

MOSQUITO FIRE

Burned Area Emergency Response Assessment



October
2022

WHAT IS BAER



Emergency Assessment and Stabilization



Suppression Repair
 Rehabilitation and Restoration
 Does not address Pre-existing issues



- Rapid Assessment
- Identify Critical Values
- Assess Threats
- Evaluate Risk
- Develop Response
- Implement Strategy



RISK		
Very High	Very High	Low
Very High	High	Low
High	Intermediate	Low
Intermediate		Very Low



FIRST STEP: SOIL PROPERTIES AND 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 removed, stronger water repellency, mortality of surface roots, soil structure weakening.



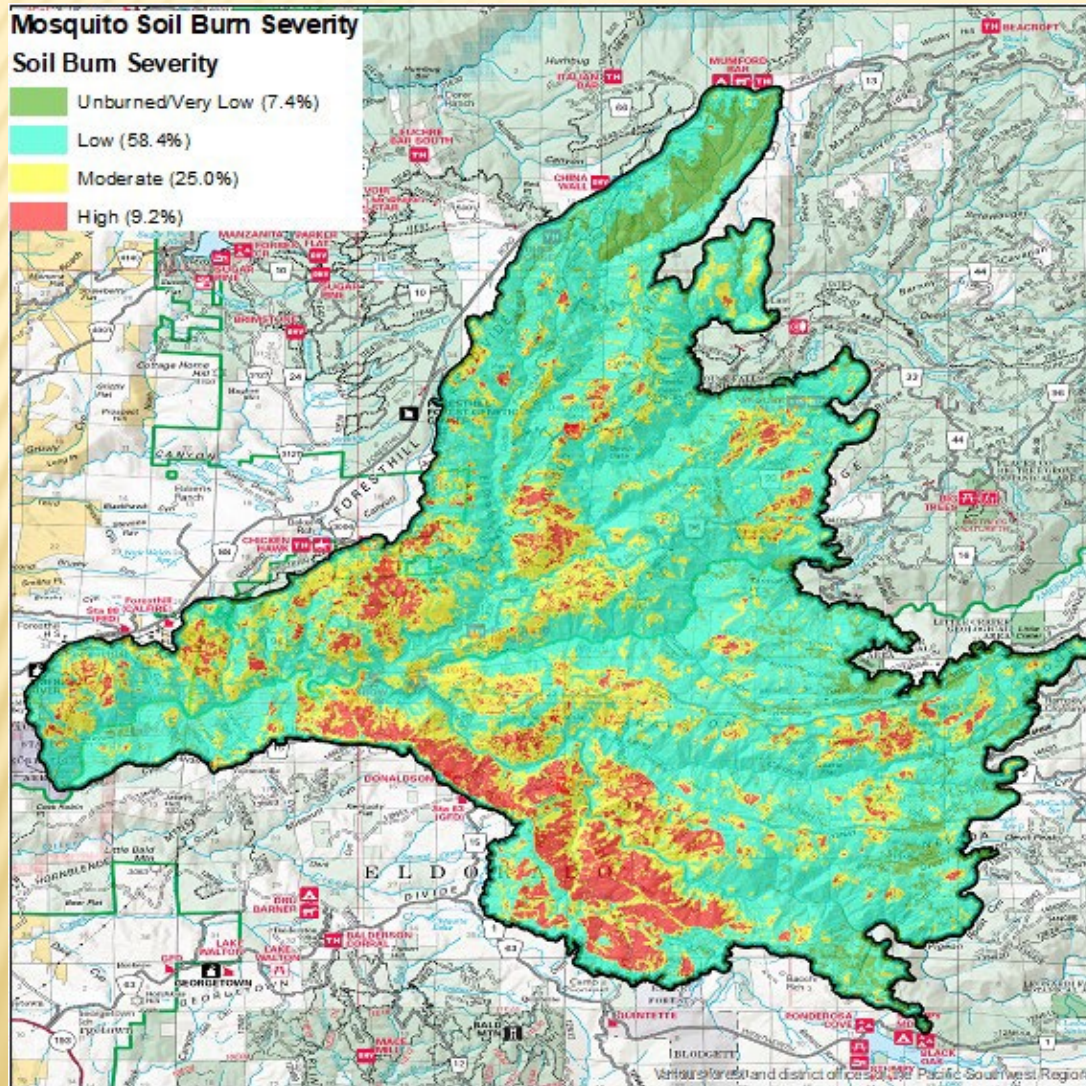
High

Complete combustion of soil cover, surface soil structure destroyed, root mortality, deeper and stronger water repellency.



