Hughes Fire Burned Area Summary

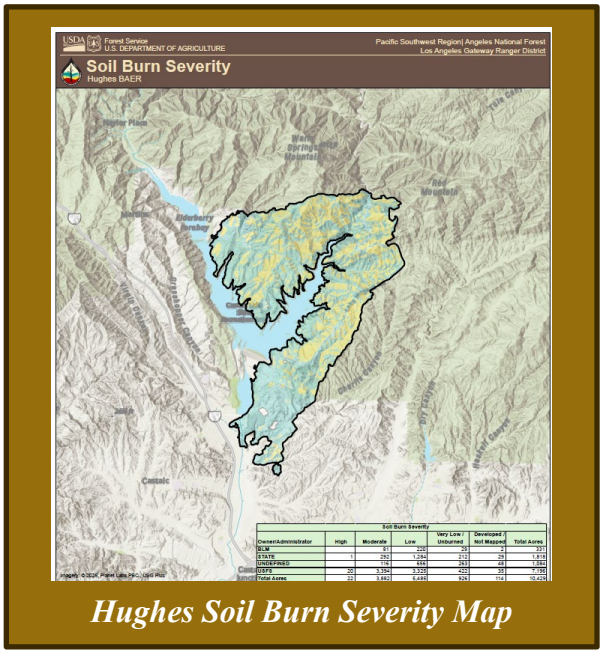
Burned Area Report

Fire Background

The Hughes Fire started on January 22, 2025, along Lake Hughes Road, near Castaic Lake, California, and as of February 5, 2025, the fire was 98% contained. It spread to over 500 acres in the first hour and was 10,000 acres within 12-hours after the start of the fire. The Hughes Fire in Los Angeles County, California exhibited extreme fire behavior due to dry vegetation, strong winds, and low humidity. Southern California has gone without significant rain for nine months. Most of the fire burn scar is dominated by typical chapparal shrub, while some canyon bottoms are dominated by riparian vegetation.

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 (NFS) 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 stabilization work that involves time critical activities to be completed before damaging events to meet program objectives.

The Forest Service assembled a BAER team on January 29, for the Hughes Fire. This team of experts in various resource disciplines began assessing the post-fire effects to critical values on Forest Service lands. Impacts to 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 predict erosion 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.



Hughes Soil Burn Severity Map

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 soil burn severity 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 burn severity is characterized by a complete consumption of organic material with 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.

Mapped and validated SBS for the burned area is High (less than 1%), Moderate (37%), Low (53%), and Very Low/Unburned (9%) (see map on page 9). 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.

Developed areas (both urban and rural) were not mapped for soil burn severity. This method has been developed for wildland vegetation and landscapes and therefore is not appropriate for describing effects of fire on developed lands and burned structures. As such, these areas were not visited or evaluated by the BAER team.

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 Hughes Fire burned in the Transverse Range and extended from approximately one mile south of Warm Springs Mountain at the north end of the fire, to Charlie Canyon and a small area of Tapia Canyon, at the southern (bottom) end of the fire. The west end of the fire was for the most part bounded by Castaic Lake, while the east boundary of the fire extended along Lake Hughes Road and just to southeast, along the ridge southeast of Lake Hughes Road. The physical location of the burn area is dominated for the most part by steep slopes and rugged canyons mostly draining into Castaic Lake.

The Hughes Fire burn footprint occurred all in the general east-west oriented Transverse Ranges of Southern California. The Transverse Ranges resulted from complex tectonic interaction between the Pacific and North American plates along the right-lateral, strike-slip San Andreas Fault.

The team provided soil burn severity field data to the US Geological Survey (USGS) 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 it appears that under conditions of a peak 15-minute rainfall intensity storm rate of 0.94 inches/hour, corresponding to a 1-year return interval storm, a majority of the drainages in the burn scar show a low (20-40%) to moderate (40-60%) likelihood of debris flow initiation, with an exception of a few drainages that present higher probabilities (60-80%) of debris flow initiation, mostly north of Castaic Lake.

