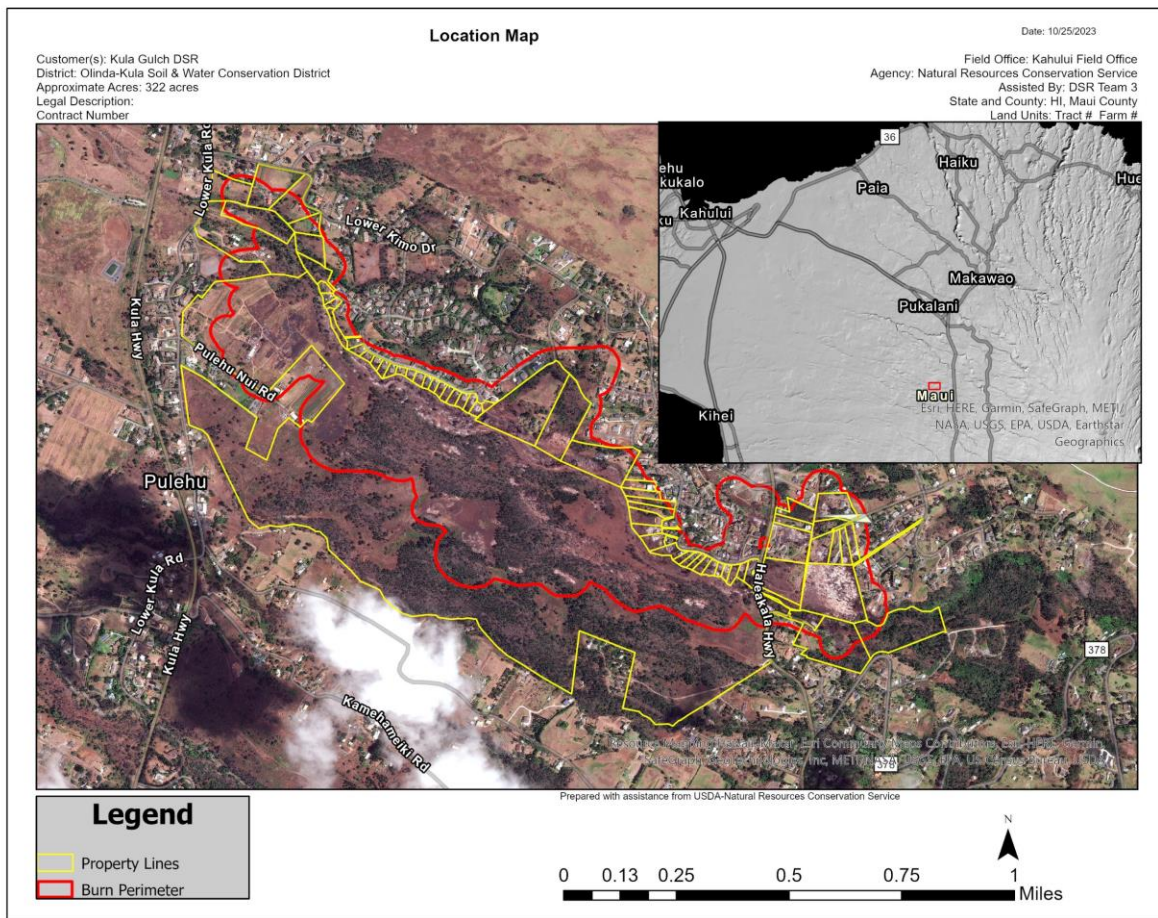


Emergency Watershed Protection Program (EWPP) Maui, Hawaii – Kula Fire:

Overview

In August 2023, the Kula Fire burned approximately 300 acres of Maui up-country in the community of Kula on Haleakala Volcano. The burn extended through residential areas and unmanaged rangeland from above the Haleakala Highway (Route 377) to just above Lower Kula Road (Route 37). The fire was fueled by vegetation surrounding Pulehu Gulch, an ephemeral stream, and was carried to the NW by strong winds from Hurricane Dora. The land to the SW of the gulch is primarily unmanaged rangeland and the land to the NE of the Gulch is residential development. Approximately 20 houses burned in this fire.



Kula Fire Location Map

The Kula Fire burn area is located on steep terrain and access to Pulehu Gulch is limited by slopes greater than 100%, rock outcroppings, houses, and waterfall features. The average annual rainfall in the area is approximately 23 inches while the primary vegetation consists of non-native species of Eucalyptus trees (*Eucalyptus spp.*), black wattle trees (*Acacia mearnsii*), and Kikuyu grass (*Cenchrus clandestinus*). The wind-driven fire burned extremely hot and had short residence time. In general, the fire intensity was

highest along the outer banks of the gulch where fuel loads were high, wind was unobstructed, moisture was low, and convective heat was transferred from lower in the gulch.