Water Repellency

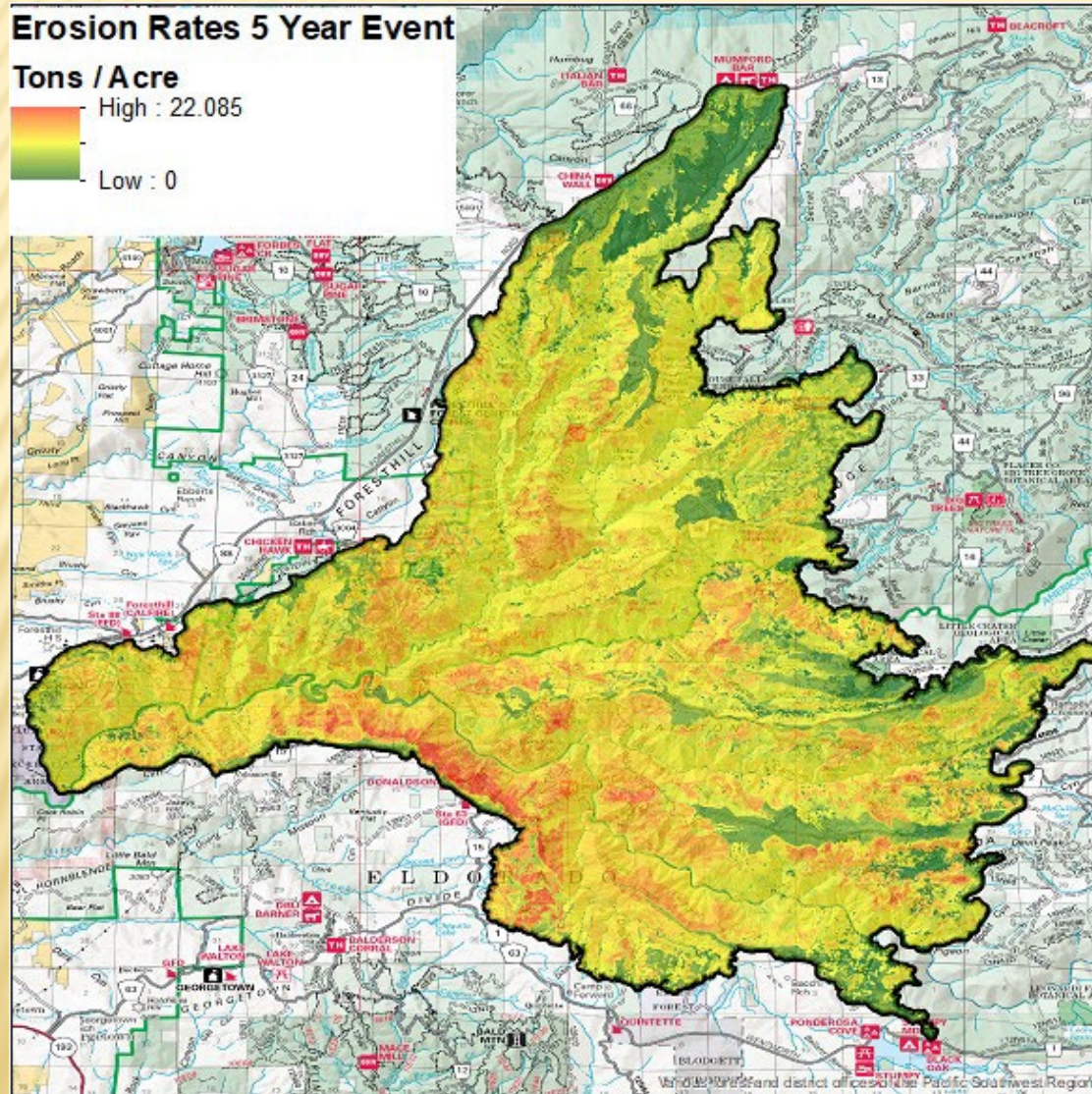
SOIL BURN SEVERITY (SBS)



	Total Acres	Tahoe N.F	Eldorado N.F
Unburned / Very Low	5,691	1,297	1,848
Low	45,077	18,280	13,393
Moderate	19,292	7,438	5,589
High	7,147	1,640	2,848
GRAND TOTAL	77,207	28,655	23,678

- Significantly higher erosion, runoff and debris flows are associated with high and moderate SBS.
- Combined moderate and high was 34% which is relatively modest compared to recent fires.
- Low SBS was the prevalent burn severity and achieves the same fuel reduction as successful prescribed fire.
- High SBS is most prevalent on steep canyon walls; too steep to consider effective land treatments. The greatest concentration of high SBS was within the Rubicon River.

EROSION



Erosion Highlights

- Modeling was completed for a 2, 5, and 10-year event
- Average rates:
 - 2 year: 4.8 Tons / Acre
 - 5 year: 9.9 Tons / Acre
 - 10 year: 13.7 Tons / Acre
- Highest erosion rates may occur on the steep slopes in high SBS.
- Slopes south of the Rubicon River will produce the highest erosion rates.
- Average erosion rates are relatively high considering the relatively low percentage of combine high and moderate SBS.
- Relatively high annual precipitation and steep slopes are driving the higher erosion rates.

FINDINGS - SOIL

Increases in accelerated erosion and sediment delivery are expected.

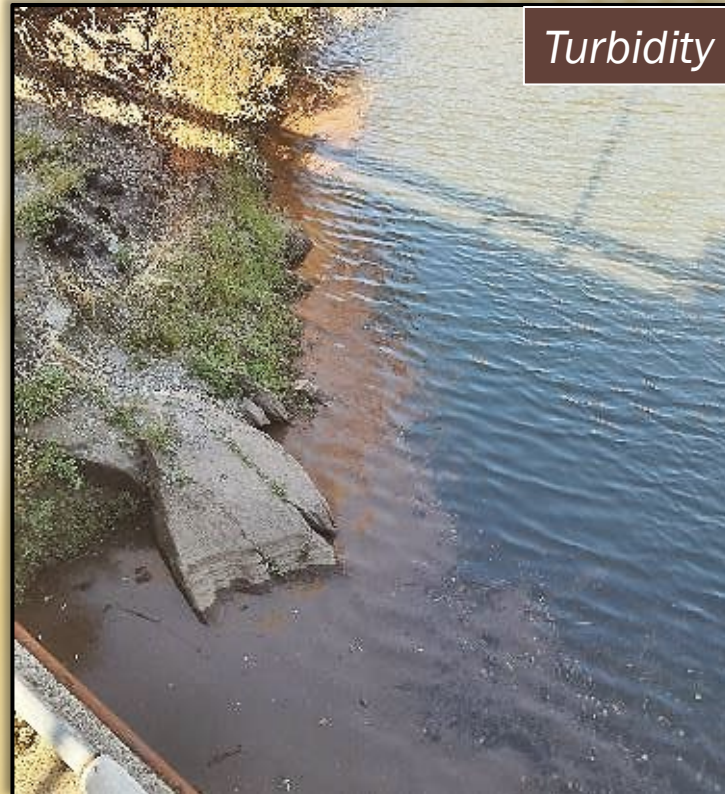
- Loss of soil productivity
 - Loss of topsoil and ecological function.
 - Soils are deep so long-term soil productivity loss is not expected.
- Majority of the fire area was a healthy understory burn.
- Oddly, the highest burn severity occurred in an 8-year-old plantation (photo right). The soil scientist speculates the overstory removal facilitated increased drying of the highly decomposed soil organic material allowing for higher soil temperatures.



