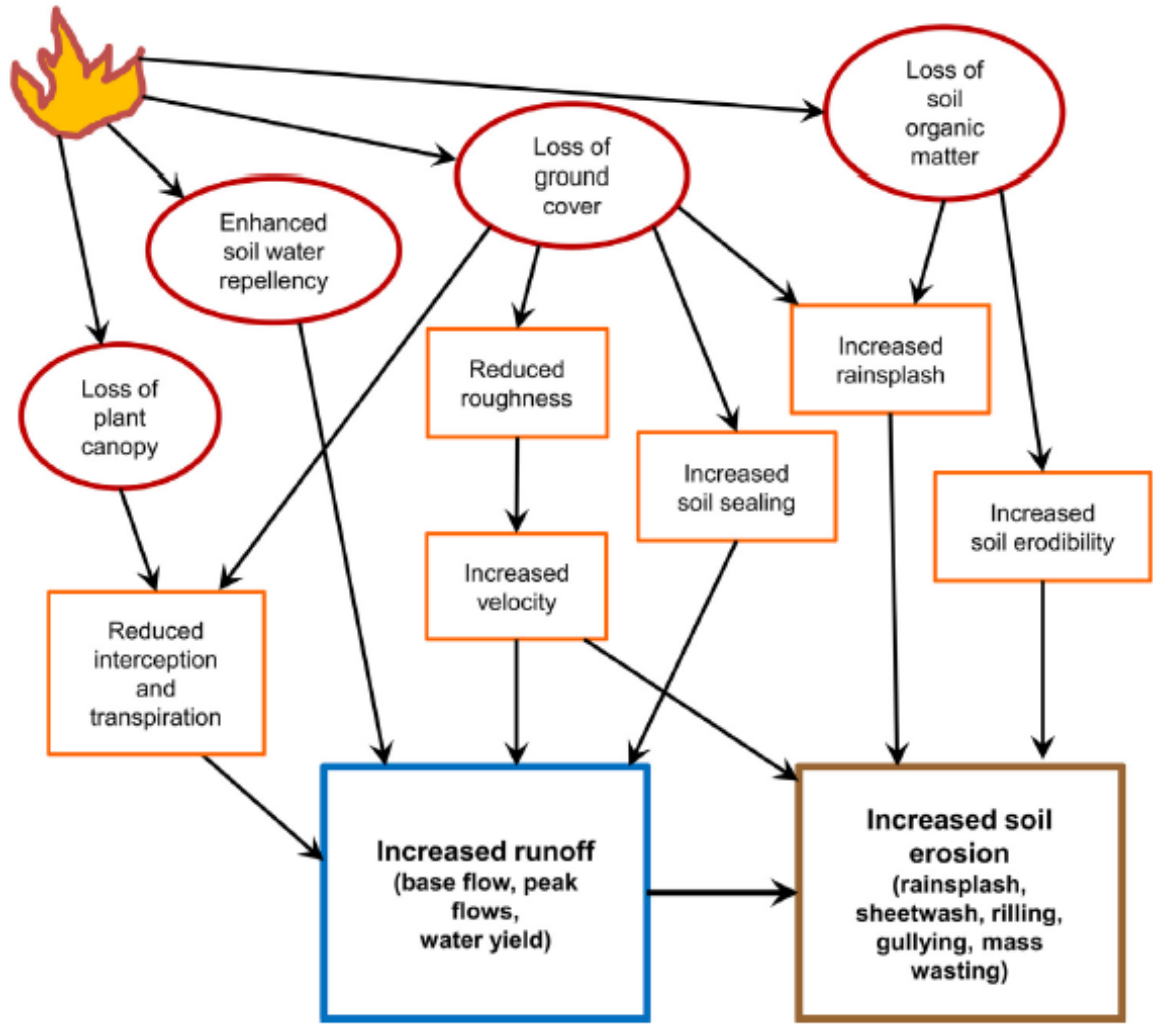


- Human Life and Safety
 - Forest Visitors Forest Service Employees
- Property
 - Roads/Bridges
 - Trails
 - Recreation Infrastructure
 - Campgrounds
 - Trailheads
 - Admin Sites/ Rec Rental

- Natural Resources
 - Native/Naturalized Plant Communities
 - Critical Habitat or Occupied Suitable Habitat For Bull Trout/ Canada Lynx
 - Soil Productivity Hydrologic Function
 - Water used for domestic or municipal supplies
- Cultural Resources
 - Sites Listed or Eligible for the National Register



