Dragon Bravo Fire Burned Area Summary

Burned Area Report

Fire Background

The Dragon Bravo Fire started early in the afternoon on Friday July 4th, 2025, by lightning on the North Rim of the Grand Canyon in Grand Canyon National Park.

On Friday July 11th, 2025, the Dragon Bravo Fire was affected by strong and unfavorable northwest winds associated with a passing weather front. Consequently, the Dragon Bravo Fire exhibited extreme fire behavior and jumped multiple containment features. In the following days fire behavior continued to be very active, driven by hot temperatures, low relative humidities, and continued strong winds. The fire moved onto the North Kaibab Ranger District of the Kaibab National Forest on July 23. As of September 17, the total acreage of the fire is 145,504 acres; of which 77,468 acres are on the Kaibab National Forest. This report will summarize only the Kaibab National Forest portion of the Dragon Bravo Fire.

While many wildfires cause minimal damage to the land and pose few threats to the land or people downstream, some fires result in damage that requires special efforts to reduce impacts afterwards. The Burned Area Emergency Response (BAER) program is designed to identify and manage potential risks to resources on National Forest System lands and reduce these threats through appropriate emergency measures to protect human life and safety, property, and critical natural or cultural resources. BAER is an emergency program for time-critical stabilization work to be completed before damaging events to meet program objectives.

An advance team of Forest Service hydrologists and soil scientists began soil condition sampling on August 19, 2025. The full Forest Service Dragon Bravo BAER team of resource experts began assessing the post-fire effects to critical values on Forest Service lands on August 20, 2025.

Figure 1 Dragon Bravo Forest Service BAER Team kickoff meeting August 20, 2025, in Kanab, UT.

Impacts on the soil are the primary indicator of potential post-fire changes in watershed response, as well as watershed recovery. The team developed soil burn severity (SBS) maps to document the degree to which the fires had changed soil properties. Using the SBS map, physical scientists can model erosion potential, potential changes to runoff and flood flows, and increased geologic hazards. Field evaluations and modeling results are used to determine relative increases in post-fire risk to different critical values and inform recommendations to address these increased risks.

Soils

Soil burn severity is not an assessment of vegetation consumption, but rather an integration of vegetation loss, changes in soil structure and infiltration capacity, remaining vegetation, duff, or ash, and soil color, all of which may indicate relative degrees of soil heating.

The final SBS maps were developed with ESRI ArcGIS software using satellite-imagery-derived Burned Area Reflectance Classification (BARC) and field survey data. Field work included assessment of ash characteristics, ground cover, root condition, soil structure, soil water-repellency, and vegetation burn severity as described in the Field

Guide for Mapping Post-fire Soil Burn Severity (Parsons et al. 2010). High soil burn severity is characterized by a complete consumption of organic material within the surface layers of the soil resulting in a change to single-grain structure. Fine roots are commonly charred or consumed 3-5 cm deep. The highest-severity areas often have a loose, dusty appearance, and no longer have any cohesion or soil strength. Generally, there will be less destruction of soil organic matter, roots, and structure in an area mapped as moderate compared to high. In areas mapped as moderate SBS, soil structure, roots, and litter layer may remain intact beneath a thin ash layer. Low soil burn severity results in very little alteration of soil organic matter and little or no change in soil structural stability.

Figure 2 Soil condition sample on moderate soil burn severity (SBS) site in the Dragon Bravo Fire where a majority of the overstory was completely consumed (upper photo) on August 20, 2025.

Mapped and validated SBS for the burned area is High 3%), Moderate (28%), Low (63%), and Very Low/Unburned (5%) (See Figure 5). The more severe a fire's effects are on the soil, the more likely those soils will erode in subsequent rainstorms – especially in locations with steep slopes. Erosion after fires can cause tremendous damage to homes and other structures in the years after a fire. There are no developed areas within the BAER analysis area.

Model predictions for the fire show a potential increase in hillslope erosion within the Dragon Bravo footprint on the KNF. It's worth noting that soils within the canyons and woodland vegetation communities, while sometimes lower soil burn severity, inherent instability will likely also result in increased hillslope erosion.

In the first few years following the fire, there is likely to be an increase in sediment discharge from stream courses. The high intensity, short duration storm events, associated with a normal monsoon season, are expected to drive the majority of the sediment delivery, sediment pulses can be expected to continue throughout the recovery period until ground cover returns and slopes stabilize.

