Burned Area Emergency Response

Spring Creek Fire

Pike - San Isabel National Forest and Royal Gorge Field Office

July 15-23, 2018

BAER

NRCS Natural Resources Conservation Service

Spring Creek Fire BAER

Team Members:

- Archaeology
- Biology / Botany
- Cadastral
- Geology
- Geospatial Information
- Hydrology
- Range / Noxious Weeds
- Recreation
- Roads / Trails
- Safety
- Soils









Spring Creek Fire BAER

The BAER Process

The BAER process has 3 phases:

- Assessment / Prescription
- Implementation
- Monitoring

Spring Creek Fire BAER

- BARC Map
- Soil Burn Severity Map
- Establish Watershed Response
- Determine Threats to VARs:
  - Human Life and Safety
  - Property
  - Natural Resources
  - Cultural Resources
- Propose Treatments

- Develop BAER Report
  - 7 - 10 Days After Containment
- Implementation

Spring Creek Fire BAER

Started: June 27, 2018

Cause: human caused

Est containment: July 31, 2018

Burned Acres: 108,045 Acres

- **USFS: 9,837 ac**
- **BLM: 12,266 ac**
- **State: 3,866 ac**
- **Private: 82,076 ac**

Team focused on a watershed approach to assessment …

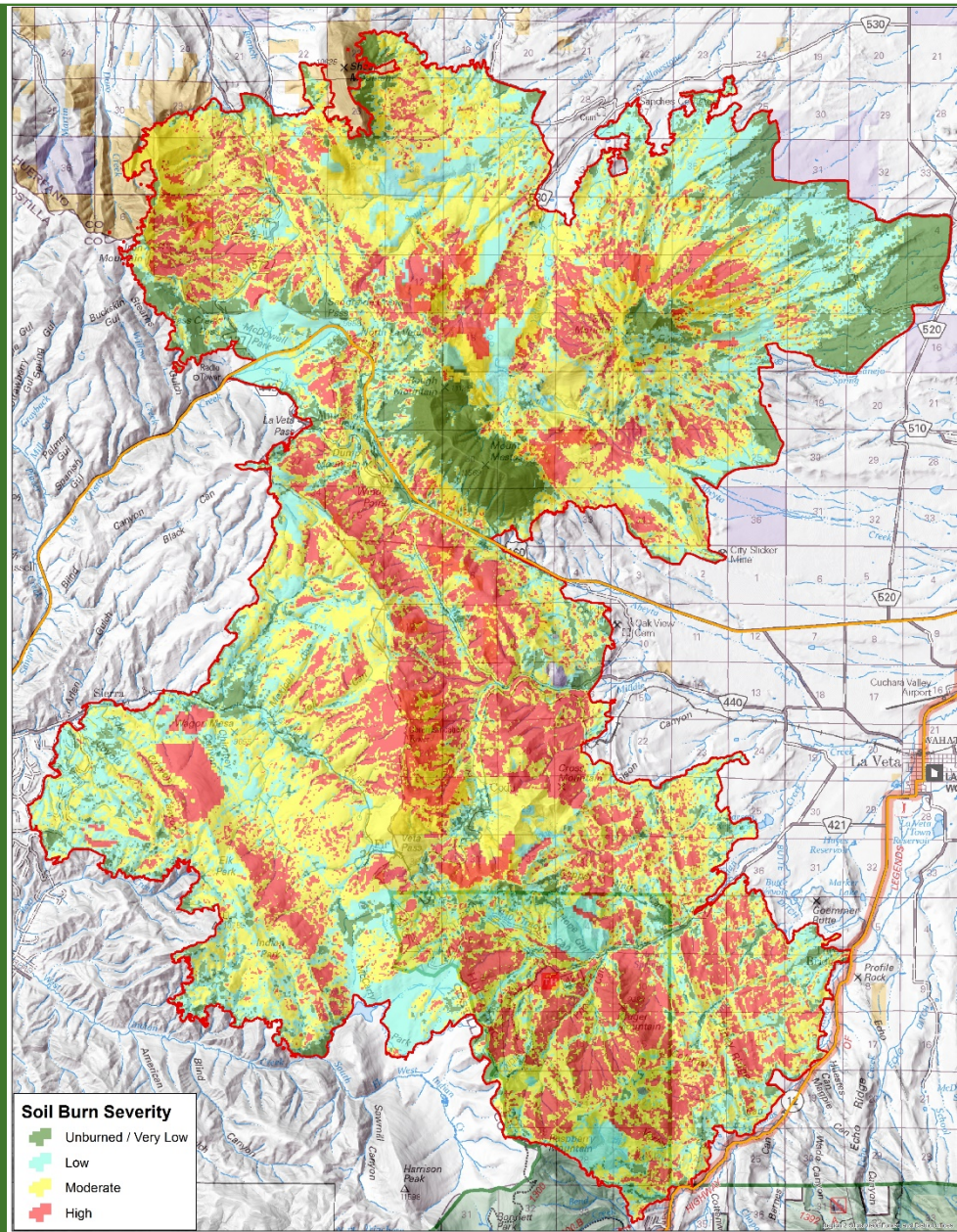
Acres of Soil Burn Severity by Ownership					
	Unburned / Very Low	Low	Moderate	High	Grand Total
FEDERAL	3,386	8,426	3,568	6,560	21,940
STATE	754	1,575	932	671	3,932
PRIVATE	9,556	33,989	20,029	18,401	81,975
Grand Total	13,696	43,990	24,529	25,632	108,045
Percent	13%	23%	41%	24%	100%

BAER specialists concluded that the amount of high soil severity burn was high (24%) in comparison to other fires due to heavy fuels and the strong wind driven event that increased intensity.

Soil Burn Severity – First Step

- Determine effects of fire on soil property changes.
- Drives severity of flooding, debris flows, and sediment delivery.