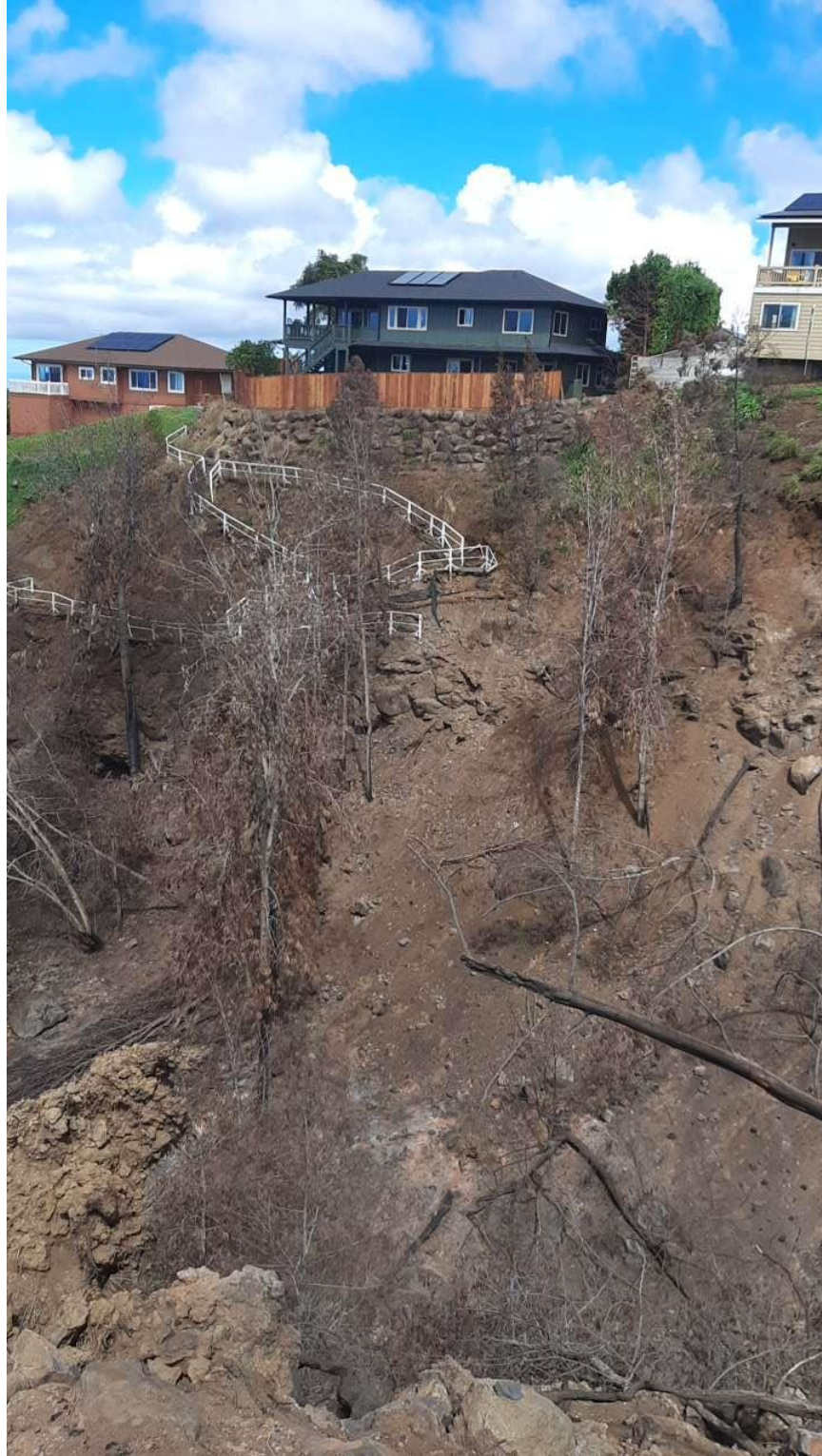


Pulehu Gulch looking downstream

Slopes along the gulch are comprised of altered basalt rock and highly erosive mineral soils. The predominant soil type in the area is Pane Silt Loam.

Resource Concerns

Water-induced erosion is a primary resource concern resulting from the Kula Fire. If left unaddressed, erosion is expected to undermine house foundations, obstruct flow through culverts and bridges, damage sensitive aquatic ecosystems, and degrade public use areas.



Erosion and woody residue below house foundations along Pulehu gulch.



Several of about 25 houses at risk of foundation erosion along Pulehu gulch



Site of proposed gabion mattress to control erosion (blue outline)



Site of proposed vegetative buffer (brown lines)



Site of proposed clearing and mulching to protect house in gulch



Outlet of the Pulehu gulch watershed into Maalaea bay

Wind erosion is another resource concern. The soil's high silt and ash content is prone to wind erosion.