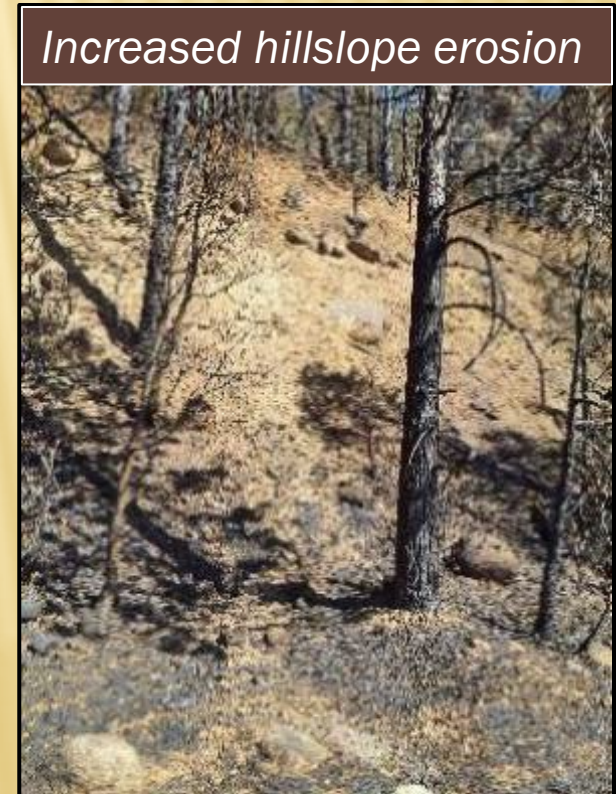
HYDROLOGY



- Increased Flooding
 - Leading to increased erosion potential
- Threats
 - Water quality, flood risks to life & safety, property, natural resources



