



Fuels to Flows: A Nature-based Solution for the Uplandscape

Fewer Trees & More Forest for Cleaner Water w/ Beneficial Biomass & Beneficial Fire



Spare the Air & Stuff the Gully to Save Salmon & Salamanders!



Photo: Sashwa Burrous

CALIFORNIA'S WORLD-LEADING NATURE-BASED SOLUTIONS BRING CLIMATE ACTION TO:



33.5 million acres of areas at risk of wildfire



11.9 million acres of forests



3.4 million acres of croplands



1.6 million acres of grasslands



1.5 million acres of deserts and beaches



233,000 acres of wetlands and seagrasses



“Governor Gavin Newsom’s California Climate Commitment has 81 targets for nature-based solutions to help California achieve its world-leading climate goals, including reaching carbon neutrality by 2045.”

April 22, 2024

That is a lot of acres in need of vegetation management!

That will generate millions of tons of:
Slash as Trash?,
or is it Beneficial Biomass!

What is the plan to
Balance this Beneficial Biomass Budget
w/ this once-in-a-generation resource?

What the targets call for by 2045:

- 33.5 million acres managed to reduce wildfire risk, mostly through beneficial fire
- 11.9 million acres of forest managed for biodiversity protection, carbon storage, and water supply protection

Beneficial Biomass Portfolio

Planning on doing vegetation management for fire resiliency?

Have you considered a broad suite of practices that reutilize slash to achieve multiple restoration goals? Practices closer to the top of the circle tend to retain more carbon on-site, cost less, and produce fewer emissions, benefiting the carbon, water, and life cycles on your land.

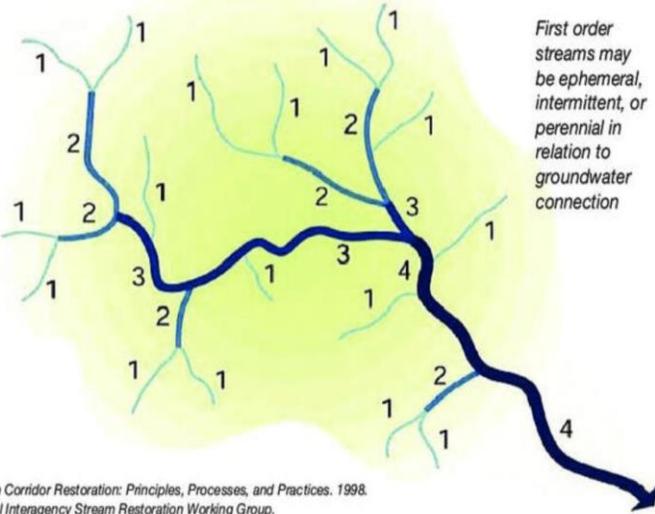


**Practices included in this graphic are not comprehensive.
Learn more at OAEC.org/fuels-to-flows*

OCCIDENTAL ARTS
& ECOLOGY CENTER

Strahler Stream Order:

Classification system describing position within the drainage network



Uplandscape (First Order/Class 3)



Riverscape

Beaverscape

BASINS OF RELATIONS
*A Citizen's Guide to
Protecting and Restoring Our Watersheds*

WATER INSTITUTE
OCCIDENTAL ARTS & ECOLOGY CENTER

Before Beneficial Fire - Slash is not Trash - It is Beneficial Biomass!



Permits are needed to 'fill' Waters of the State in California.

In First Order/Class 3 Uplandscapes USACE 404 permits are no longer needed based on Sackett v. EPA 2023



North Coast Regional Water Quality Control Board

September 13, 2021

Brock Dolman
Occidental Arts & Ecology Center
15290 Coleman Valley Road
Occidental, CA 95465
brock@oaec.org

Dear Brock Dolman:

Subject: Notice of Applicability (NOA) for Coverage under the *Conditional Waiver of Waste Discharge Requirements for Specific Categories of Low Threat Discharge in the North Coast Region R1-2017-0039*

File: Occidental Arts & Ecology Center Restoration Project, WDID No. 1B21166WNSO, ECM PIN CW-875439



State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Bay Delta Region
2825 Cordelia Road, Suite 100
Fairfield, CA 94534
(707) 428-2002
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director