Fire Effects on Runoff Processes



09/13/2013



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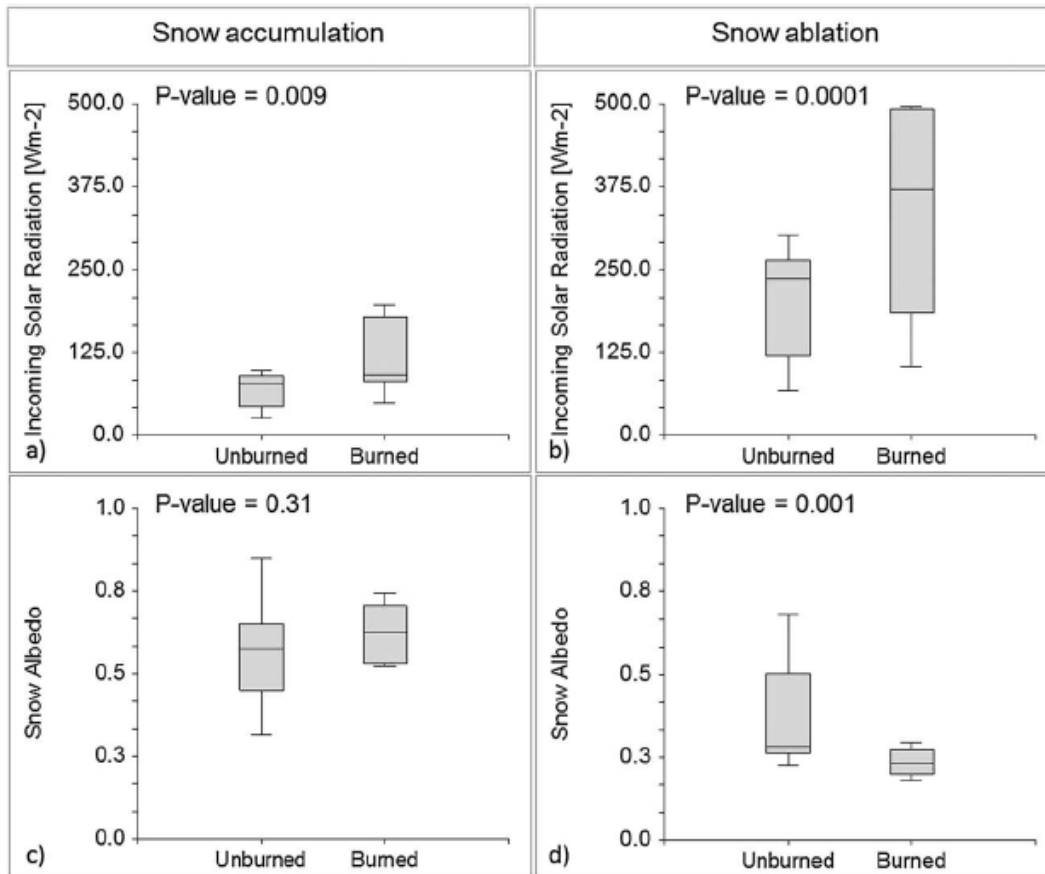
Soil Water Repellency



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Fire effects on the timing of snowmelt

GLEASON ET AL.: CHARRED FORESTS INCREASE SNOWMELT



- 40% reduction in snow albedo as a result of burned woody debris during ablation
- 200% increase in net shortwave radiation



From Gleason et al. 2013



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Watersheds Affected by the Pioneer Fire