Soil Burn Severity	Acres	Percent
Unburned / Very Low	13,696	12.7
Low	24,528	22.7
Moderate	43,987	40.8
High	25,630	23.8



Soil Burn Severity

Unburned / Very Low:
Slight to no duff scorching, no below ground effects

Low:
Soil cover/duff reduced, Increased surface water repellency, minimal mineral soil effects

Moderate:
Duff mostly altered reduce benefit, stronger water repellency, mortality of surface roots, soil structure weakening

High:
Complete combustion of soil cover, soil structure destroyed, deeper root mortality, deeper and stronger water repellency. Top photo before rain compaction and erosion lower photo after rain.

Active Erosion Following Thunderstorms

Rill erosion prevalent where thunderstorms occurred. Rill depth determined by depth of live roots and water repellent layer.

Transport of thick sediment deposits to Indian Creek. Re-establishment of vegetation ameliorates sediment transport.

Severe sheet erosion at Indian Creek. Occurs when capacity of rills are exceeded and flow spreads out to sheet flow.

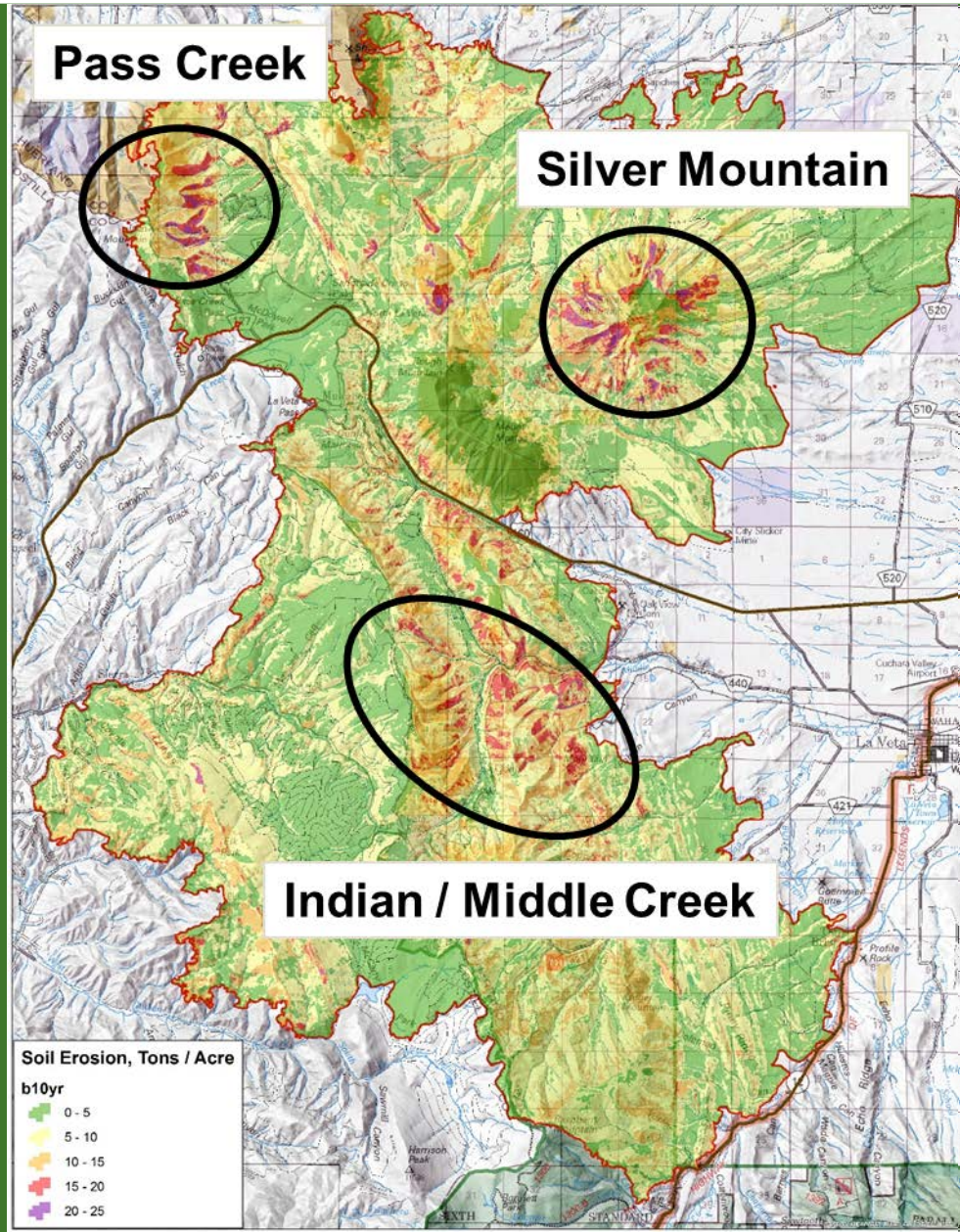
Extreme sheet erosion at Silver Mountain. Note unburned roots segments that were below ground before storms.

Erosion and Sedimentation

- Erosion is the removal of soil material from the hillslope.
- Determined by soil cover, soil type, topography, soil burn severity and weather.
- Drives severity of flooding, debris flows, and sediment delivery.

Watersheds with high erosion rates

Watershed	10 year event	2 year event
	Tons / Acre	
North Abeyta Creek	2.61	0.63
Pass Creek	3.10	0.79
Wagon Creek	3.67	0.82
South Oak Creek	4.12	1.00
South Abeyta Creek	4.30	0.81
Indian Creek	6.06	1.46
Headwaters Middle Creek	6.14	1.16



Watershed Response

Hydrologic Process	Type of Change	Specific effects
Interception	Reduced	• Moisture storage smaller • Greater runoff in small storms • Increased water yield
Litter storage of water	Reduced	• Less water stored • Overland flow increased
Transpiration	Temporary Elimination	• Streamflow increased • Soil moisture increased
Infiltration	Reduced	• Overland flow increased • Stormflow increased
Streamflow	Changed	• Increased in most ecosystems

Watershed Response

Methods

Field methods

- Field observations of the burned area and affected downstream areas were conducted July 15-21, 2018.
- Conditions of county roads and neighborhoods were observed.
- Stream conditions were evaluated, including observations of stream and hillslope and road responses to rains received during the field assessment period, with consideration of Values at Risk.