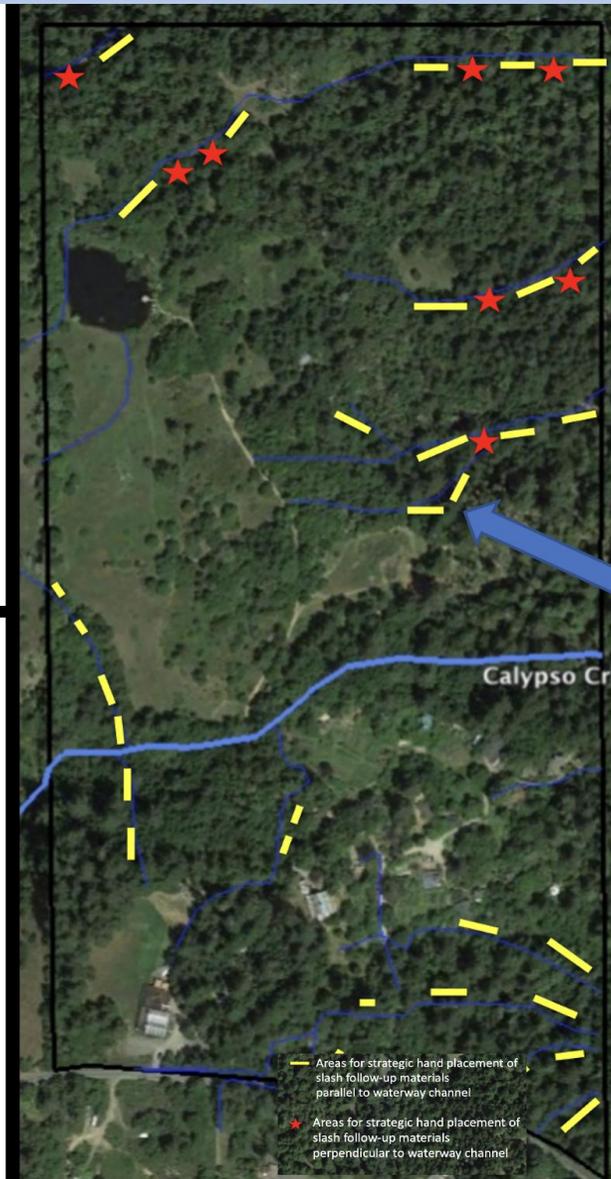
October 5, 2021

Brock Dolman
Occidental Arts & Ecology Center
15290 Coleman Valley Rd
Occidental, CA 95465
Brock@OAEC.org

Dear Mr. Dolman:

Final Lake or Streambed Alteration Agreement, EPIMS Notification No. EPIMS-SON-22045-R3, Upland Watercourse Restoration and Enhancement

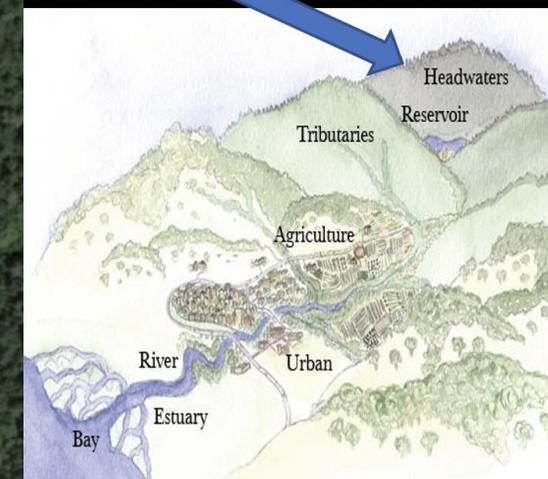
Attached is the final Streambed Alteration Agreement (Agreement) for the Upland Watercourse Restoration and Enhancement (Project). Before the California Department of Fish and Wildlife (CDFW) may issue an Agreement, it must comply with the California Environmental Quality Act (CEQA). In this case, CDFW determined your Project is exempt from CEQA and filed a Notice of Exemption (NOE) on the same date it signed the Agreement.



Order 1 streams are headwater streams where no other streams flows into it.

Forest Practices Act Class 3 upland ephemeral waterways that do not support aquatic life

Headwaters drainages at OAEC selected for Fuels to Flows Treatments



— Areas for strategic hand placement of slash follow-up materials parallel to waterway channel
★ Areas for strategic hand placement of slash follow-up materials perpendicular to waterway channel