Boise River Basin

- 60,665 Acres – 32%
 - Crooked River
 - Mores Creek
 - Grimes Creek

Middle Fork Salmon River

- 22,334 Acres – 12%
 - Bear Valley Creek
 - Bearskin Creek

South Fork Payette

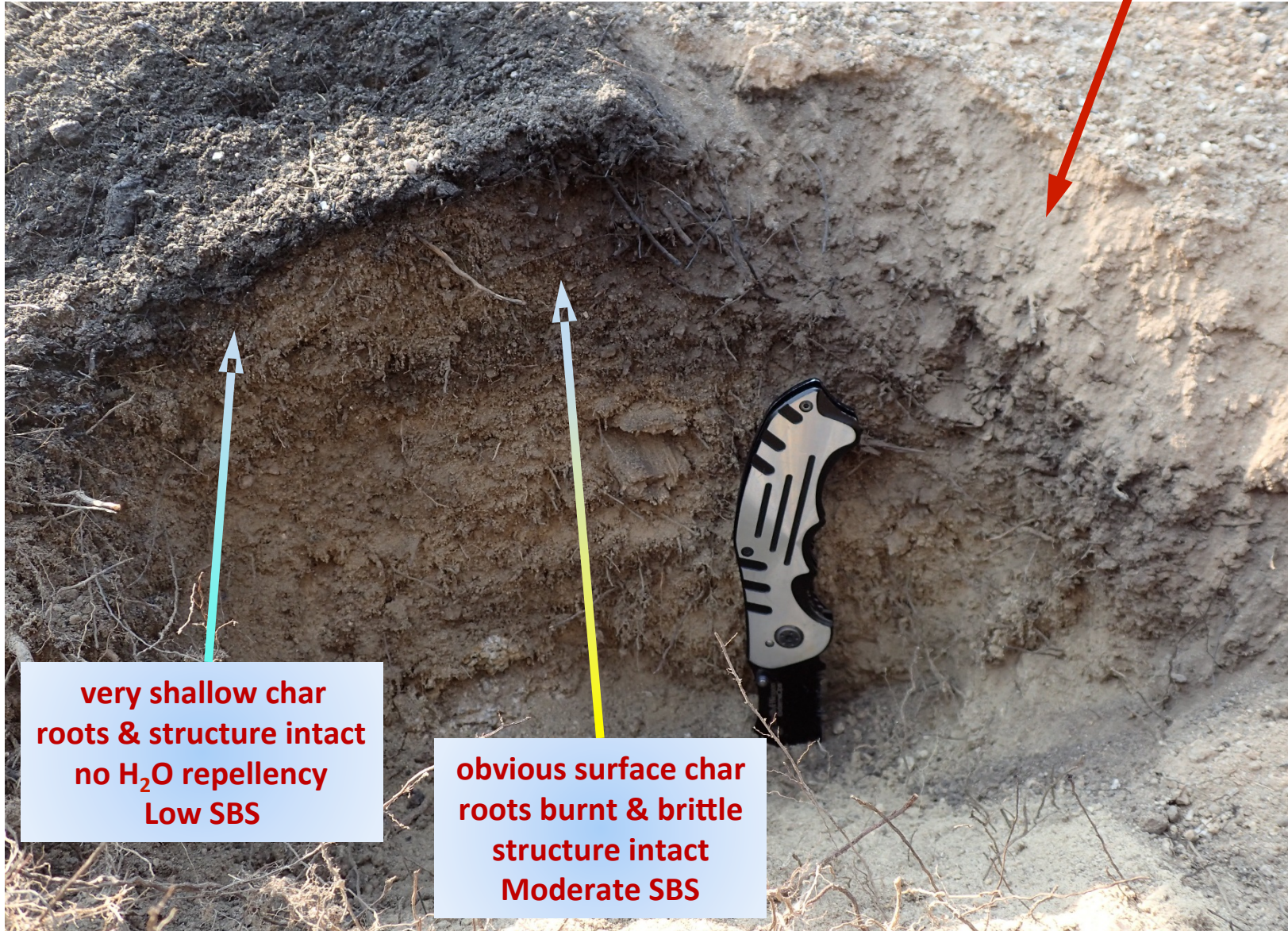
- 106,032 Acres – 56%
 - Clear Creek
 - Deadwood River
 - Rock Creek
 - SF Payette Canyon



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Soil Burn Severity

small log consumed
high residence time
structure, roots, OM destroyed
High SBS [extreme]



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Upper Clear Creek Drainage



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Slopes South of Pilot Peak



USGS Debris Flow Hazard

- Identifies increased risk of debris flows in Clear Creek, Hole in the Wall, Little Hole in the Wall, Rock Creek, and Stevens Creek
- Concern for flooding and debris flows that could impact low lying infrastructure near Lowman and Garden Valley