Hydrologic Modeling

- Estimated change in predicted runoff from burned areas was modeled at the 6th level sub-watersheds for most of the burned area. Indian Creek was modeled at the NFS boundary for localized results. Vories Creek was modeled to show substantial effects to downstream Values at Risk, including life and safety and property along Vories Creek and Highway 12.
- The USGS web application StreamStats was used for pre-fire stream flows. Post-fire flows based on a modifier calculated based on observed stream flows after a 2-year storm that occurred on July 16th, in addition to soil burn severity mapping.

A rapid assessment was conducted to get an overview of effects of the fire and a general overview of the types of Values at Risk. More detailed assessment is recommended to determine specific Values at Risk and recommendations on private lands and other infrastructure not associated with BLM and National Forest lands

BAER

Watershed Response Findings

0.7 inches of rain produced these overtopping flows of CO Hwy 12

Buried utility line exposed at crossing of Wagon Creek within Forbes Park

South Abeyta Creek overtopped road crossing

Road in Paradise Acres at high risk for washouts and debris flows

Anticipate:

Increased overland flow, flooding, and sedimentation.

Impacts to roads including plugged culverts, water overtopping roads, increased connectivity to streams.

Beneficial uses/water quality negatively affected.

Increased risk of flooding in areas not previously susceptible to flooding.

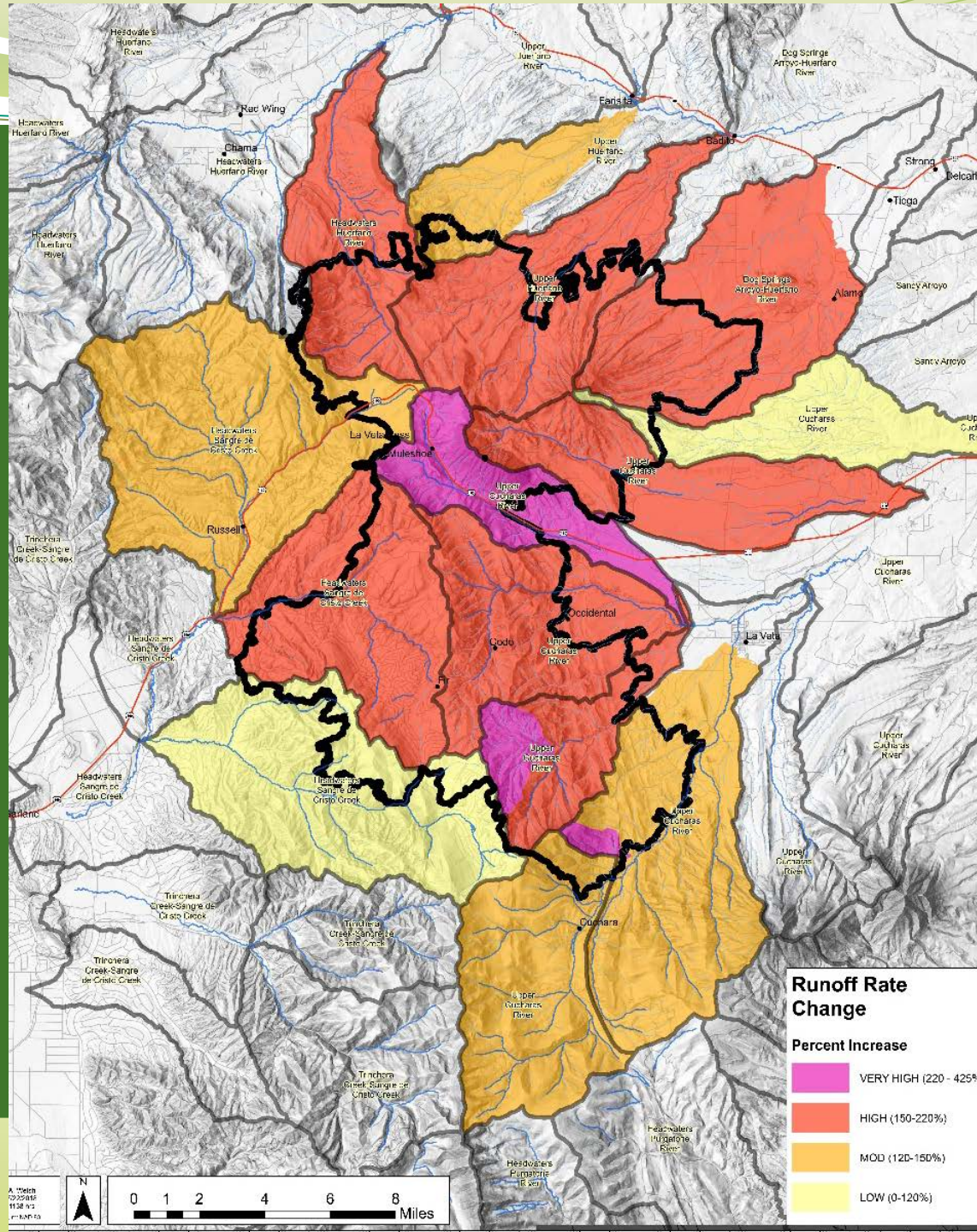
In some areas, mainstem channels have wide floodplains and riparian vegetation that may help attenuate flows.

Runoff is dependent on the severity of storms.