Combined hazard (volume + likelihood) rating is low to moderate along most drainages in the burn scar. Volume estimates show that under these same storm conditions, some drainages in the burn scar are predicted to mobilize debris flows of <1,000 cubic meters, while other drainages are predicted to mobilize debris flows with volumes ranging from 1,000 to 10,000 cubic meters. Based on ground

surveys it is evident that some drainages in the burn scar, especially on the north side of Castaic Lake have experienced debris flows in the past. These drainages flow directly into Castaic Lake. In the southern end of the fire, out-side Forest Service lands, some drainages that flow into the Castaic Lagoon, or through Charlie and Tapia canyons present for the most case low to very low (0-20% or 20-40%) probabilities of debris flow initiation. Despite these low probabilities, it is very important to keep high alert during rainstorm events in these areas, since these areas present a higher probability of folks living, working or recreating in. (see debris flow maps on pages 10-12).

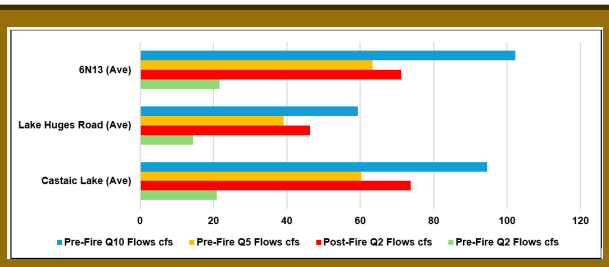
Based on some steep slopes in the burn area, the soil burn severity, the elevated hydrophobicity/soil water repellency, and the amounts of stored sediments in most drainages in the Hughes Fire burn area, the BAER team estimates that as a result of short duration, high intensity storms, the probabilities of hyper-concentrated flows and/or debris flows are moderate in most channels in the burn area. Very few channels present a high probability of initiation of debris flows, while some other channels, mostly in the southern part of the burn area, present low probabilities. Most drainages in the burn scar flow directly into Castaic Lake which functions as a source of drinking water and a destination of water recreation activities.

Foreground: Burned Castaic Creek Bridge in Elizabeth Canyon

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



Comparison of Pre- and Post-Fire Peak Flow Increase for a Q2 Bulked Design Storm

A rapid hydrologic assessment of the Hughes burn area with three areas modeled for post-fire runoff response include Castaic Lake, Lake Hughes Road, and Forest Service Road 6N13. Because the soil burn severity (SBS) mosaic of low and moderate was relatively evenly distributed across the landscape, the modeled runoff response for basins in these areas were very similar. With the lack of high SBS, there were no "outlier" basins showing distinctly higher flood response. As such, an average was taken for basins in these study areas

Water meter flow rates are fundamental parameters that defines an operational range and accuracy. A Q2 typed water flow rate is considered a transitional flow rate which is 1.6 times more than a Q1 minimum flow rate.

For a water meter flow rate of a Q2 bulked design storm, the greatest modeled increases in post-fire runoff (300-480% increase) were basins draining into Castaic Lake. Specific areas along Hughes Lake Road showed increases between 281-330%, and Forest Service Road 6N13 showed increases between 270-370%. As such, risks from clear water or bulked flooding (overflow of water

onto dry land causing damage) alone are generally considered low for a 2-year storm event. Debris flows, rockfall and shallow landslides, on the other hand, pose an increased threat in areas of steep terrain and moderate to high soil burn severity

Critical Values on National Forest System Lands

Human Life and Safety

The first critical value BAER teams assess is always human life and safety on National Forest System (NFS) lands. During and after heavy rainstorms, Forest Service employees and visitors to NFS lands could be threatened by floodwaters and debris flows. Generally, users of roads within and downstream of the burned areas could 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 an area closure, general warning signs, and communications to travelers on any of the approximately 12 miles of NFS roads within or directly adjacent to the Hughes Fire.

A. DESCRIPTION OF CRITICAL VALUES/RESOURCES AND THREATS
The BAER Critical Value matrix was used to assess the overall risk for all the resources analyzed under this BAER process.

CRITICAL VALUE MATRIX			
Probability of Damage or Loss	Magnitude of Consequences		
	Major	Moderate	Minor
	RISK		
Very Likely	Very High	Very High	Low
Likely	Very High	High	Low
Possible	High	Intermediate	Low
Unlikely	Intermediate	Low	Very Low

Roads and Bridges

Critical values addressed in the Hughes Post-Fire BAER assessment include Forest Service roads and related drainage features. Treatments for the protection of these roads include improve road drainage structures, armor drainage crossings, conduct storm inspections and response actions, and install warning signs to alert travelers of hazardous conditions within the Hughes burned areas.

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.