Geology

The team identified the geologic conditions and processes that have shaped and altered the watersheds and landscapes and assessed the impacts from the fire on those conditions and processes that could affect downstream critical values. Using the understanding of rock types and characteristics, geomorphic processes, and distribution of geologic hazards helps predict how the watersheds will respond to and be impacted by upcoming storms. The geology of the fire is limestone and mixed sedimentary alluvium, colluvium and residuum.

The team provided soil burn severity field data to the US Geological Survey Landslide Hazard Program to assist in forecasting the probability, potential volumes, and hazards of debris flows through their developed empirical models. The USGS Post-fire Debris Flow Hazard Model estimates that North Canyon, Fence Canyon, South Canyon, Tater Canyon, and Pleasant Valley Canyon have the greatest propensity for high debris flow hazard within modeled watersheds and stream channels.

The team performed additional debris flow volume analysis at the watershed scale using the Southwest V1 model. This model is an empirical model developed to improve post-fire debris flow volume estimates for New Mexico and Arizona. BAER post-fire debris flow assessments currently employ the empirical USGS Emergency

Assessment model. Debris flow volumes from the V1 model are lower than the modeled USGS volumes. Similar to the USGS debris flow model, results from the VI model show that North Canyon, Fence Canyon, South Canyon, Tater Canyon, and Pleasant Valley Canyon have the greatest propensity for high debris flow hazard within modeled watersheds and stream channels. The volumes expected under the VI model are less than the USGS model.

Hydrology

Primary watershed response is expected to include an initial flush of ash and burned materials, erosion in drainages and on steep slopes in the burned area, increased peak flows and sediment transport and deposition, and debris flows. Watershed response is dependent on the occurrence of rainstorms and rain-on-snow events and will likely be greatest with initial storm events. Increased watershed response is most likely in areas with high to moderate soil burn severity.

Figure 3 BAER Hydrologist Kelly Mott LaCroix assesses soil condition on the Dragon Bravo Fire on August 19, 2025

Disturbances will become less evident as vegetation is reestablished. Vegetation provides ground cover that reduces erosion and increases surface roughness, which slows flow accumulation and increases infiltration.

A rapid hydrologic assessment suggests that there will be a change in hydrology from pre-fire conditions. The Dragon Bravo burn scar covers 149,399 acres resulting in patches of moderate and high soil burn severity, mostly in the headwaters of watersheds. Areas of moderate and high soil burn severity resulted in high vegetation mortality and complete loss of effective ground cover creating high runoff potential relative to pre-fire conditions. Additional effects of the fire include accelerated sheet and rill erosion throughout the fire areas, flushing flows of ash, as well as the potential for rock fall and debris flows

The highest hydrologic response was observed within the subbasins containing the highest percentages of moderate/high soil burn severity. Watersheds of greatest concern include South Canyon, North Canyon, Tater Canyon, Pleasant Valley Canyon, and Kane Canyon.

Emergency stabilization treatments proposed for hydrology include channel stabilization at the North Canyon Springs Complex (Aconitum Springs, 3 North Canyon Springs) and wood structures in 1.5-mile perennial section of North Canyon Creek, a grazing deferral at Indian Lake until ground cover is restored to pre-fire conditions, and protection measures (straw wattle, log erosion barriers) to protect Wildcat Cave.

Critical Values

The first critical value BAER teams assess is always human life and safety on National Forest System lands. During and after heavy rainstorms, Forest Service employees and visitors to National Forest System Lands could be threatened by floodwaters and debris flows. In addition, users of roads within and downstream of the burned areas may be affected by road washouts during and after heavy rainstorms. The National Weather Service can establish an early warning alert plan for areas that are potentially at risk from these events. The BAER team recommends closures, both long-term and seasonal, general warning signs and communications to travelers on any National Forest System both roads and trails within or directly adjacent to the fire. See the resource specific discussion below for specifics.

Roads and Bridges

Roads in and downstream of burned areas are at

risk of damage due to post-fire conditions. The most likely threat due to the fires is clogging of culverts, bridges, and other in-channel infrastructure from the higher levels of floatable debris (especially burned trees) in burned watersheds. Once blocked by debris, road drainage structures no longer function and the stream flows over the road, often causing considerable damage and limiting access. Various measures can reduce this risk, including protecting culvert inlets with debris racks, removing large floatable debris from channels upstream of structures before floods, and making heavy equipment available and readily mobilized during storm events to keep structures clear of debris.