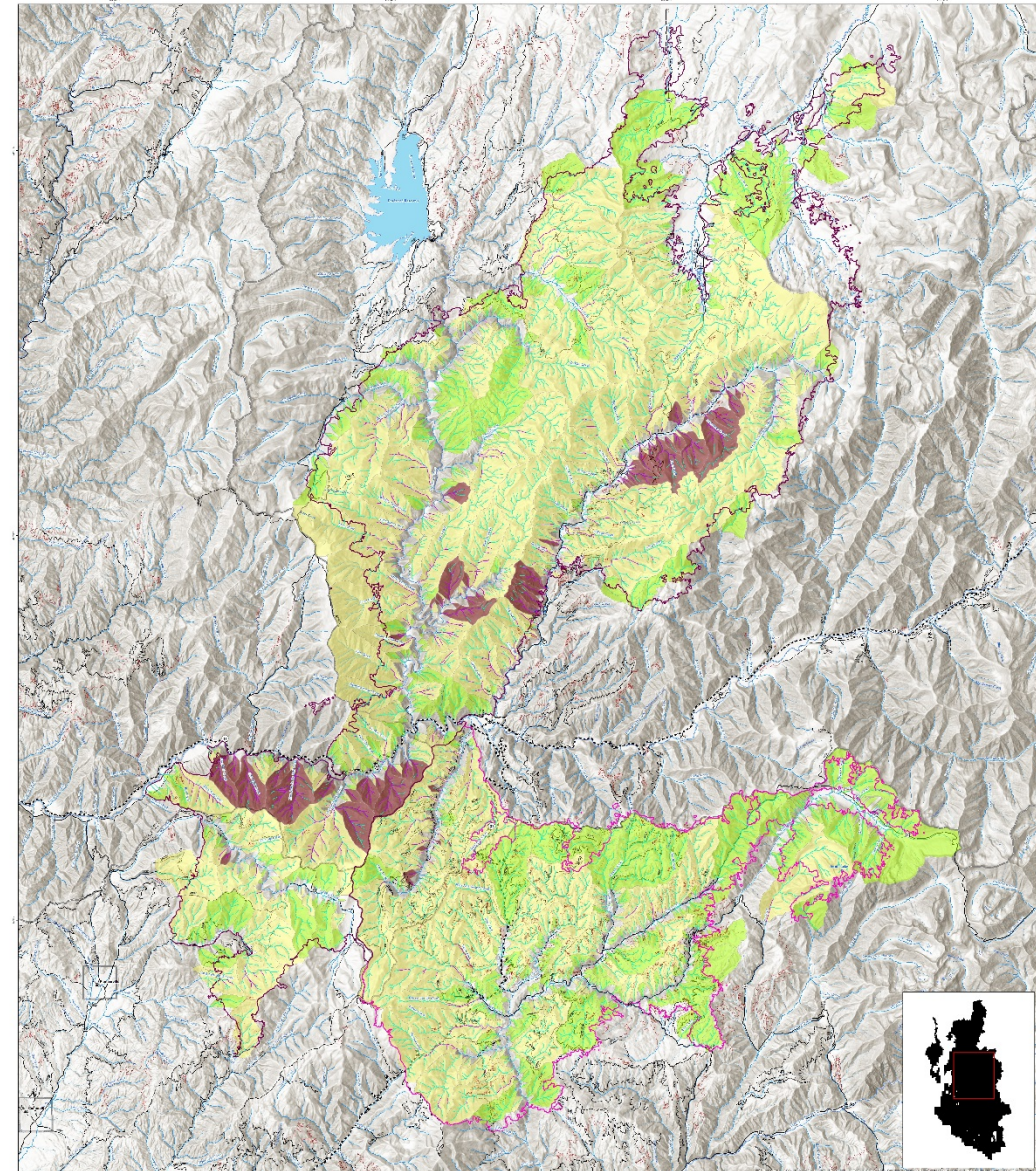
http://landslides.usgs.gov/hazards/postfire_debrisflow/2016/20160718pioneer/



USDA Forest Service

Pioneer North BAER

USGS Debris Flow Prediction Hazard



U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire and Aviation Resources Division, Fire Sciences Laboratory, and the U.S. Geological Survey, Western Water Science Center, Boise, Idaho, and the U.S. Geological Survey, Western Water Science Center, Reno, Nevada. This map was prepared for the U.S. Forest Service, Rocky Mountain Research Station, Fire and Aviation Resources Division, Fire Sciences Laboratory, and the U.S. Geological Survey, Western Water Science Center, Boise, Idaho, and the U.S. Geological Survey, Western Water Science Center, Reno, Nevada. This map was prepared for the U.S. Forest Service, Rocky Mountain Research Station, Fire and Aviation Resources Division, Fire Sciences Laboratory, and the U.S. Geological Survey, Western Water Science Center, Boise, Idaho, and the U.S. Geological Survey, Western Water Science Center, Reno, Nevada.