Recreation

Typical National Forest System (NFS) recreation infrastructure includes campgrounds, trails, and day use areas. Most of the recreation assets within the Hughes Fire burned area on National Forest Lands consisted of dispersed opportunities. Similar to roads, recreation infrastructure could be damaged in post-fire storm events.

After an initial BAER team internal assessment, questioned whether these recreation values or infrastructure within the Hughes Fire perimeter required further analysis since no developed campgrounds, system trails, or other recreation facilities appeared to be at risk. However, a follow-up assessment was conducted that identified Prospect and Cottonwood Campgrounds as potential concerns. Since both Forest Service campgrounds were located outside the fire footprint and thus, are not at risk of post-fire processes.

No National Forest System (NFS) trails exist within the Hughes burned area, confirming that no recreation infrastructure is at risk. Third party sources identified two user-created trails within or near the burn area. The “Zombieland” trail, located in the south-east area of the burned area, is approximately 1 mile in length and has only a portion located on Forest Service lands. Usage data indicates minimal activity with only one recorded rider in the past six months. This trail is primarily

used for mountain biking. In the north-central section of the burn area, the "Necktie Basin Truck" trail spans approximately five miles descending from the summit of Warm Springs Mountain to the north side of Castaic Lake Road. Reports described this as an old, steep jeep trail with loose climbs in both directions and very little traffic.

Additionally, BAER team members observed dirt bike tracks on/near dozer lines, and sporadic off highway vehicle (OHV) activity near roadways. Post-fire conditions have removed dense chaparral, increasing the likelihood of unauthorized motorized use in previous inaccessible areas. A temporary forest closure could assist law enforcement in managing unauthorized entry, ensuring public safety, and protecting sensitive post fire ecosystems. Without natural barriers, previously untraversable areas may become more inviting to OHV users, increasing risk of resource damage and safety concerns.

A minor dispersed recreation area was identified near the northeast section of the reservoir, possibly within Castaic Lake Canyon near the old Red Mountain Fire Station. Light recreational use, primarily fishing, may occur in this area. However, the site is managed in part by the local county parks department, which may have additional information on visitor use patterns. Given the limited public use, placing warning signage at key access points to alert visitors of potential post-fire hazards is recommended as a precautionary measure. No further recreation-related BAER treatment actions were recommended by the team.

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.

Current infestations are primarily located along roads, old dozer lines, campgrounds, and trails throughout the burned area, with interior areas being largely un-infested. However, the burned area creates conditions for invasive species to outcompete native plants. The BAER team recommends a treatment of Early Detection, Rapid Response (EDRR) to monitor for noxious weed infestation and expansion in areas disturbed due to mechanical suppression activity and burned areas prone to new noxious weed infestations.

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 damaging activities such as looting or vandalism. Cultural resources were evaluated by the BAER team and treatments proposed for road and recreation will also protect these values from post-fire threats.

Hazardous Materials

The highly toxic nature of exposed hazardous materials (hazmat) such as asbestos, lead, mercury, arsenic and polychlorinated biphenyl [PCBs] are generated by the burning of structures and located within the burned refuse. The BAER team noted the potential for impacts to human health and the environment. Concerns for the hazmat are two-fold: 1) exposure can present a threat to human health, and 2) can contaminate soil and water and have long-lasting environmental and public health threats to Forest Service employees, forest visitors, and wildlife.

An area of concern is Castaic Creek bridge on the 6N66 Forest Road that was damaged by the Hughes Fire, causing the bridge (and burned wood) to collapse into the stream channel. The bridge decking, beams, and rails were constructed with creosote and chemically treated wood (Copper Chromium Arsenate or CCA). Approximately 50% of the bridge wood structure burned with a large amount of the partially burned wood still attached to

the bridge structure. Much of the burned crumbly wood fell to the stream channel causing immediate contamination of the water of Castaic Creek and to stream banks below the bridge structure. Human exposure to the burned chemical wood could result in long-term injury and health issues. The BAER team recommended emergency stabilization of the hazmat burned bridge debris.

Federally Listed Species - Wildlife and Fisheries

There are two federally-listed threatened or endangered (T&E) species within the Hughes Fire area on National Forest System (NFS) lands: 1) the California condor (Endangered), and 2) the Coastal California gnatcatcher (Threatened). No designated Critical Habitat is present.