Debris flows are less likely than debris-laden flood flows, but they pose a greater threat to roads when they do occur and are difficult to mitigate.

Critical values addressed in the BAER report include Forest Service System Roads and related drainage features and human life and safety on the following National Forest System Roads (NFSR): NFSR 211, NFSR 213, NFSR 219, NFSR 220, NFSR 241; NFSR 445A, NFSR 445B, NFSR 610, NFSR 611, NFSR 8910, Crystal Springs Bridge (on NFSR 611), NFSR 610 and 611 trailhead restroom and one communication site (off NFSR 219)

Storm proofing, storm inspection and response and hazard signs are proposed on NFSR 211, NFSR 213, NFSR 219, NFSR 445A, NFSR and 445B. NFSR 241 has the same treatments plus a culvert modification. NFSR 610 has the same three treatments plus a culvert removal. NFSR 610 has storm proofing and storm inspection, and response proposed as emergency treatments.

There are two roads that the BAER Team is proposing for seasonal closures for public safety. NFSR 220 has a seasonal closure proposed, along with storm inspection, road hazard sign and physical closure prescribed. NFSR8910 has storm proofing of existing drainage structures, storm inspection and response, stream crossing protection, road hazard signs and physical closure devices prescribed along with a seasonal closure.

Recreation

National Forest System recreation infrastructure includes campgrounds, trails, and day use areas. Most of the recreation assets within the Dragon Bravo Fire burned area relate to life and safety in dispersed recreation areas; 12.6 miles of the 800-mile Arizona National Scenic Trail (AZT); FS# 6 South Canyon Trail; FS#57 Saddle Mountain Nankoweap Trail; FS#4 North Canyon Trail; FS#7 East Rim Trail ; and Upper and lower trailheads and access points for Nankoweap, North Canyon, South Canyon trails and the East Rim and Kaibab Plateau (AZT) trailheads.

Similar to roads, recreation infrastructure could be damaged in post-fire storm events.

The team proposes trail drainage stabilization treatments, which include armoring and/or cleaning existing water control features and adding additional drainage features to provide additional capacity for elevated sediment laden post-fire runoff on 11 miles of the Arizona Trail, approximately 1 mile of the North Canyon Trail, and 2 miles of the Nankoweap Trail.

The BAER Team also recommends that two trails be administratively closed, The South Canyon Trail and East Rim trail until disaster relief funds can be obtained and utilized to reconstruct the trails to provide for user safety and trail sustainability.

Botany

Invasive plants adversely affect native plant communities through allelopathy (suppression of growth of a native plant by release of a toxin from a nearby invasive plant) and direct competition for water and resources. Over time, native plant diversity decreases as invasive plants expand, reducing habitat for native plant species and wildlife. Shifts from diverse native plant communities to non-native invasive plant dominance could alter future fire behavior, intensity, extent, and season of burning.

Limited survey data for noxious weeds exists for the Dragon Bravo Fire area. With that being said, current infestations are likely located along roads, old dozer lines, campgrounds, and trails

throughout the burned area, with interior areas being largely un-infested.

A Pediocactus Conservation area, a management area in the Kaibab Land Management plan, is present in the affected area of the KNF. The conservation area includes important plant communities and habitat for the narrow endemic Paradine plains cactus (*Pediocactus paradinei*) and other rare plants where invasive species are absent to infrequent. The Paradine plains cactus is also managed under a conservation agreement with FWS to preclude the species from listing as threatened or endangered. The goal of the management area is to achieve and maintain self-sustaining populations of Paradine plains cactus. The Paradine plains cactus appears to be able to survive low intensity wildfires however hot fires kill plants.

Also, as wildfires open forest canopies and expose mineral soil, habitat for other opportunistic weeds would increase. However, the burned area creates conditions for invasive species to outcompete native plants. The team recommends Early Detection and Rapid Response (EDRR) to monitor noxious weed infestation and expansion in areas disturbed due to mechanical suppression activity and burned areas prone to new noxious weed infestations. The treatments will focus on 18 constructed helispots 77 miles of dozer lines, 17.75 miles of hand line, two spike camps, one safety zone and 12 large dozer pushouts with no prior invasive plant infestations. EDRR treatments will be for detection and hand removal.