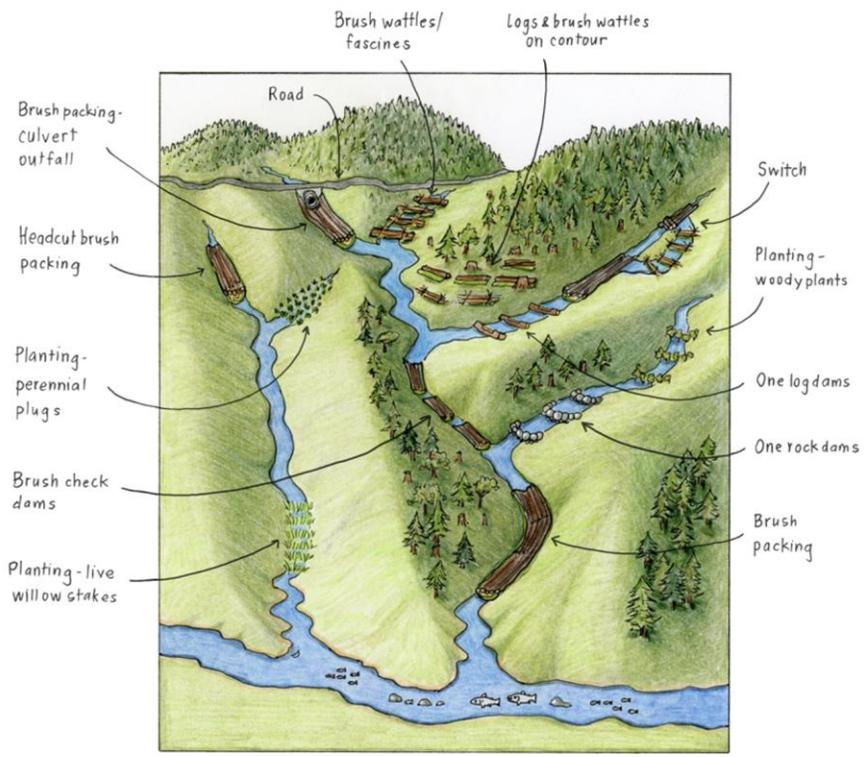
OAEC Watercourse Restoration Project Progress and Monitoring Photos

For the period of Oct. 2021 - June 2023

<https://oaec.org/projects/oaec-wildlands-fuels-to-flows-demonstration-site/>



Low-Tech Process Based Restoration for Upper Watersheds



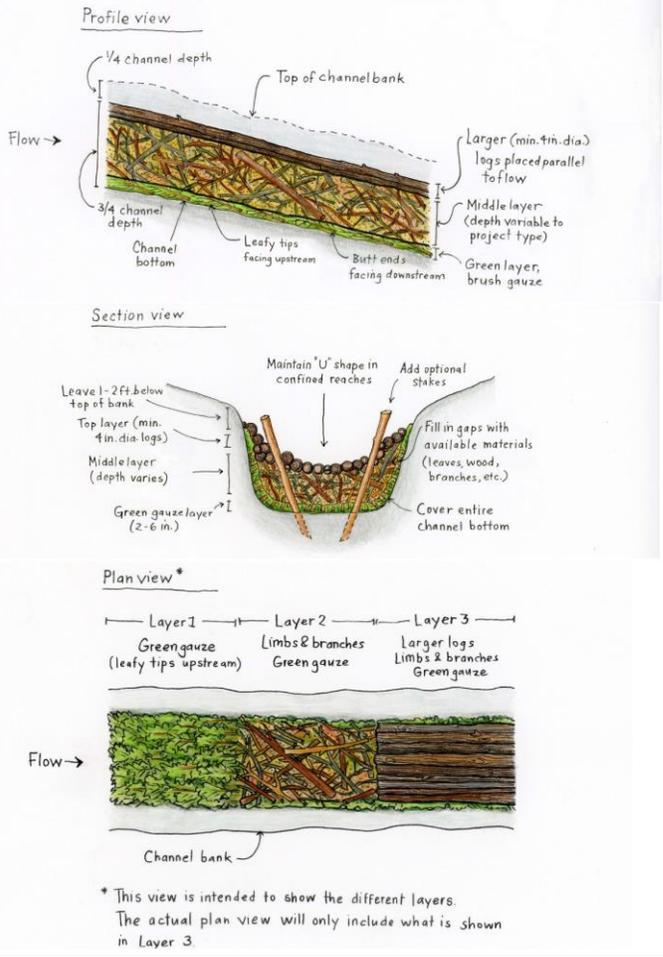
Date
March 2025

Authors
Brock Dolman, Hannah Wilton, Occidental Arts & Ecology Center Water Institute
Minona Heaviland, Sonoma County Regional Parks
Fatima Burhan, Aaron Fairbrook, Jessica Pollitz, P.E., Sonoma Resource Conservation District