California condors are considered critically-endangered with fewer than 600 living individuals (and about 200 of those are in captivity). The BAER team assessed potential impacts to the condors from post-fire watershed post-fire conditions. Typically, those assessments focus on post-fire flooding, debris flows, and erosion concerns. The team's assessment of the condor's habitat in the burn area concluded that typical post-fire erosion and flooding effects were not issues for condors after the Hughes fire. However, there is a different type of emergency for condors in the fire area. The team noted that even in the low soil burn severity areas, vegetation was completely burned off, exposing trash. Micro-trash is present along the roads, lakeshore, gathering areas, and along user-created trails. They also noted little trash in areas away from the roads. Given the fact that condors are using the fire area for foraging, the newly-exposed trash that used to be hidden by vegetation poses a significant threat. To reduce the risk to California condors, the BAER team recommended a clean-up of the micro-trash in some portions of the Hughes fire area.

California gnatcatchers are found in coastal sage scrub vegetation – and assumed to be present within the fire perimeter. The BAER team recommended an area closure until the burned vegetation within the gnatcatchers' habitat can be re-established.

There are three T&E species (willow flycatcher, least Bell's vireo, and arroyo toad) in and near the Hughes Fire but are not located on NFS lands (so they are not BAER critical values). However, the BAER team did assess potential effects to the habitat for the two birds in the Castaic Lagoon area and will share the findings with US Fish and Wildlife Service such as that area will likely see some increases in flow but, under the predicted 2 and 5-year events, long-term habitat effects appear to be unlikely.

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. Even with only a short period of time since fire containment, resprouting of trees and shrubs as well as emergence of forbs have been noted within the burned area.

Because of the potential that OHV (off-road vehicle) and other recreational activities can hinder native plant recovery and germination and increase the risk of establishment/ spreading of non-native plants, the BAER team recommended an area closure.

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 has engaged with interagency partners to facilitate consideration of off-Forest values covered through other programs with the relevant responsible entities.

Partner agency contacts:

Don Lindsay, CA Geological Survey-CAL WERT
California Department of Conservation

Los Angeles County Parks and Recreation Dept.
Parks & Recreation – Los Angeles County

DOI Bureau of Land Management (BLM)
https://www.blm.gov/california

Natural Resources Conservation Service (NRCS)
California | Natural Resources Conservation Service

Alex Tardy, NOAA NWS-San Diego
https://www.weather.gov/sgx/

Jayme Laber, NOAA NWS-Los Angeles-Oxnard
https://www.weather.gov/lox/

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 identified imminent threats to critical values based on a rapid assessment of the area burned by the Hughes 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 (NFS) critical values against post-fire threats.

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 increased 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. However, vegetation recovery is anticipated to be rapid with ground cover approaching pre-fire conditions within 1-3 years, which will attenuate any post-fire effects on watershed processes. The Forest Service will continue to provide information and participate in interagency efforts to address threats to public and private values resulting from the Hughes Fire. Information can be found on-line at https://inciweb.wildfire.gov/incident-information/caanf-Hugheshurst-postfire-baer.

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.

Local Forest Service Leadership

Roman Torres, Forest Supervisor
roman.torres@usda.gov
Tony Martinez, Deputy Forest Supervisor
tony.r.martinez@usda.gov