Cultural Resources

The most typical post-fire threats to cultural sites are physical threats such as erosion or damage from (now dead) falling trees. In some cases, newly exposed artifacts are threatened by human activities such as looting or vandalism. Cultural resources were evaluated by the team and treatments proposed as necessary to protect these values from post-fire threats. Treatments are proposed to protect 69 cultural sites through straw wattle installation, seeding and signage, as well as felling of trees at two sites to prevent further loss to site integrity.

Figure 4 BAER archaeologist Noni Lyndon documents fire effects to a cultural resource site on the Dragon Bravo Fire on August 22, 2025.

Federally Listed Species - Wildlife and Fisheries

No occupied federally listed species are within the Dragon Bravo Fire area.

Anticipated Vegetation Recovery

Post-fire recovery varies greatly based on climate, vegetation types and burn severity. It is typical for recovery to take between 3-5 years for reestablishment of ground cover. The persistence of drought in the years following wildfires also delays the recovery time frame. At the end of August, prior to full containment of the fire, resprouting of trees and shrubs, as well as emergence of forbs, have been noted within the burned area.

Non-Forest Service Values

Since fire effects know no administrative boundaries, additional threats exist for assets not owned or managed by the Forest Service. Post-fire emergency response is a shared responsibility. There are several Federal, State, and local agencies that have emergency response responsibilities or authorities in the post-fire environment. The BAER team and local unit BAER Coordinator have engaged with interagency partners to facilitate consideration of off-Forest values covered through other programs with the relevant responsible entities.

Conclusion

There are multiple phases of post-fire actions after a wildfire covering suppression repair through long-term recovery. BAER is the rapid assessment of burned watersheds by a BAER team to identify imminent post-wildfire threats to human life and safety, property, and critical natural or cultural resources on National Forest System lands and take immediate actions to implement emergency stabilization measures before the first major storms. The BAER team has identified imminent threats to critical values based on a rapid assessment of the area burned by the Dragon Bravo Fire. The assessment was conducted using the best available methods to analyze the potential for damage from post-fire threats, including flooding and debris flows. The findings provide the information needed to prepare and protect National Forest System critical values against post-fire threats. The recommended BAER treatments in this report have been approved and funded.

BAER treatments cannot prevent all the potential flooding or soil erosion impacts, especially after a wildfire-changed landscape. It is important for the public to stay informed and prepared for potentially dramatic increases in run-off events. Many burned-area watersheds were already hydrologically responsive to rainfall and prone to erosion and sediment transport prior to the fire and will likely be even more responsive due to post-fire conditions. Vegetation recovery on the Dragon Bravo fire is anticipated to be variable depending on the soil burn severity. Low soil burn severity across all vegetation types will see rapid vegetative recovery within 1-3 years post-fire. Areas with moderate to high soil burn severity may take 5-10 years to recover.

The Forest Service will continue to provide information and participate in interagency efforts to address threats to public and private values resulting from the Dragon Bravo Fire. Information can be found on-line at the Dragon Bravo Forest Service BAER InciWeb site https://inciweb.wildfire.gov/incident-information/azknf-burned-area-emergency-response-baer-dragon-bravo-usfs or the Kaibab National Forest Facebook page https://www.facebook.com/KaibabNF.

The Forest Service will continue to work towards long-term recovery and restoration of the burned area in coordination with efforts to rebuild and restore the communities affected. A vegetation burn severity map, or mortality map, may be produced as a part of the recovery efforts to help other scientists, such as wildlife biologists, botanists, and silviculturists understand what to expect from this changed landscape for wildlife habitat, invasive weeds, timber salvage, and reforestation needs.

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Recreation	Ron Turner, Allison Ayers (t)
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References:

Parson, Annette; Robichaud, Peter R.; Lewis, Sarah A.; Napper, Carolyn; Clark, Jess T. 2010. Field guide for mapping post-fire soil burn severity. Gen.