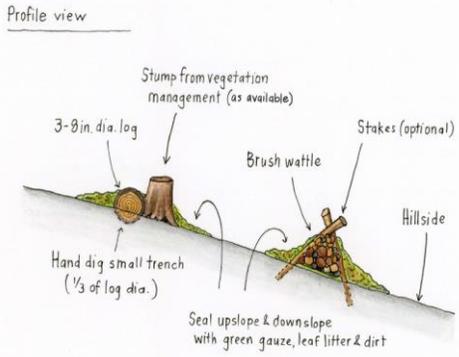
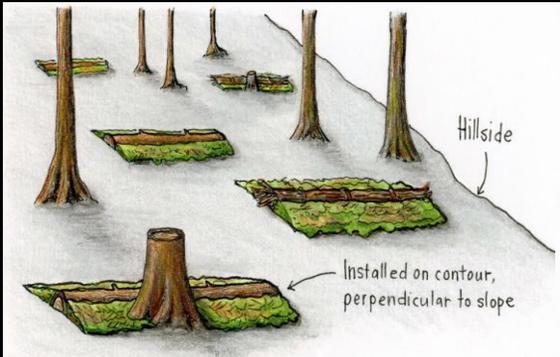
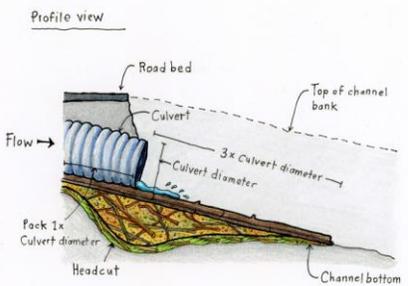
Illustrations
Mary Ann King