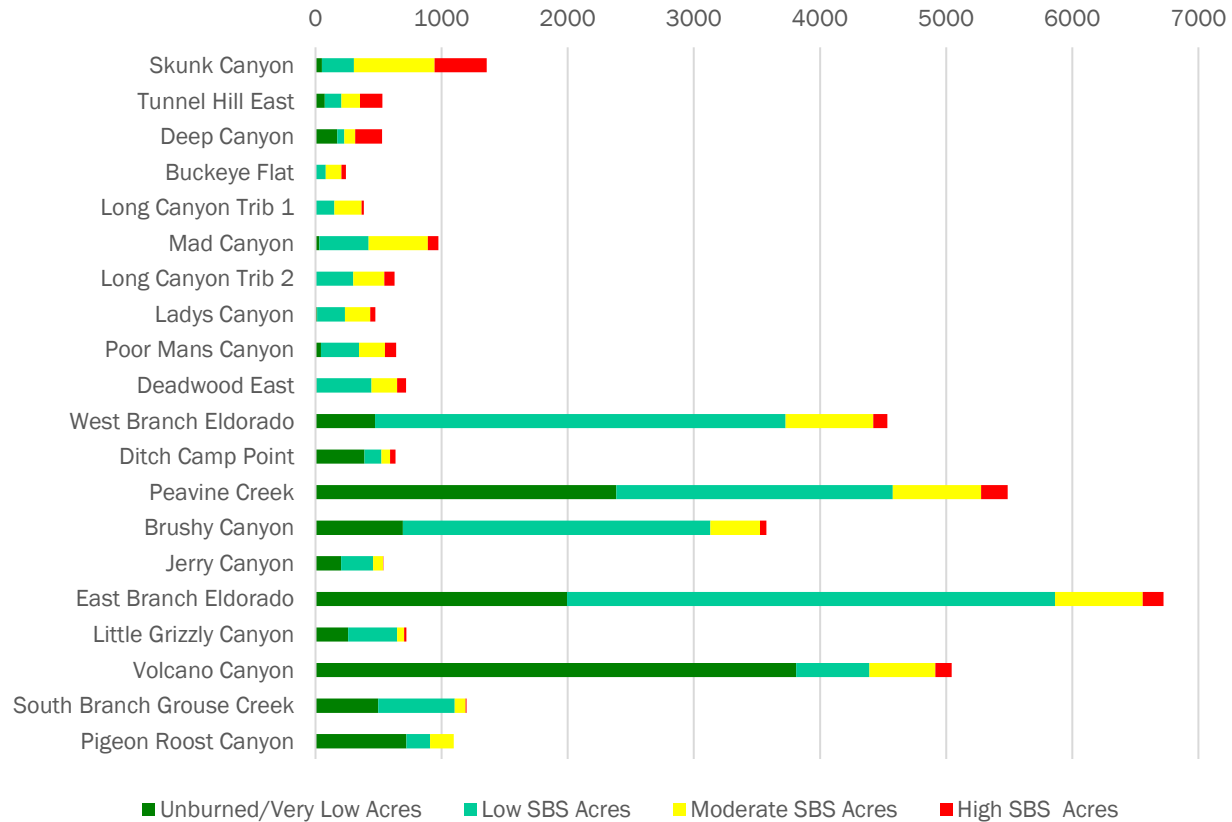
Turbidity



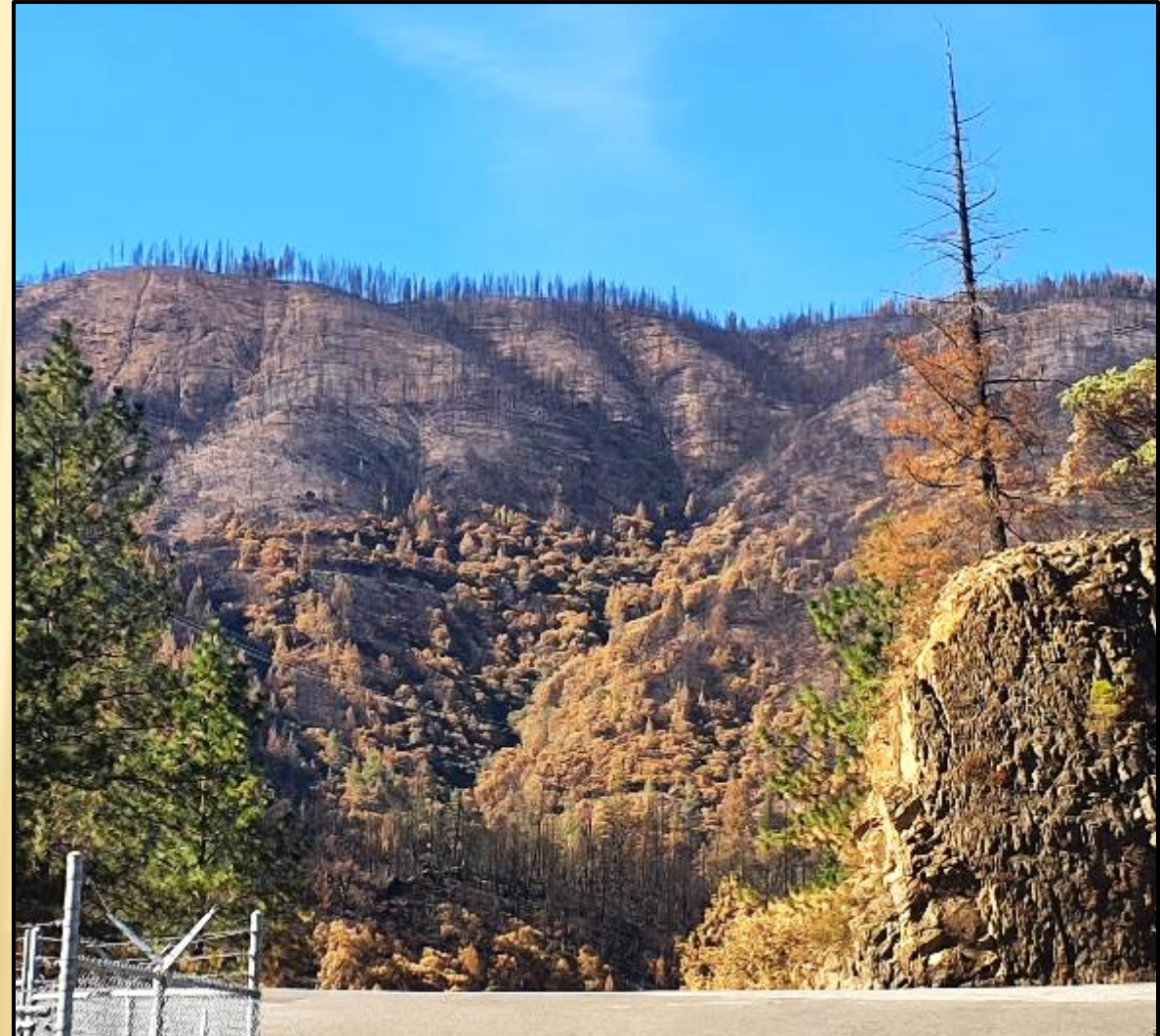
Increased hillslope erosion

HYDROLOGY

Acres of Soil Burn Severity in Analysis Watersheds

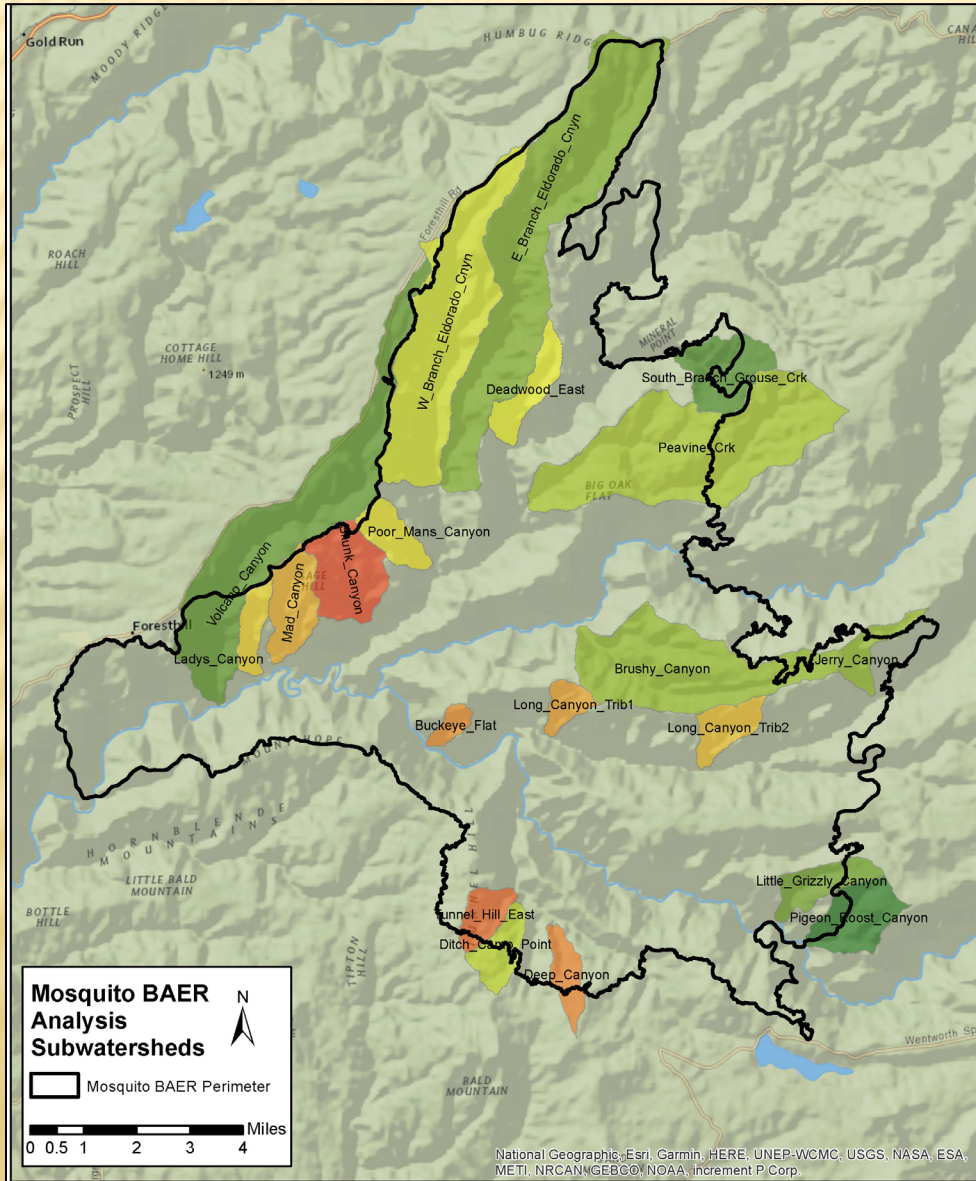


Pour Points generally relate to critical BAER values; property, roads, rec sites, heritage sites, T&E aquatics.