Airborne silt from foot traffic above the Kula firebreak

Without intervention, woody debris and sediment is expected to obstruct culverts, bridges and associated roads needed for transportation, including emergency services. For example, the bridge immediately downstream of the Kula burn unit, at Lower Kula road, already has a history of overtopping. Fire induced damage to the watershed will exacerbate this problem.



Overtopping damage visible on the downstream guard rail at Lower Kula road

Recommended Alternatives

NRCS recommends converting the firebreak along the SW bank of Pulehu Gulch, below Route 377, into a gravel access road. A gravel road will provide equipment access to the SW bank of the gulch, reduce dust, reduce erosion, reduce runoff, and facilitate continued firebreak protection. Access to the opposite side of the gulch is impeded by the residential properties, making the SW side the logical place to provide machine access to the top of the gulch. The proposed access road is approximately 5,580 feet long by 14 feet wide. NRCS recommends the application of wood chip mulch and seeding between the proposed access road and the top of the gulch bank:

- Wood chip mulch (3" thickness) shall be placed on these areas where the soil is bare. Wood chips are locally available from non-native tree species. In the specific case of organic mulches, use of NRCS EWPP funding is only permissible for purchase, production or spreading of organic mulches sourced from the island of Maui.
- Severe burn intensity in localized areas of the burn unit destroyed most of the seed bank so seeding of bare soils will be important for reducing erosion of the banks. Seeding of grasses of common groundcover species, with proven short-term restoration values that are not weed risks such as annual rye grass (*Lolium multiflorum*) or perennial rye grass (*Lolium perenne*) is recommended. Other perennial groundcover species that are already naturalized in this landscape could be included in such mixes, however NRCS must approve all species and seeding rates prior to application for all EWPP-funded work.

NRCS recommends the application of wood chip mulch and seeding on bare soil firebreaks and a few other targeted areas (approximately 32 acres total within the Kula burn scar) following the guidelines above. The soils in these areas are extremely erosive and the newly established firebreaks have been pulverized by equipment.

NRCS recommends the clearing and removal of debris from streambeds within the burn area. Woody debris, dead trees, and trees with burn damage should be removed from stream beds to prevent flow obstructions and scouring. Unexposed roots and rooted herbaceous material should be left intact to help stabilize the soil. Additionally, dead and dying trees on the banks of Pulehu Gulch should be removed, where it can be done safely, to reduce the deposition of woody debris into the waterway and to prevent tree throw erosion. When removing trees on the bank slopes, do not remove the stumps. Stumps should be cut to a height of 2 to 3 feet above the ground level to provide potential anchor points along the slope. Clearing and debris removal work typically commences from the top of the watershed and advances toward the bottom.

NRCS recommends the use of log erosion barriers in two areas where water enters Pulehu Gulch by over-bank flow. These treatments will reduce the formation of gullies and sediment transport in areas of concentrated flow.