Local Forest Service BAER Coordinator

Jason Collier, Jason.collier@usda.gov

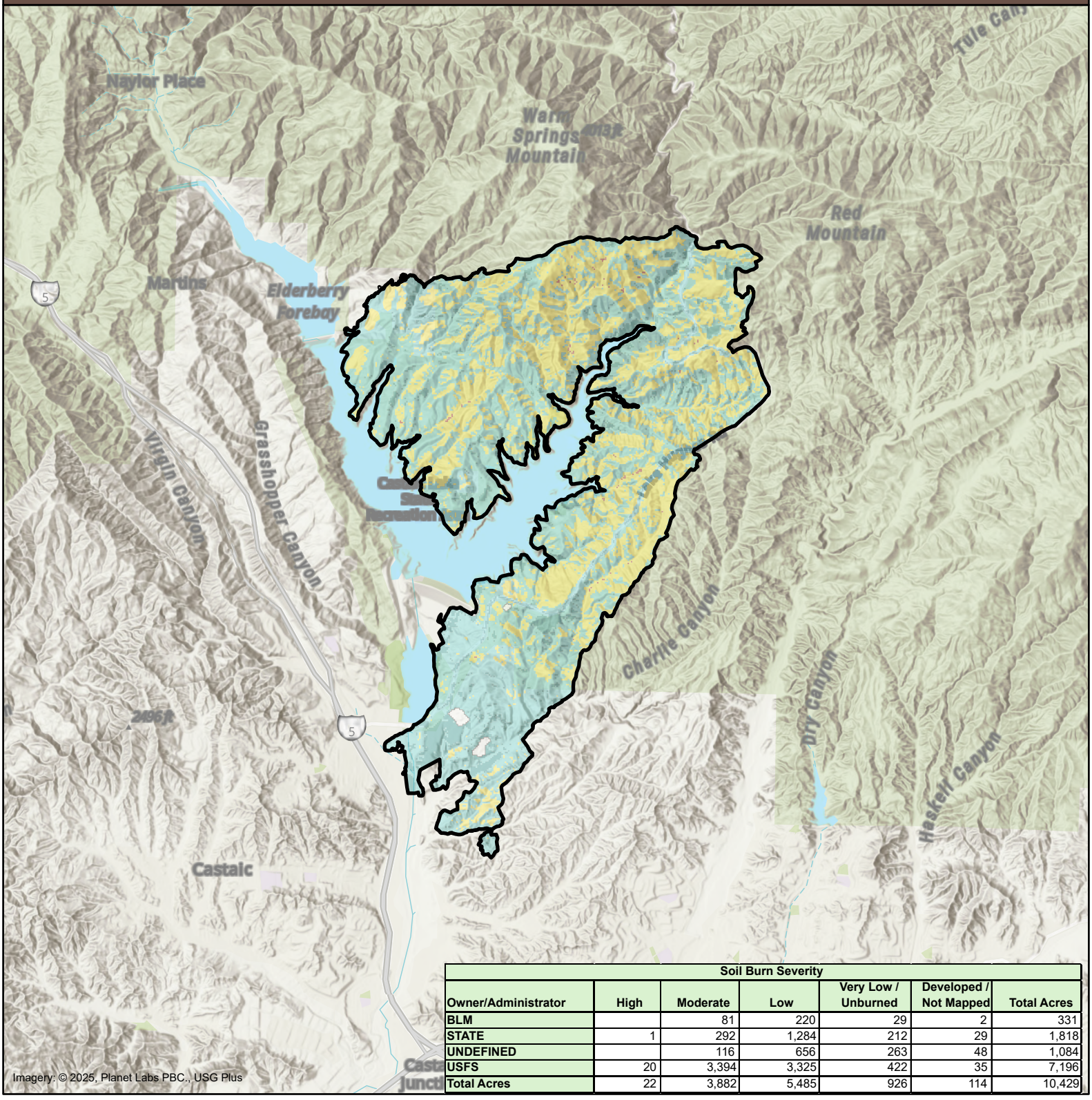
References:

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)

Hughes Fire Perimeter 3-D Map

Soil Burn Severity

Hughes BAER



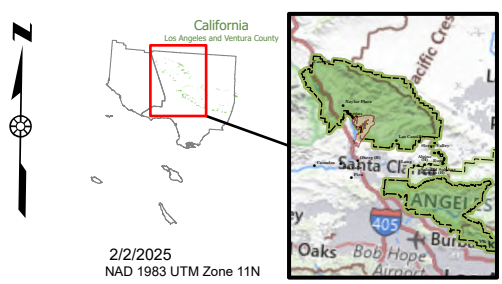
Soil Burn Severity						
Owner/Administrator	High	Moderate	Low	Very Low / Unburned	Developed / Not Mapped	Total Acres
BLM		81	220	29	2	331
STATE	1	292	1,284	212	29	1,818
UNDEFINED		116	656	263	48	1,084
USFS	20	3,394	3,325	422	35	7,196
Total Acres	22	3,882	5,485	926	114	10,429