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Post-fire BAER Treatments to address threats to critical values

- **Aerial Hillslope Mulching**
 - 3,000 Acres in Clear Creek Drainage
- **Culvert Removals and Upsizing**
 - 45 culvert replacements, 3 removals
- **Road/Trail Drainage Reconstruction**
 - 350 miles
- **Road/Trail Storm Patrols**
- **Hazard Tree Mitigation**
 - Developed facilities
- **Noxious Weed Detection and Treatment**
 - 3,000 acres
- **Hazard Warning Signs**
 - 120 hazard signs



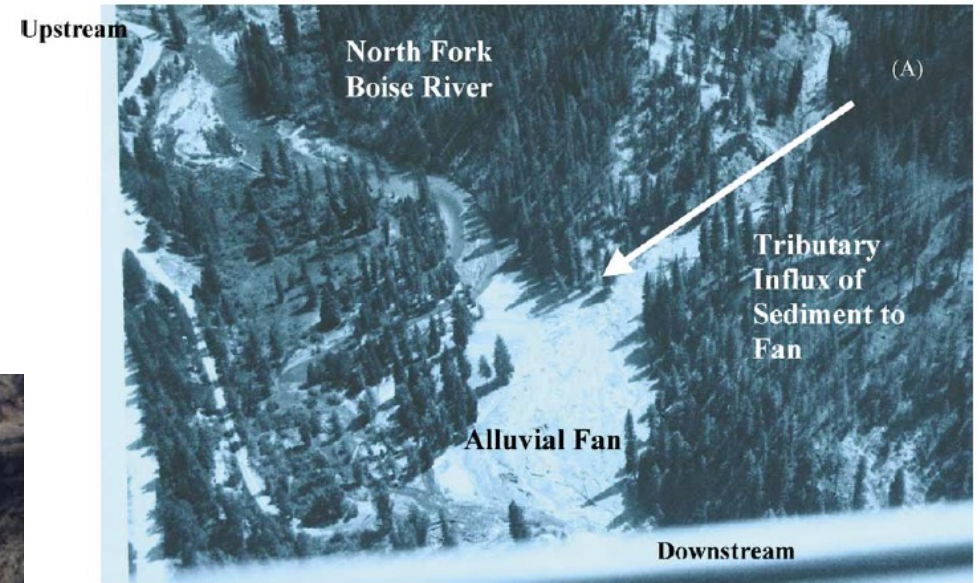
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Past Fires on the Boise

Elk Fire 2013



Rabbit Creek Fire 1997



From Benda et al. 2003

2016 Debris Flow Events



Tributary to Clear Creek



SF Payette River at Little Hole in the Wall Creek



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Photos courtesy Jen Pierce

Pioneer Fire effects on hydrology and water resources

- **BAER treatments (mulching, crossings, road drainage, storm patrols)** are intended to mitigate effects of increased watershed response to **critical values**
- Greatest potential for effects in the **South Fork Payette River**
- Localized **flooding and debris flows** (Rock Creek, Clear Creek, Deadwood River, and South Fork Payette River)
- Greatest threat associated with **high intensity summer thunderstorms** and/or **rain-on-snow events**
- Potential for **large amounts of sediment and debris (ie. boulders wood)** in the South Fork Payette River Channel
- **Increased snow ablation rates** and **earlier timing of snowmelt** in areas with loss of forest cover



References

Benda L., Miller D., Bigleow P., and Andras K. 2003. Effects of post-wildfire erosion on channel environments, Boise River, Idaho. *Forest Ecology and Management*. Vol 178 105-119.

Gleason K. E., Nolin A.E., Roth T. R. 2013. Charred forests increase snowmelt: Effects of burned woody debris and incoming solar radiation on snow ablation. *Geophysical Research Letters*. Vol 40, 4654-4661.

Wagenbrenner J. W., MacDonald L. H., Coats R. N., Robichaud P. R., Brown R. E. 2015. Effects of post-fire salvage logging and skid trail treatments on ground cover soils, and sediment production in the interior western United States. *Forest Ecology and Management*. Vol 335, 176-193.



Pioneer Fire July 22nd 2016



<https://www.nasa.gov/image-feature/goddard/2016/pioneer-fire-in-idaho>



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