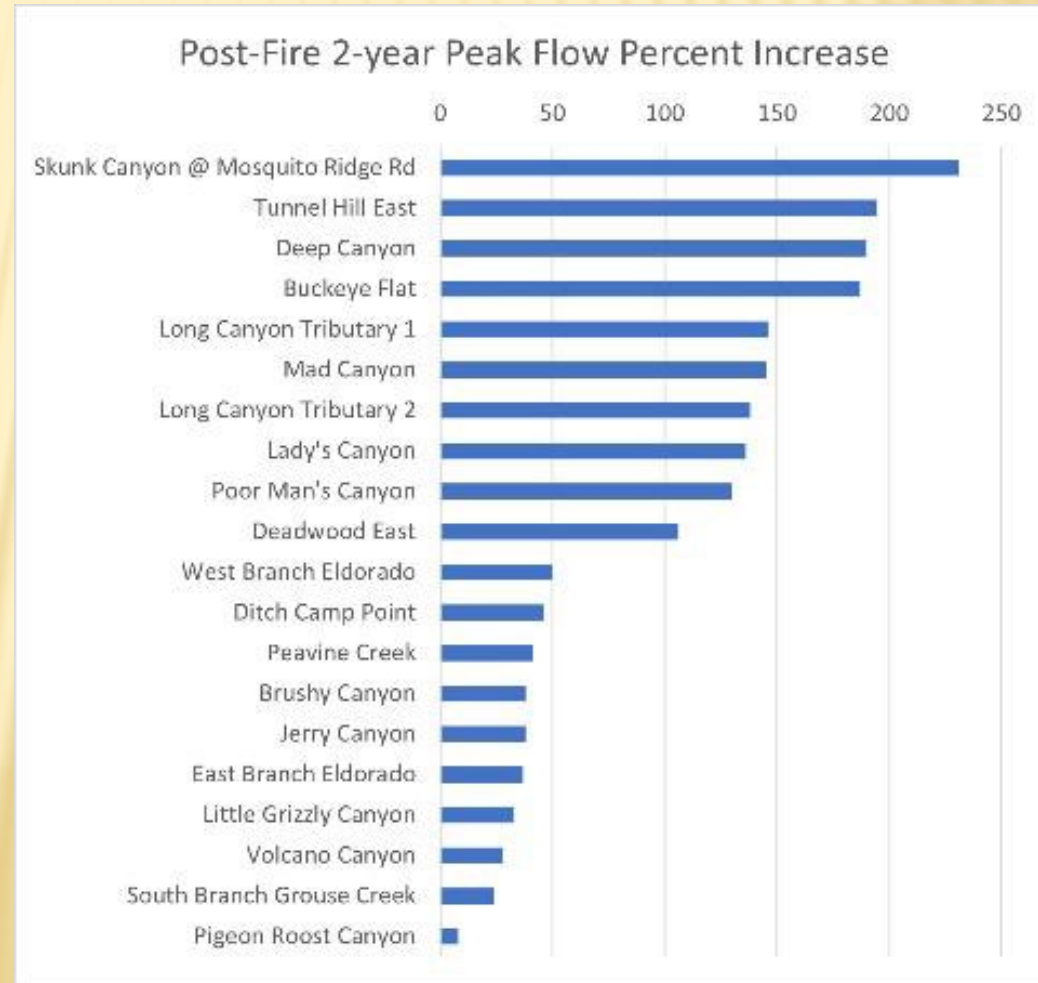


West side of Skunk Canyon Watershed

HYDROLOGY



➤ Unacceptable risks caused by increased runoff threats are addressed by NFS road and trail treatments.



GEOLOGY

Types of Geologic Post-Fire Responses

- Rock-fall
- Slope failures and landslides
- Debris flow
- Sediment-laden flooding



GEOLOGY

Fractured metamorphic rock units in the area are naturally prone to rockfall and mass wasting



Rockfall on Blacksmith Flats Road from Mosquito Ridge Road to Ralston Reservoir



Ancient river gravel deposits and volcanics naturally prone to slope failure, erosion and rockfall – fire significantly exacerbates these hazards

GEOLOGY

**Value at Risk: Human Life and Safety
along roads, trails, and campgrounds**

- **Mosquito Ridge Road**
- **Blacksmith Flat Road**
- **Ralston Day Use Area**
- **Gorman Ranch Road (*Placer Co.*)**