0 0.55 1.1 Miles

Fire Perimeter

Soil Burn Severity

- High
- Moderate
- Low
- Very Low/ Unburned
- Developed/ Not Mapped



2/2/2025
NAD 1983 UTM Zone 11N

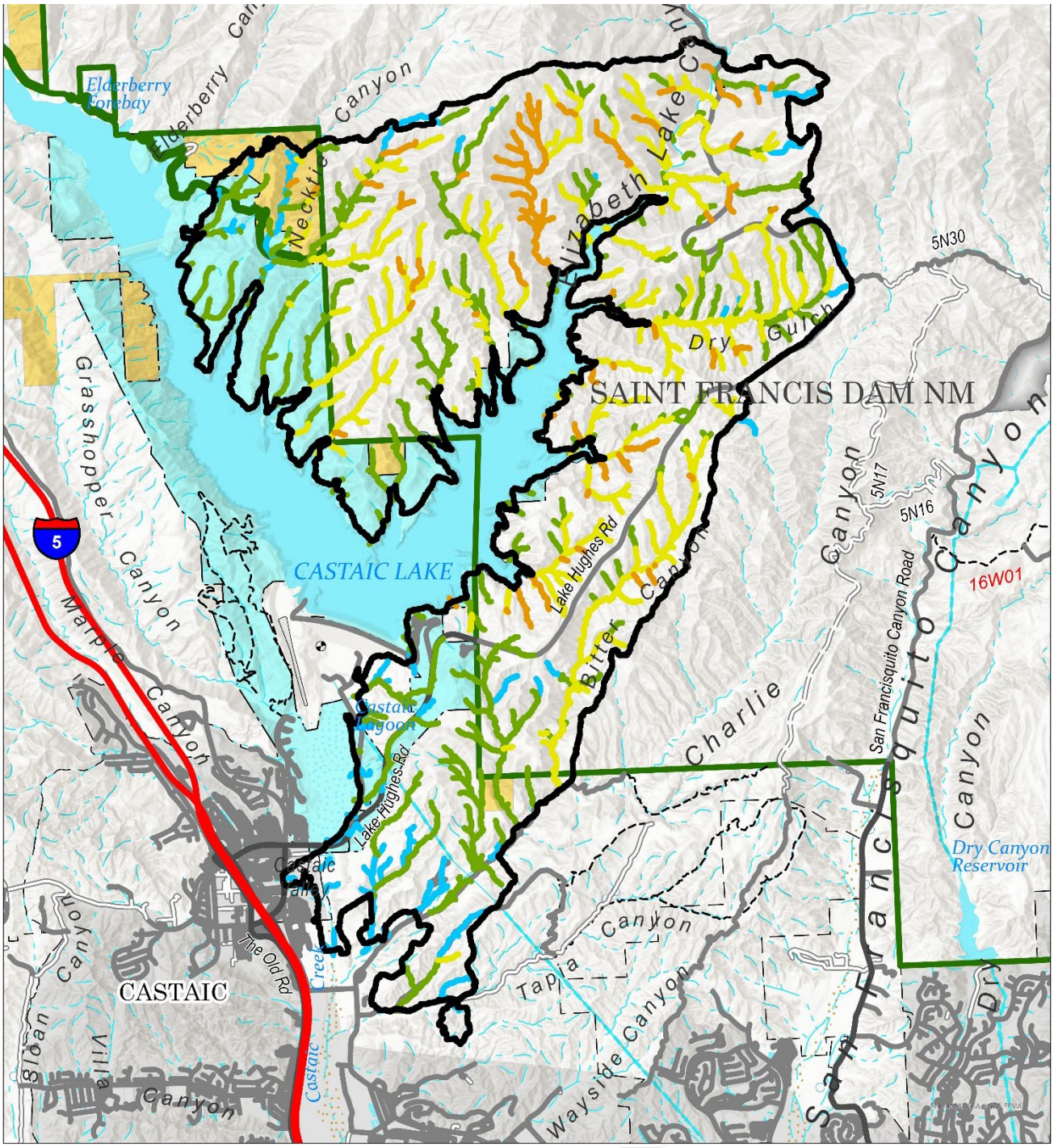
Disclaimer:

This is a product of BAER rapid assessment.

Further information concerning the accuracy and appropriate uses of this data may be obtained from the USDA Forest Service. The Forest Service, makes no warranty, expressed or implied, including the warranties of merchantability and fitness for a particular purpose, nor assumes any legal liability or responsibility for the accuracy, reliability, completeness or utility of these geospatial data, or for the improper or incorrect use of these geospatial data.