Tech. Rep. RMRS-GTR-243. Fort Collins, CO:
U.S. Department of Agriculture, Forest Service,
Rocky Mountain Research Station. 49 p.
(https://www.fs.usda.gov/rm/pubs/rmrs_gtr243.pdf)

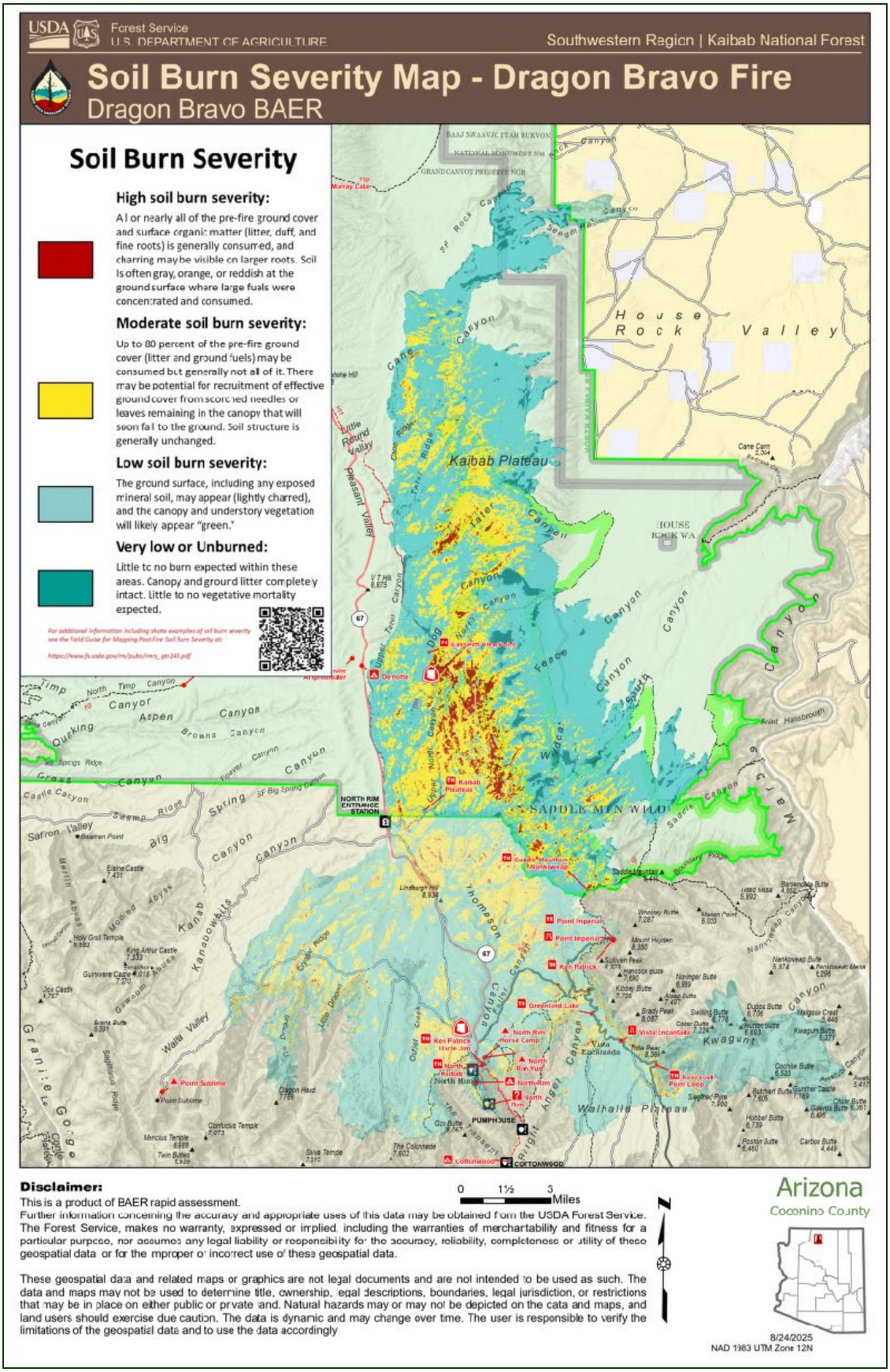
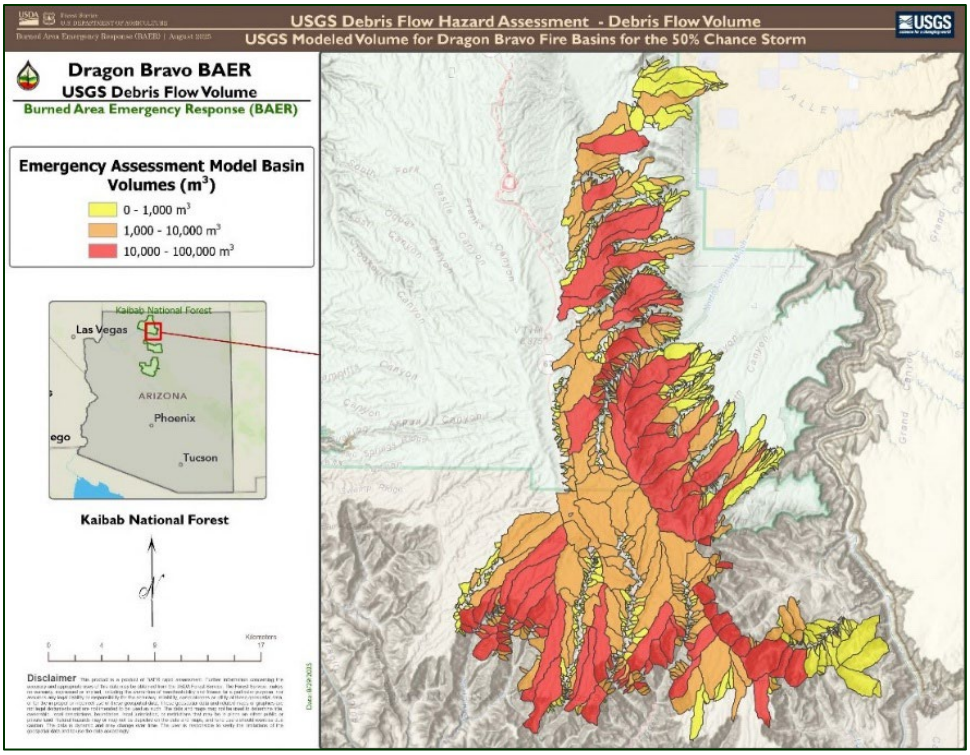