Existing landslides along Blacksmith Flat Road



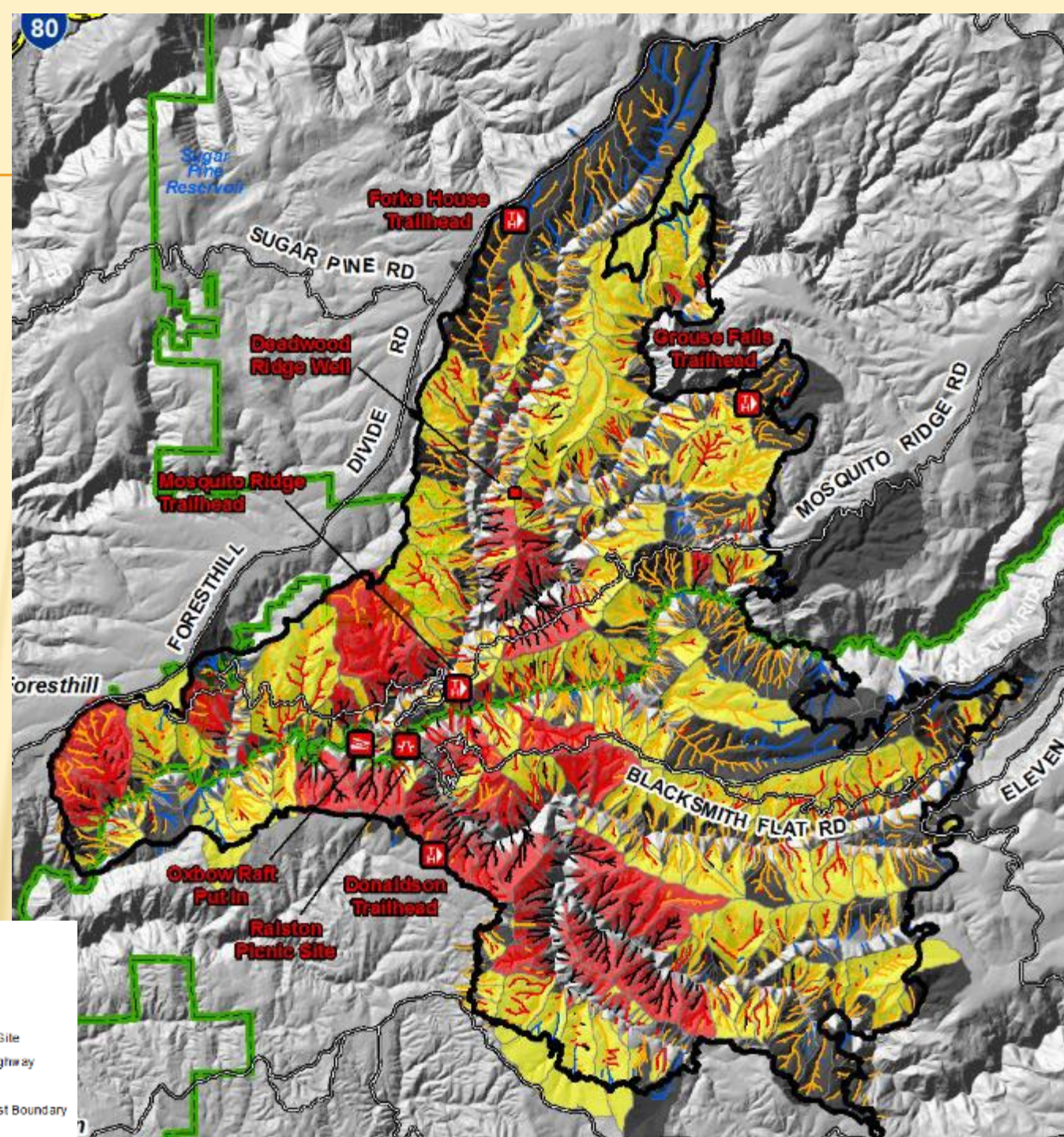
Mosquito Ridge Road on landslide-prone slopes

Rockfall signage and road closures recommended

GEOLOGY

USGS Debris Flow model – screening tool for identifying highest *relative* increased watershed response

- Skunk Canyon Watershed and Gorman Ranch Road have High hazard of debris flows and sediment-laden flows
- Where rock content is limited in high hazard basins, still likely to produce large volumes of sediment during runoff events



MOSQUITO FIRE BAER ASSESSMENT



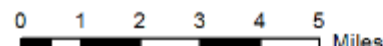
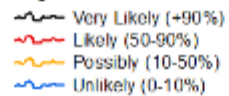
- Debris Flow -

Peak 15-Min Rainfall Intensity Storm of 28mm/hr Rate

USGS Combined Basin Hazard



Debris Flow Segment Prediction



map produced 10/3/22

Boating Site



Picnic Site



Trailhead



Organization Site

Interstate / Highway



Major Road



National Forest Boundary

ABANDONED MINE LANDS / HAZMAT

Values at Risk

- Human Life and Safety
- Natural Resources: Wildlife Habitat for Bats
- Roosting, birthing and hibernation habitat at risk for loss.



Cash Rock Adit Bat Culvert 1 before (left) and after (above) the fire.

ABANDONED MINE LANDS / HAZMAT

Potential Threats

- Injury or loss of human life from one vertical (shaft) and nine horizontal (adits) underground mine hazards.
- Human disturbance of bat habitat causing infection of white-nose syndrome, a disease of hibernating bats.

Risk Assessment

- High visitor use. The hazardous mine openings are close to Michigan Bluff, Volcanoville, ATV staging areas, roads and trails.
- Human disturbance of bat habitat can cause the spread of white-nose syndrome, a disease of hibernating bats.

Probability of Damage or Loss: **Possible to Likely**

Magnitude of Consequences: **Major**

Overall Risk: **High** to **Very High**



Cash Rock Mine Shaft near Volcanoville

AML/HAZMAT

Possible BAER Treatments:

- Install bat-friendly metal culvert gates into the 3-adit portals.
- Close the Cash Rock mine shaft with a Polyurethane foam (PUF) plug.
- Install 2-bat gates
- Install a temporary fence and post warning signs around 1-abandoned water well and 7-hazardous mine openings



ENGINEERING – VALUE AT RISK

194 Miles of NFS Roads within Mosquito Fire

- Road Failure or Damage Due to Increased Flow and Stump Holes
- Overwhelmed Drainage Crossings
- Rock Fall, Flooding, and Debris Flow Preventing Access and Creating Dangerous Driving Conditions