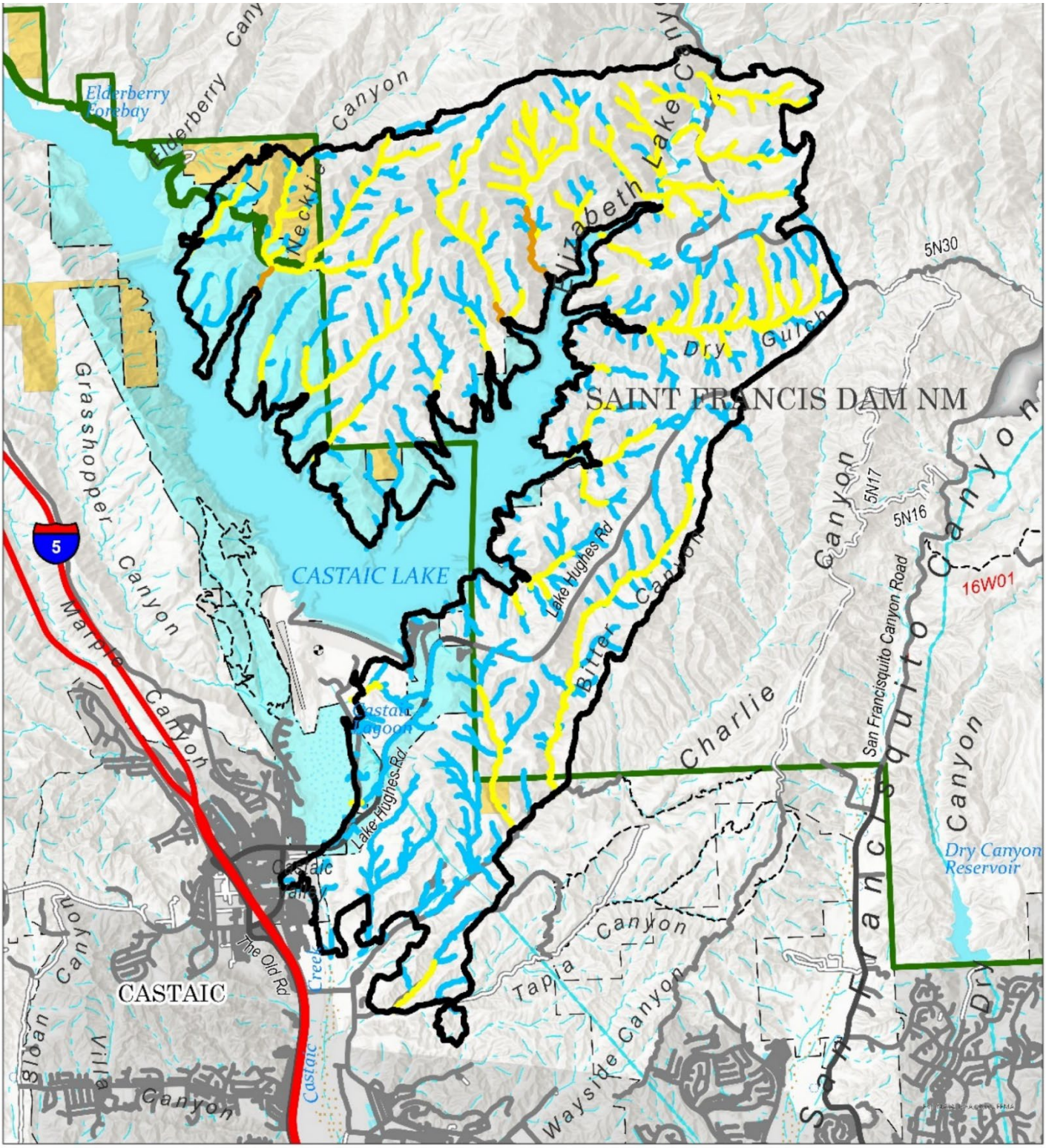
These geospatial data and related maps or graphics are not legal documents and are not intended to be used as such. The data and maps may not be used to determine title, ownership, legal descriptions, boundaries, legal jurisdiction, or restrictions that may be in place on either public or private land. Natural hazards may or may not be depicted on the data and maps, and land users should exercise due caution. The data is dynamic and may change over time. The user is responsible to verify the limitations of the geospatial data and to use the data accordingly.