BAER

Watersheds affected by the Spring Creek Fire	Estimated Factor of Increase
Chavez Arroyo	1.1
Cucharas River La Veta	1.2
Cucharas River at Three Bridges	1.4
Dog Springs Arroyo	1.8
Headwaters Sangre de Cristo Creek	1.2
Headwaters Cucharas River	1.5
Headwaters Middle Creek	1.8
Indian Creek	1.9
Indian Creek-NFS Boundary	3.7
North Abeyta Creek	1.5
Oak Creek-Huerfano River	1.3
Pass Creek	2.0
South Abeyta Creek	2.2
South Oak Creek	2.0
Wagon Creek	1.5
West Indian Creek	1.1
Vories Creek	4.25

Volume of stream flows may be larger than modeled flow due to increased sediment and woody debris, as well as the possibility of debris flows occurring in some locations in the upper portions of watersheds affected by the fire.



Values at Risk – from effects of the fire

Within watersheds affected by the fire:

- Public and private roads
- Highways
- Municipal and other water supplies dependent on surface water diversions
- Aquatic Habitats and Fisheries
- Power Lines and Fiber Optic Lines
- Railroad Lines
- Structures and other property in floodplains, swales, stream channels, and pathways of debris flows
- Water and air quality – from Hazardous Materials exposed to runoff and wind from burned structures

Private road washed out by debris flow

South Abeyta Creek – private or utility access road

Indian Creek

BAER

Geologic Hazards

Geological Hazards in the burned area include:

- Rockfall
- Debris Slides
- Debris Flows
- Hyper Concentrated Flows

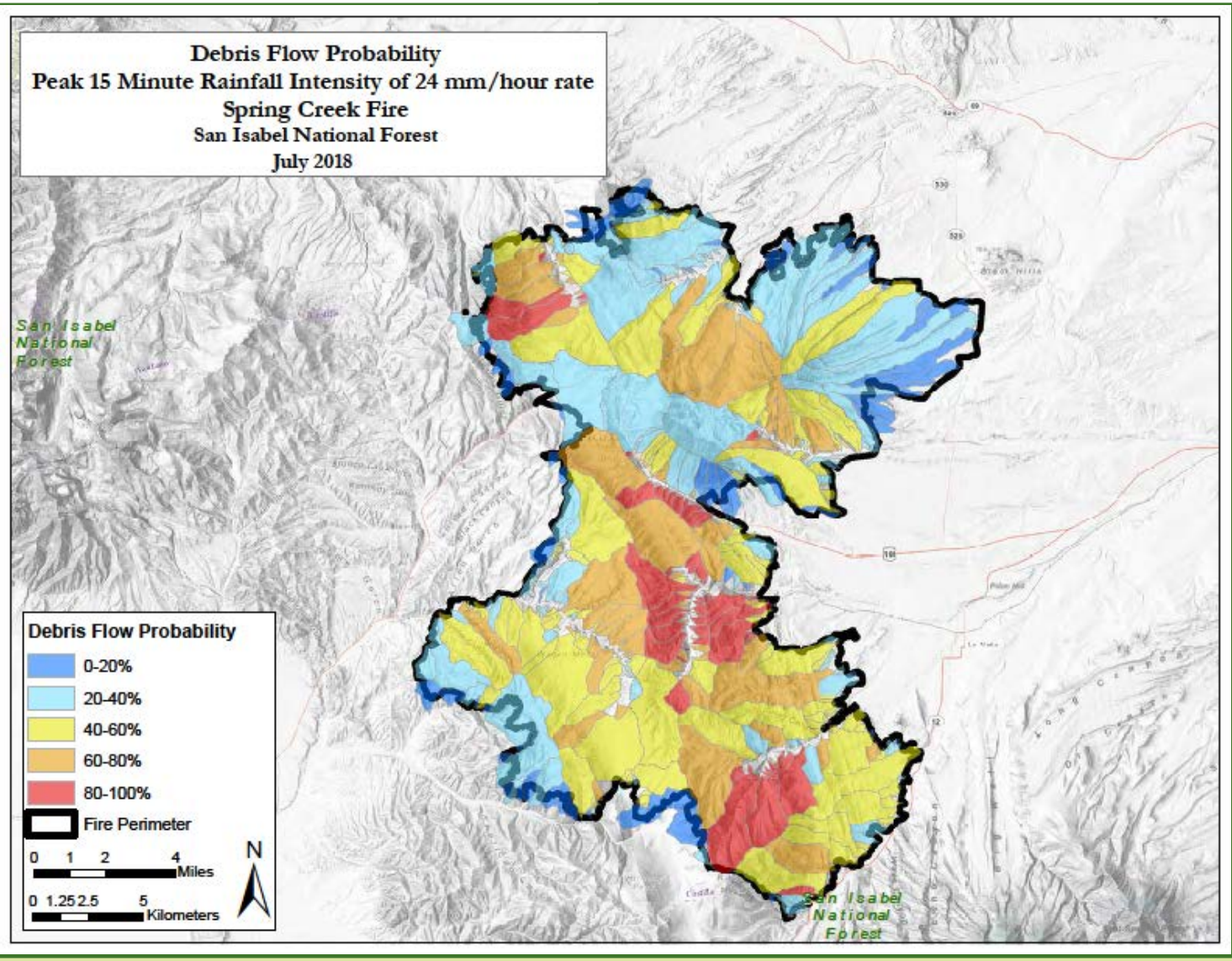
Geological Hazards are expected in watersheds that have:

- Moderate - high soil burn severity
- Steep slopes
- Significant amounts of stored sediment & loose rocks on slopes and in channels

Debris Flow

Debris Flows:

- There is an elevated potential (80-100%) for debris flows to occur in burned area until vegetation reestablishment
- Predicted volumes for many of these debris flows are 10K-100K cubic meters
- Debris flows are predicted to occur in several areas including Hwy 12, County Roads 421 & 572 and the community of Paradise Acres



Geological Hazards Recommendation

Recommend developing an early warning detection and alert system, post warning signs and road closures during storm conditions.

Road Hazards

Property

- Road infrastructure is at high risk due to increased runoff, sediment delivery and excessive erosion.
- If not mitigated, road failure is possible due to drainage features being overwhelmed by the exacerbated conditions.