ENGINEERING – FINDINGS

STEEP CANYON DRAINAGES WITH POTENTIAL FOR POWERFUL DEBRIS FLOW

**Tahoe
National
Forest**

**7.8 Miles
BAER
Critical
Road Work**

83.7 Miles

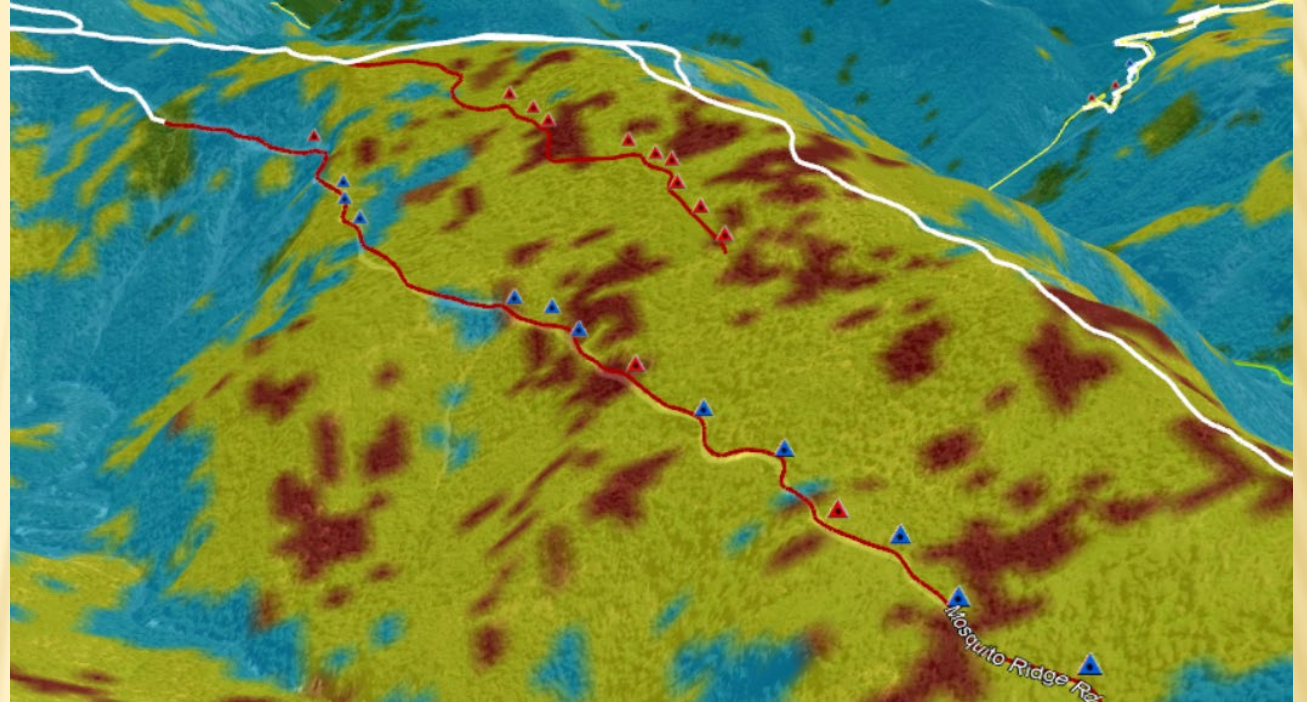
**Drainage &
Safety
Point
Treatments**

**Eldorado
National
Forest**

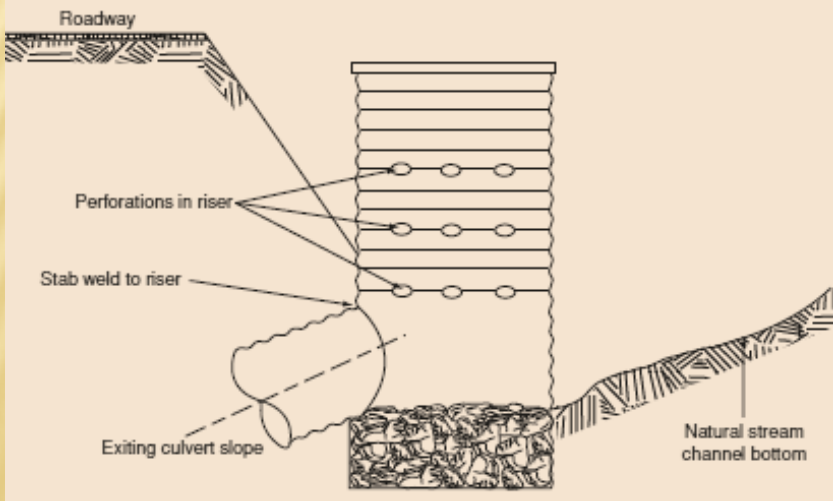
**6.9 Miles
BAER
Critical
Road Work**

110.3 Miles

**Drainage &
Safety
Point
Treatments**



ENGINEERING – POSSIBLE BAER TREATMENTS



Dips – Carry Water Off Roadway, Road Erosion Prevention

Culvert Risers, Catch Basin Improvements

Roadway Reconditioning & Drainage Restoration

Repair Stump Hole - Remove Burned Wood To Prevent Collapse Of Roadbed

Storm Inspection and Response

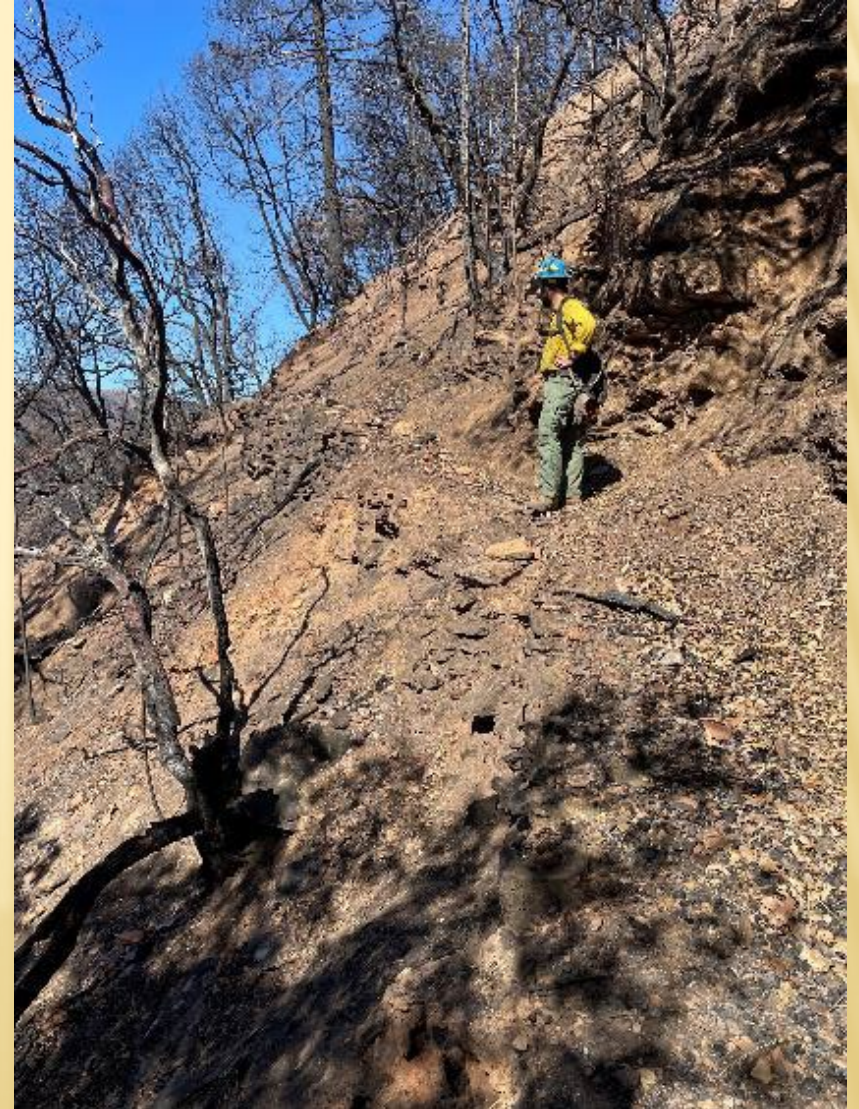
Health & Safety Treatments – Signage, Road Closures

MOSQUITO FIRE- RECREATION AND TRAILS



Michigan Bluff side of El Dorado Canyon – Photo by Carol Hewitt

World Famous Western States Trail



RECREATION ASSESSMENT

▪ Values at Risk

- Health and Human Safety due to hazard trees and rock-slide potential:
 - Ralston Day Use
 - Donaldson Trailhead
 - Other Trailheads
- Loss or damage to property and access due to falling hazard trees, erosion and trail blowouts.
 - 58 miles of NFS trails within the fire
 - Historic Western States Trail and Loop 6 Motorcycle Trail, and non-motorized trails on the Eldorado NF



Ralston Picnic Area

POSSIBLE BAER RECREATION TREATMENTS

- Close affected recreation sites (developed and dispersed) until hazards are mitigated:

- **Tahoe NF:** Grouse Falls Trailhead, Mosquito Ridge Trailhead, Forks House Trailhead, Deadwood Canyon and Devil's Thumb recreation sites
- **Eldorado NF:** Donaldson Trailhead and Nevada Point Trailhead

- Storm Proofing Priority Trails in high-risk areas

- **Tahoe NF:** Western States Trail and Codfish Loop 6 Motorcycle Trail
- **Eldorado NF:** Volcanoville Tie Trail



Donaldson Trail down to the Rubicon River

AQUATICS ASSESSMENT

Values at Risk

- California Red-Legged Frogs (ESA listed as threatened)
- Designated Critical Habitat (92% of the DCH burned)

Critical habitat at risk occurs on:

- Newly Constructed Wetlands



California red-legged frogs observed within the Mosquito Fire perimeter on 9/28/2022. Photo provided by Westervelt Ecological Service.

AQUATICS ASSESSMENT – CRITICAL VALUES AT RISK



Wetland #17 Pre-Fire (Notice the Large Woody Material-LWM)



Wetland #17 Post-Fire (Notice LWM completely denuded)

AQUATICS ASSESSMENT