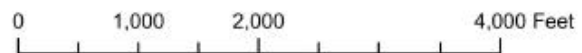
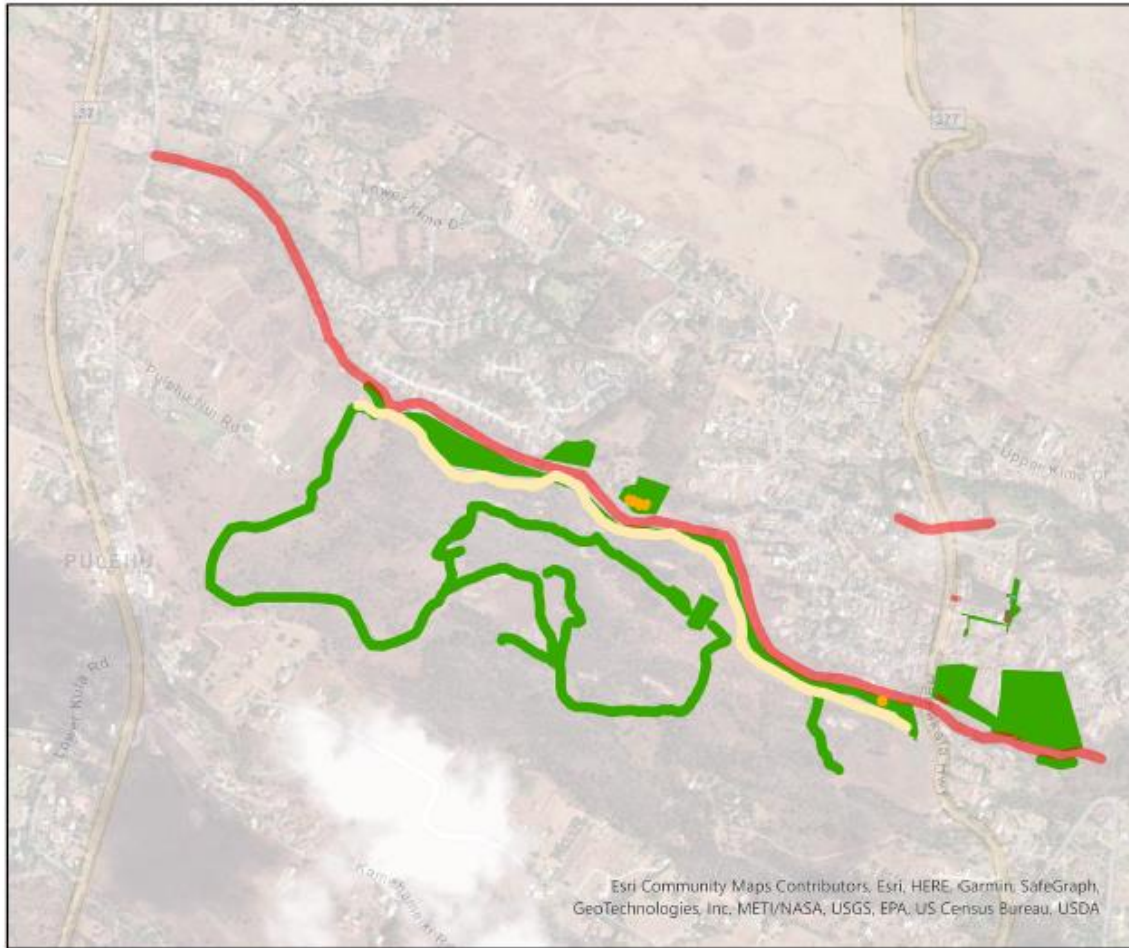
NRCS recommends use of a 48 x 12 x 1 foot gabion mattress below the house at 20.77571 N, 156.30572 W. This house is located at the top of a steep hill with a gully forming below it. The gully has been destabilized by the loss of vegetation and the house appears to be built on backfill material that is less stable than the surrounding soil. The proposed gabion will convey water over the unstable backfill material and discharge it onto a competent rock shelf. Adjacent to this property is a rock retaining wall that has also been destabilized by the fire. NRCS recommends a vegetative buffer using vetiver grass (*Chrysopogon Zizanioides*) plugs to help stabilize this wall and prevent rocks from sliding into a house.

Kula Fire DSR Map

Date: 10/28/2023

Customer(s): Chevalier, et al.
District: Olinda-Kula Soil & Water Conservation District
Approximate Acres: 80 (Treatment)
Legal Description: TMK 223016002
Damage Survey Report Number #

Field Office: Kahului Field Office
Agency: Natural Resources Conservation Service
Assisted By: NRCS Kula Fire DSR Team
State and County: HI, Maui County



Legend

Prepared with assistance from USDA-Natural Resources Conservation Service

- Proposed 10,500 Feet Clearing and Snagging (Practice Code 326)
- Proposed 5,580 Foot x 14 Foot x 6 Inch Gravel Access Road (Practice Code 560)
- Proposed 3 Inch Mulching & Seeding (32 Acres, Practice Codes 484 & 342)
- Proposed Erosion Log Barriers (Quantity 8, Practice Code 410)
- Proposed Gabion Mattress, 40 x 12 x 1 Feet (Practice Code 466)
- Proposed Vegetative Buffer, 120 Feet (Vetiver, Practice Code 601)

Considered Alternatives (Not recommended for EWPP)

NRCS considered the option of an exclusion fence to prevent Axis deer from destroying revegetation. Deer fence would be expensive and challenging to install due to the need for equipment access to the gulch, proximity to the residential neighborhood, steep terrain, and maintenance of the fence within the water course. It was also noted that deer have access to the vegetation in the residential neighborhood and likely prefer it to the grass revegetation that is proposed.

NRCS considered using jute mat, hydromulch, or similar treatments to protect the banks of the gulch from erosion. Due to the steepness of the banks, the field team did not feel that hydromulch or wood chip mulch would remain on-site. Covering the banks with fabric would be more effective, but rock outcroppings would make it difficult to maintain contact between the fabric and the soil. Additionally, fabrics are relatively expensive and securing fabric to steep slopes is hazardous.

NRCS considered applications of irrigation water to accelerate regrowth in the burn scar. Although NRCS encourages irrigation of erosive soils to promote seed germination, the field team had concerns about including this in an EWPP contract due to water availability issues, site access limitations, and timing of irrigation events relative to rain events. The application of irrigation water at an appropriate time, amount, and application rate deserves additional consideration.