Human Life, Public Safety

- On public use roads, there is a high risk to FS and BLM personnel, permittees, public and other road users. These road users need to be aware of the potential dangers they may encounter when entering a burned area and/or be prevented from entry where full danger mitigation is not feasible.

Road Hazards

Assessment Results

- Moderate and High severity on slopes adjacent to FS and BLM system roads.
- Storms will cause increased runoff and sediment delivery to existing drainage structures.

- If not reinforced or removed, features will likely be overwhelmed, causing excessive erosion of road bed and/or prism failure which compounds risks to Life and Safety, Property and Natural Resources lower in the watershed.

Road Hazards

Treatment Recommendations

- Gate closure (NFSR 421) and warning signage
- Spot hazard tree removal
- Reinforcement of existing drainage features
- Installation of additional drainage features
- Removal of stream crossing culverts (NFSR 421)
- Storm inspection and response

Recreation and Trails

Indian Trail 1300

4.9 Miles of trails at Risk

Threats to VARs:

- Flash Flooding
- Debris Flow
- Hazard Trees

Recreation and Trails

Indian Trail 1300

Trail Treatments:

- Temporary trail closure with signing
- Trail stabilization
- Storm proofing drainage crossings
- Treatment of hazard trees
- storm inspection and response

Recreation Dispersed Camp Sites

Human Life and Safety
Hazard Tree risk
Temporary Closure and Informational signing

- **Forest Boundary Warning Signs**
- **Signs at popular camp sites**

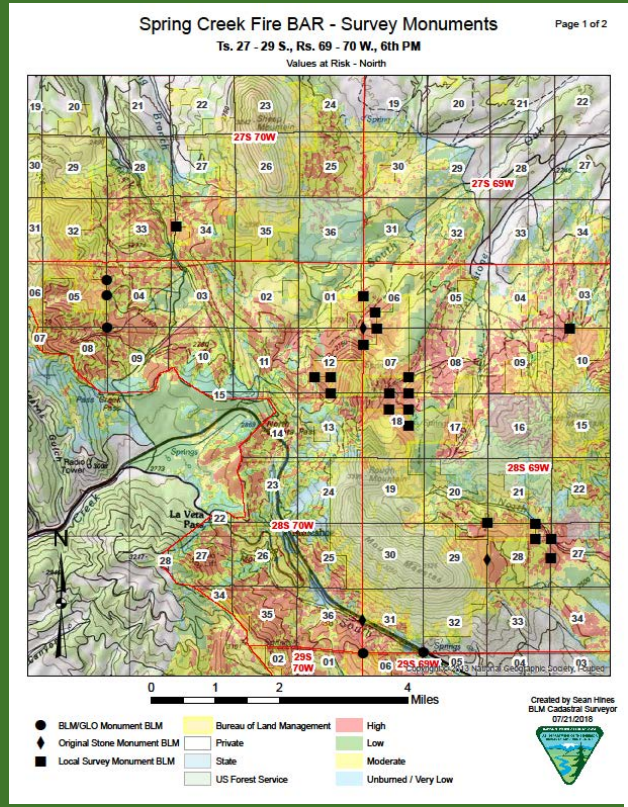
Survey Monument Protection

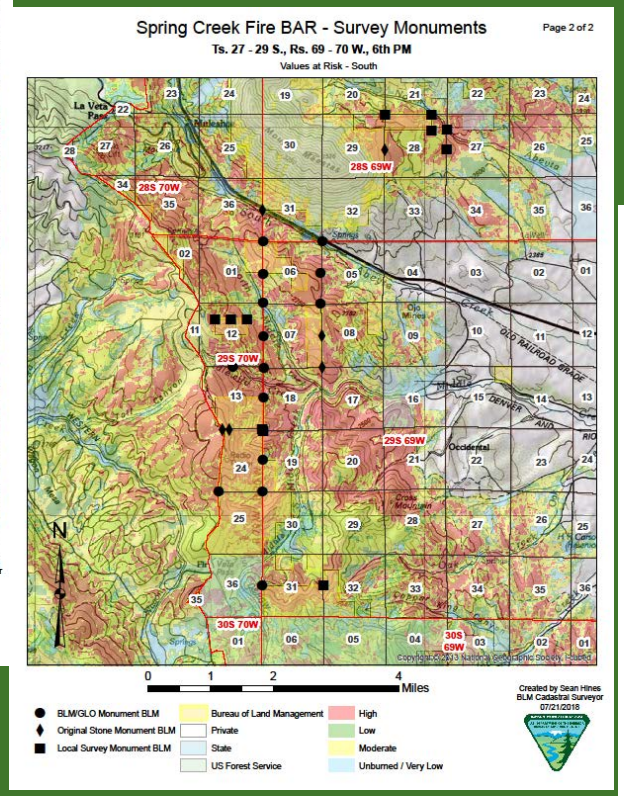
88 Monuments At Risk

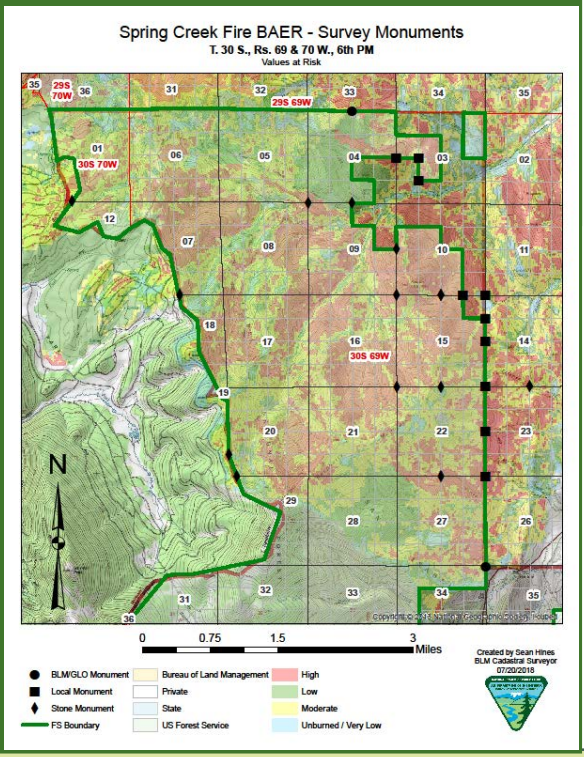
- 29 USFS Boundaries
- 59 BLM Boundaries