Figure 5 Dragon Bravo Soil Burn Severity Map



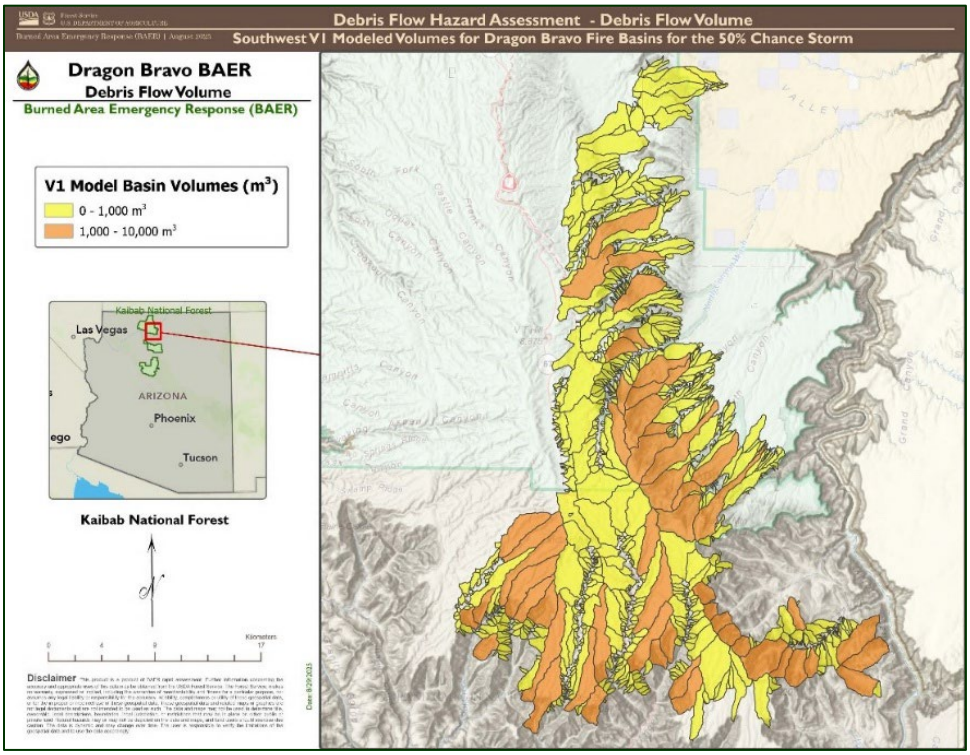


Figure 6 : Debris flow likelihood for 40 mm/hour event (equivalent to the 50% chance storm) from the USGS Debris flow model (top) and the VI model (bottom). The V1 model estimates less debris movement than the USGS debris flow model