Debris Flow Probability



Debris Flow Probability
Hughes Fire- Angeles National Forest
February 2025
Peak 15 Minute Rainfall Intensity 24mm/h rate
Burned Area Emergency Response (BAER)

Debris Flow Estimated Volume



Debris Flow Volume
Hughes Fire- Angeles National Forest
February 2025
Peak 15 Minute Rainfall Intensity 24mm/h rate

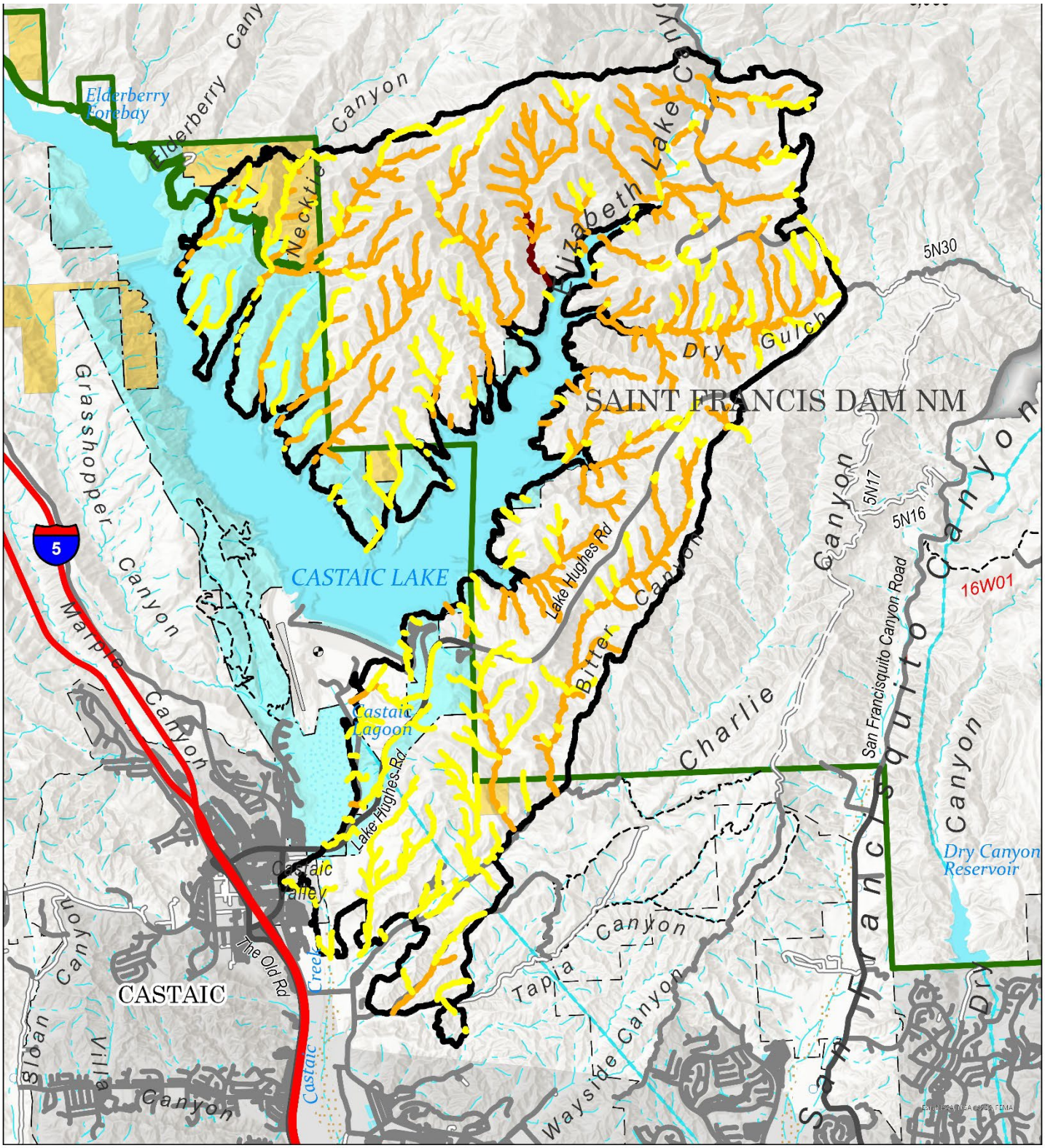
Burned Area Emergency Response (BAER)

Debris Flow Estimated Volume (cubic meters)
- <1,000
- 1,000-10,000
- 10,000-100,000
- >100,000
- BAER Perimeter

0 ½ 1 Miles

USGS

Debris Flow Combined Hazard



Debris Flow Combined Hazard
Hughes Fire- Angeles National Forest
February 2025
Peak 15 Minute Rainfall Intensity 24mm/h rate

Debris Flow Combined Hazard
- High
- Moderate
- Low
- BAER Perimeter

0 ½ 1 Miles

Burned Area Emergency Response (BAER)

USGS science for a changing world