Threats to VARs:

- Flash Flooding
- Debris Flow
- Land Slides
- Hazard Trees







BAER

Survey Monument Protection

BLM, GLO and Locally Established Monuments

- Modern
- Made of Steel, Brass and Aluminum

Proposed Treatment

- Preserve location with survey grade GPS coordinates
- Create mound of stone around monument
- Set steel sign post and sign along side for easy identification
- Preserve bearing trees and establish new ones
- Remove hazard trees from immediate area

Protect from flooding, debris flow, landslides and hazard trees

Survey Monument Protection

Original Stone Monuments

- Established by the GLO in the 19th Century
- Very likely to be destroyed in a post fire event
- Difficult to locate, essential and cost effective to preserve

Proposed Treatment

- Preserve location with survey grade GPS coordinates
- Re-monument with a modern survey monument
- Preserve original bearing trees and establish new ones
- Set steel post and sign alongside for easy identification
- Remove hazard trees
- Publish the new monument record according to federal law

Rangeland Management

Burned Fence Indian Creek (Photo: Eduardo Duran, BLM)

- 17 Active allotments affected, 16 on BLM and 1 on NFS.
- 18.2 miles of boundary fence separating BLM, NFS and Private were affected.
- Allows proper Allotment management preventing livestock drift and trespass.

High Risk to Values at Risk

- Boundary fences between BLM/NFS and Private lands

Rangeland Management

La Veta Pass N. Allotment (Photo: Eduardo Duran, BLM)

Post fire treatment and conclusion

- Construct new fence along surveyed boundaries.
- Fencing allows for proper rest of rangeland vegetation for recovery in areas of high to moderate soil burn severity (SBS) and maintenance in areas of low SBS or unburned.
- Allotments in high to moderate SBS have a high potential for erosion and slow recovery due to low precipitation levels, slope, soil and vegetation type.
- Boundary fence allows proper management, rest and recover of rangeland vegetation.

Noxious & Invasive Weeds

Scotch Thistle-Sheep Mtn. (Photo: 2018 Eduardo Duran, BLM)

- On BLM lands, 5.76 miles of dozer line & on FS lands 8.99 miles dozer lines intersect with known noxious weed infestations.
- Invasive plants were observed & have been inventoried along access roads and in areas where suppression activities occurred.

Completed Dozer Line on BLM, (Photo: 2018 Eduardo Duran, BLM

High Risk to Values at Risk

- Native and naturalized plant communities at high risk from potential invasion from noxious weeds and invasive plant species.

BAER

Noxious & Invasive Weeds

Post fire treatment

- Early detection and rapid response (EDRR) needed along dozer lines, roads/trails and in High to Moderate SBS areas, especially those located in Cuchara Roadless Areas.
- Treat known and newly found weed infestation while conducting early detection surveys.
- Decreased noxious weed establishment/dispersal
- Reestablish desirable plants and a healthy plant community

Post Fire Canada thistle Rough Mtn. (Photo: 2018 Eduardo Duran, BLM)

Noxious & Invasive Weeds

Downy brome Silver Mtn (Photo: Eduardo Duran , BLM)

- The Spring Creek Fire burned areas with documented weed infestations on BLM, NFS, State and Private lands.
- Early detection and rapid response is necessary to protect native plant communities from non-native invasive plant infestation within the fire affected areas.
- Fire perimeter and middle interior is very accessible to public consequently creating a transmission vector for the introduction and spread of noxious and invasive species.

Wildlife and Fisheries

Values at Risk

- Canada Lynx habitat
- Rio Grande Cutthroat occupied habitat

Wildlife and Fisheries

Potential Threats to Canada Lynx:

- Delayed recovery due to erosion and run off

Potential Threats to Rio Grande Cutthroat:

- Debris flows
- Sedimentation
- Degradation of Fish Barriers

Wildlife and Fisheries

Treatments and Recommendations:

- Coordination/ Collaboration with USFWS, CPW and Trinchera Ranch
  - Provide two weeks of funding for BLM Fisheries biologist through BAR to work with USFWS, CPW and Trinchera Ranch
  - $4000/year for 5 years

- Treatments were not recommended to specifically protect Canada Lynx habitat– natural recovery recommended.

Recommendations:

- Salvage of RGCT
- Monitor habitat recovery
- Maintain/Repair/ Install fish barriers
- Re-stock

Cultural Resources

Values at Risk

- Native American and Historic Archaeological Sites
- Ceremonial and Gathering Locations

- **Archaeological values are fragile and their loss considered irreversible and irretrievable**

Potential effects include:

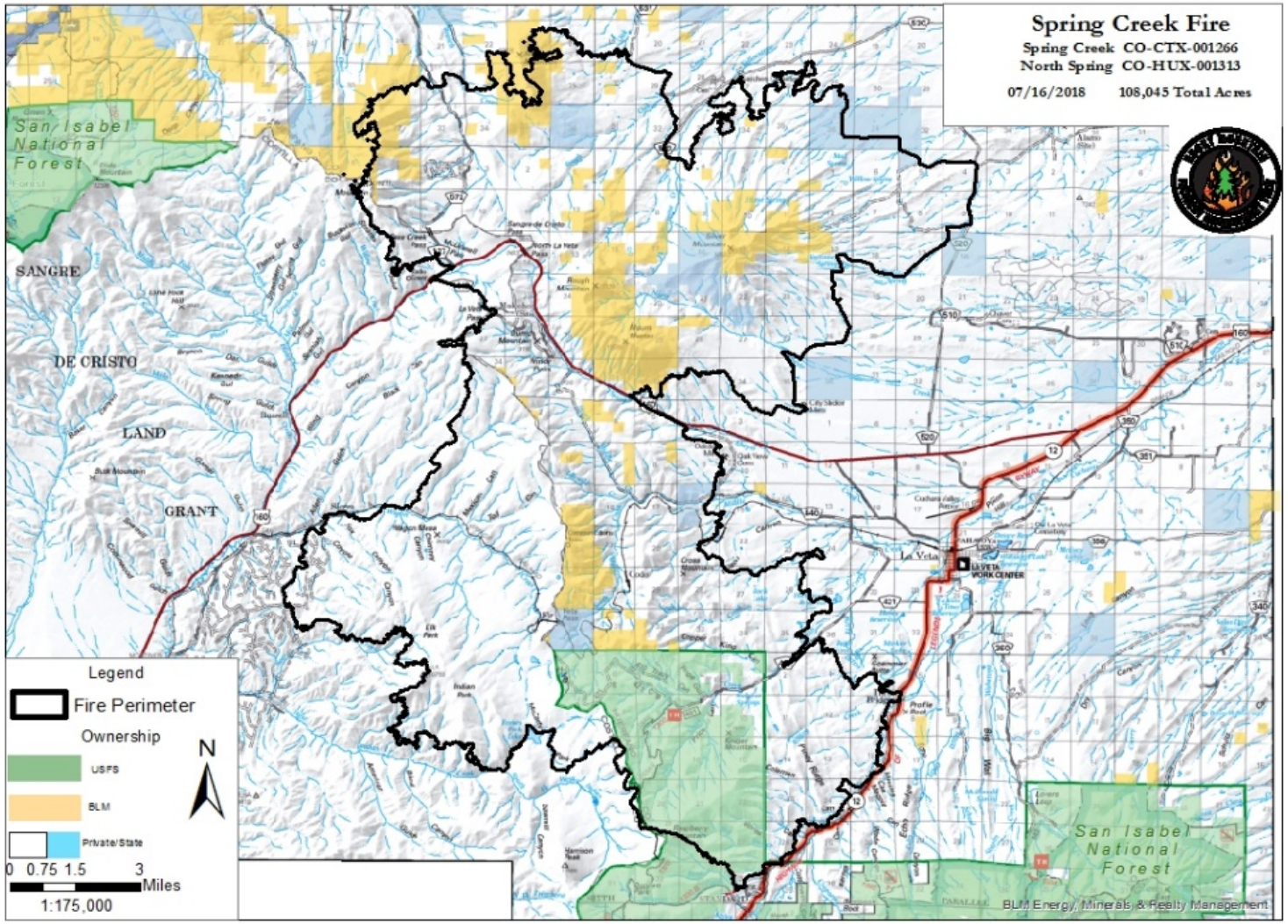
- Increase of on-site erosion, displacement of primary cultural deposits
- Increased vulnerability to looting

Cultural Resources

Area of Potential Effect

The Area of Potential Effect (APE) for consists of the fire burn area, locations of treatment actions, and areas potentially impacted by direct effects (i.e., flooding, debris flows, etc.)

- Due to limited archeological survey on federal lands, no known eligible prehistoric or historic properties are located on Federal Lands within the APE.
- No treatments for archeological resources is recommended.