Potential Threats:

- Sedimentation (pool filling and impaired breeding)
- Decreased water quality

Possible treatments such as water bars and wood mulch will reduce sediment and ash input into the suitable habitat

- Probability of damage to DCH is likely
- Magnitude of consequences is moderate
- Risk is high = emergency



BOTANY AND WEEDS

Values at Risk

- Ecosystem health and the integrity of largely intact native plant communities.
- Federally listed plant species (Layne's butterweed)



Left to right; serpentine outcrop, Layne's Butterweed.
Photos by Blake Engelhardt and Matt Brown

BOTANY AND WEEDS

Potential Threats:

- Both native ecosystem heath and the Federally Listed Layne's butterweed are threatened by spread of invasive weeds.

Risk Assessment:

- Fire camps were infested with invasive plants- limited equipment washing, and rain event created ideal conditions for equipment and crew to transport seeds from camp.
- Fire line was constructed through Layne's butterweed population on the TNF.
- Invasive plants introduced into susceptible post fire environment will likely cause long-term habitat degradation

Probability of Damage or Loss: Very Likely.

Magnitude of Consequences: Major

Overall Risk: Very High



Spotted knapweed photo by Mike Taylor

BOTANY AND WEEDS

Possible BAER Treatments:

- Early detection, rapid response (EDRR) surveys will be conducted for suppression lines, and suppression disturbed ground on Forest Service lands.
- EDRR surveys will also be conducted at known infestations that burned at moderate or high SBS to ensure infestations are not spreading within the fire footprint.
- EDRR is a combination of early surveys combined with immediate treatment of new infestations.
 - This is the most effective and cost-efficient treatment to mitigate establishment of infestations.

Interagency Coordination



BURNED AREA—THE ROAD TO RECOVERY

What we are seeing

The photo to the right is the first sign of soil healing in the Mosquito Fire following the first rains. The charred vegetation feeds the molds and fungus causing rapid growth.

What to expect

Expect a flush of incredible soil stabilizing vegetation like bryophytes and bear clover. Root sprouting of oak will occur prior to winter. In areas of low and moderate SBS, natural seeding of fir and pines will be evident in the spring of 2023. Large areas of high SBS will be very slow to recover.



Photo by Tyler Segura, Mosquito Fire