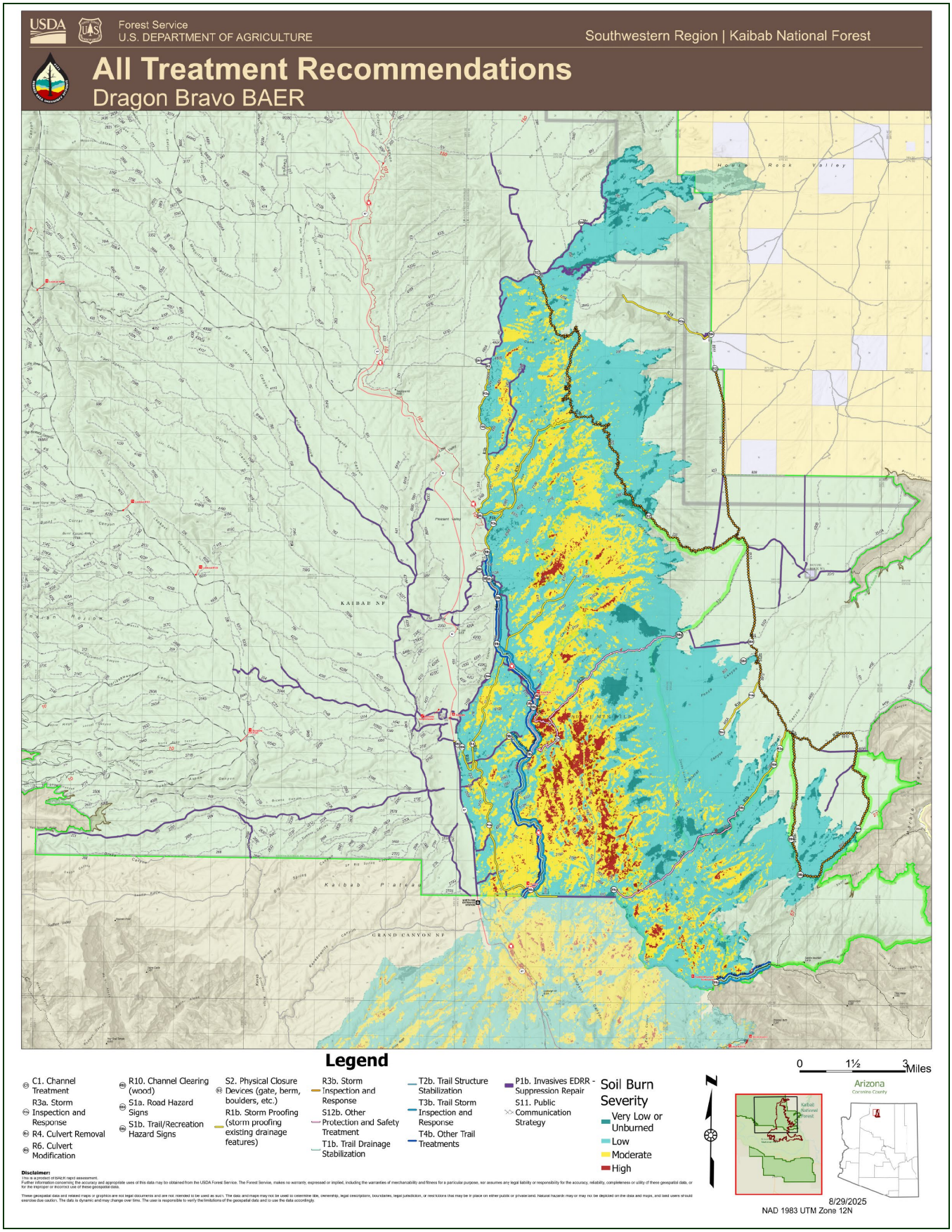


Figure 7 All treatment recommendations for the Dragon Bravo BAER