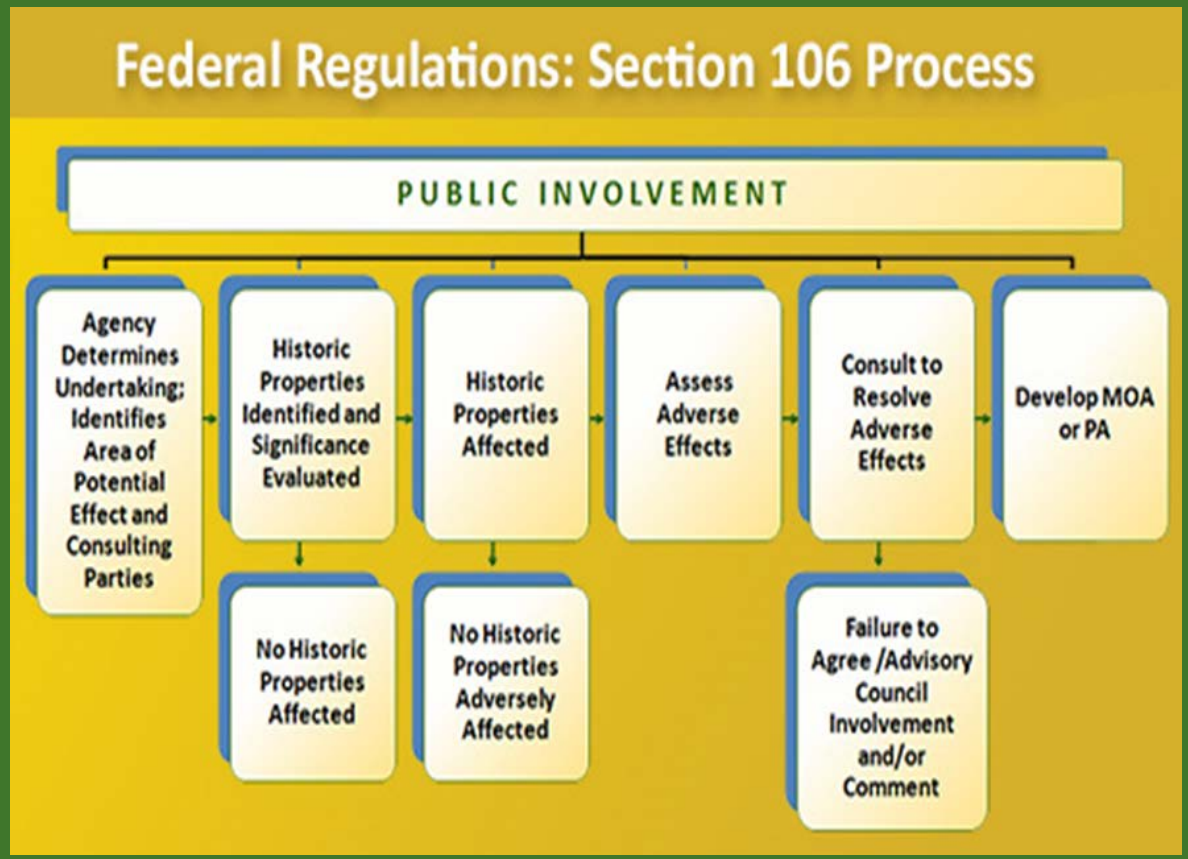


Spring Creek Fire APE

BAER

Cultural Resources

- Proposed BAER treatments range from ground disturbing activates with potential to adversely affect significant cultural resources to activities such as patrols, signage, and closure that have little to no potential for effect. Activities of particular concern are road treatments, culvert removals and replacements, hazard tree removals, drill seeding treatments, etc.
  - These activities are undertakings that will require NHPA Section 106 consultation with the Colorado SHPO and affected Indian tribes prior to their implementation.



Spring Creek Fire BAER Assessment

Conclusion:

Soil burn severity, modeling for soils, hydrology, and geology all point to four areas of **high** concern:

- Paradise Acres (evulsion zone/fan)
- Sulfur Springs (floodplain)
- Pass Creek – SR 572 (road on stream terrace)
- Vories Creek – Hwy 12 (stream terrace/fan)

Spring Creek Fire BAER Assessment

Paradise Acres (evulsion zone/fan) & Pass Creek SR 572 (floodplain)

Spring Creek Fire BAER Assessment

Sulfur Springs (floodplain)

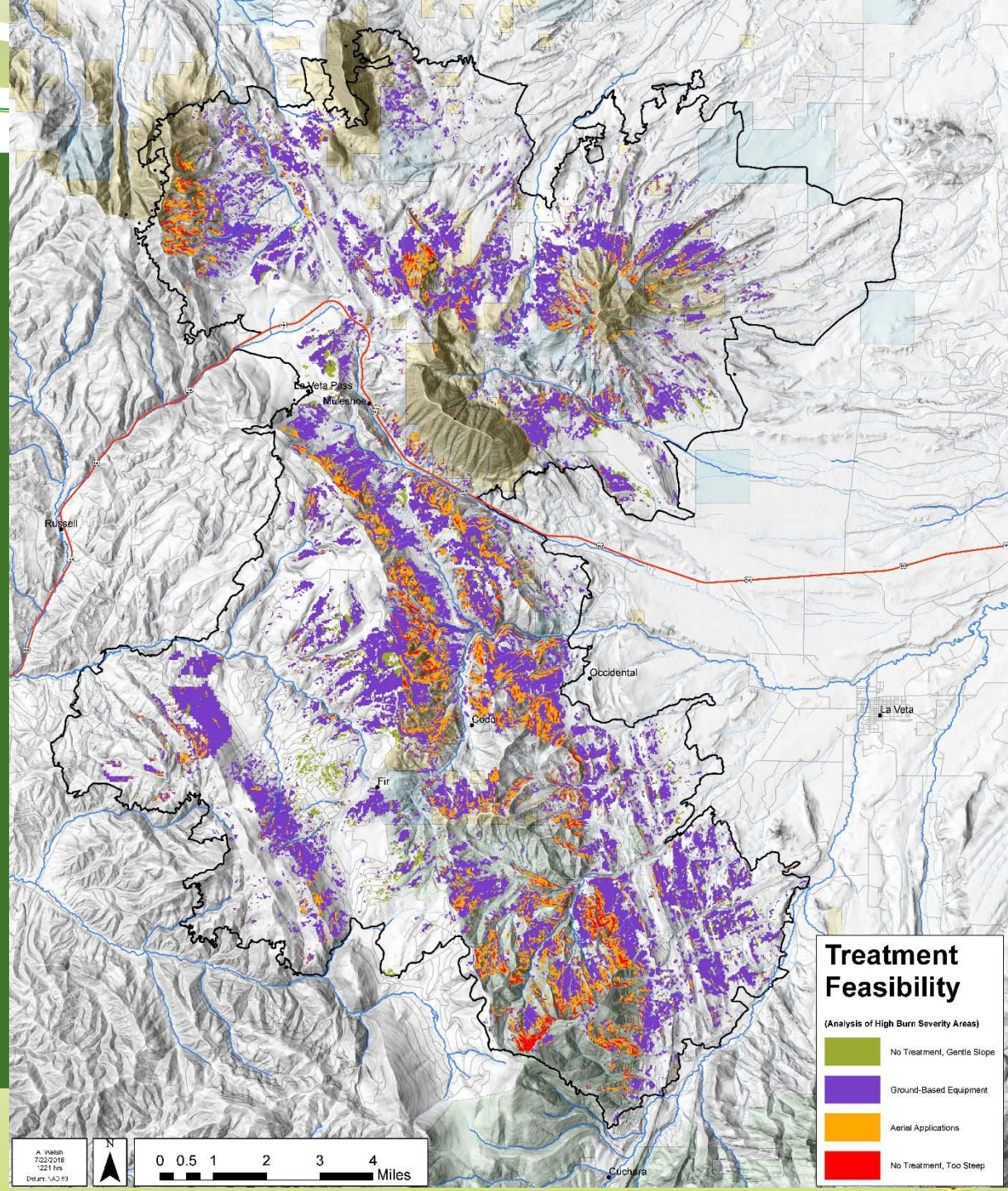
Spring Creek Fire BAER Assessment

Vories Creek – Hwy 12 (stream terrace/fan)

Soil Risk Determination and Treatment Consideration

The FS and BLM have determined there is <u>not an Emergency to Soil Productivity</u>.
No treatment is proposed.

There are opportunities to masticate extensive blocks of lands and lesser areas for aerial mulch with shredded fire-killed trees. Data is available to identify those potential treatment areas.



Spring Creek Fire BAER