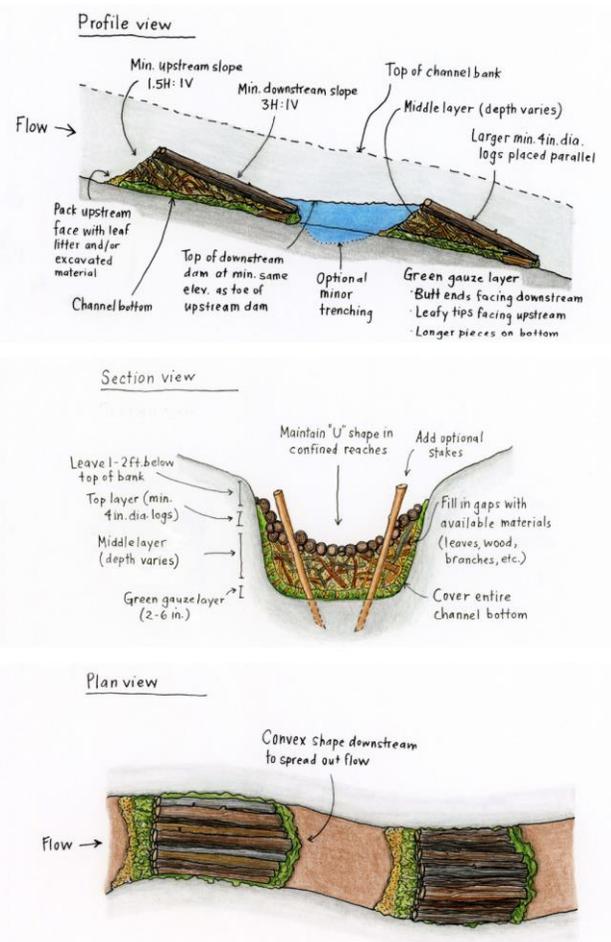
Brush Packing



Culvert Outfall



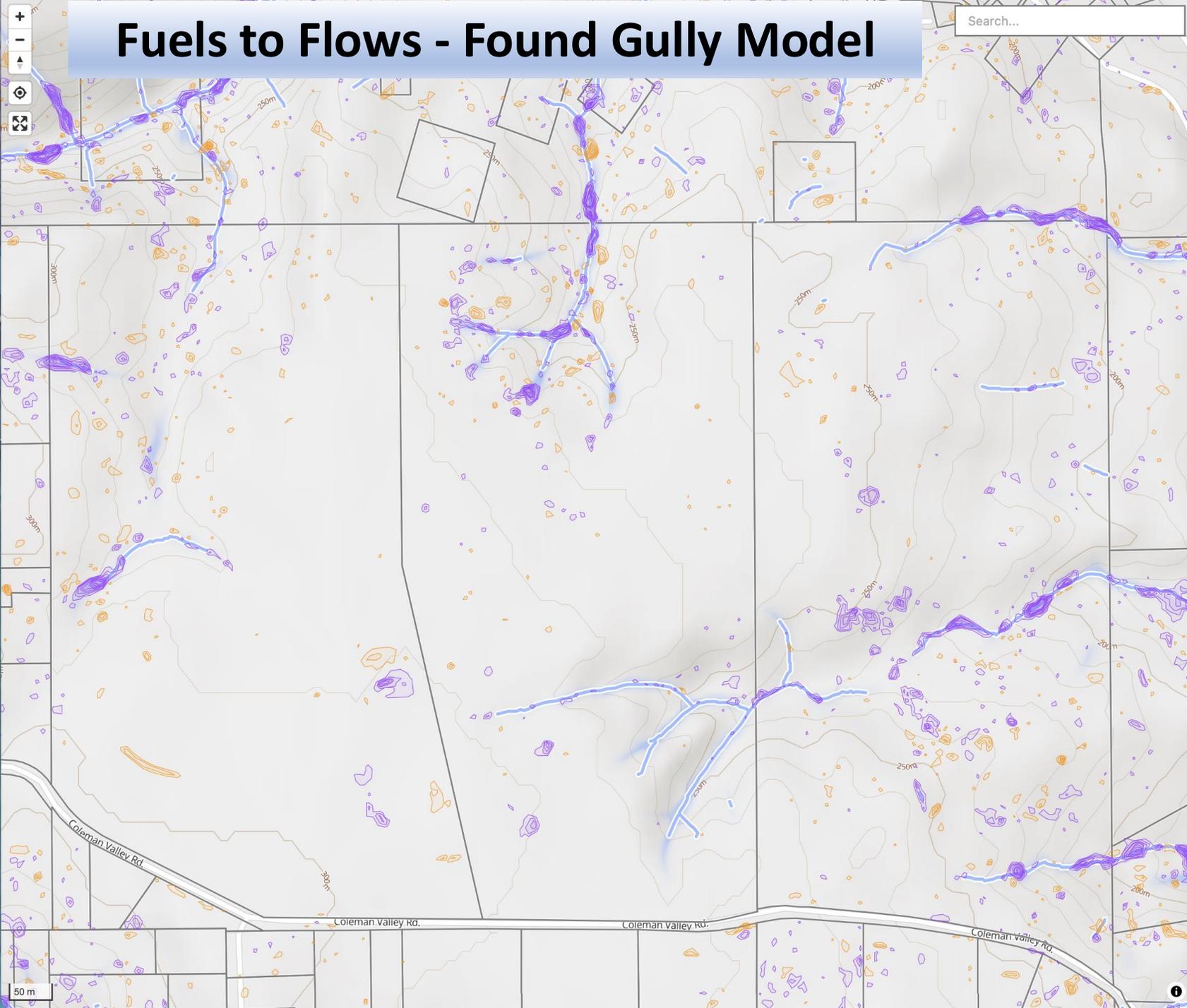
Brush Check Dams



Workforce Development Workshop June 2025



Fuels to Flows - Found Gully Model



Search...

Base layer

- Hidden Visible
- Basic street map with topography ([from here](#))
 - 2013 aerial photography ([Sonoma GIS, through Esri](#))
 - 2021 aerial photography ([Sonoma GIS, through Esri](#))
 - 2022 hillshade (page 9 of [LIDAR derivatives](#))
 - ... with 10 m contours
 - 2022 color-enhanced hillshade ([fractional-Laplacian sharpened](#) overlay)

Land ownership

- Land ownership boundaries ([source](#))

Last clicked in:

Last clicked longitude-latitude:

Fire hazard

- Hide ladder fuel proxies
 - (material in 1–4 m) / (material in 0–4 m)
 - (material in 1–8 m) / (material in 0–8 m)
- (See page 9 of [LIDAR derivatives](#))

Gullies

- Gully detection probability
- Gully paths as lines

Erosion

Disclaimer: In all of the following, "erosion" and "deposition" are a simple difference of 2013 and 2022 Digital Terrain Models (DTMs), with "erosion" meaning the elevation is *lower* in 2022. Differences in dense underbrush can mimic changes in elevation, confounding this measure of erosion, so it should be taken as an indication of where erosion *may have* occurred. Follow up with ground-truth!

- 2013-2022 elevation difference contours
 - erosion, deposition, contour line every 1/3 meter
 - ...and fill in the polygons

Volume of erosion

- Paint region instead of moving map (holding the **control** or **command** key temporarily enables this paintbrush)

m² in painted area

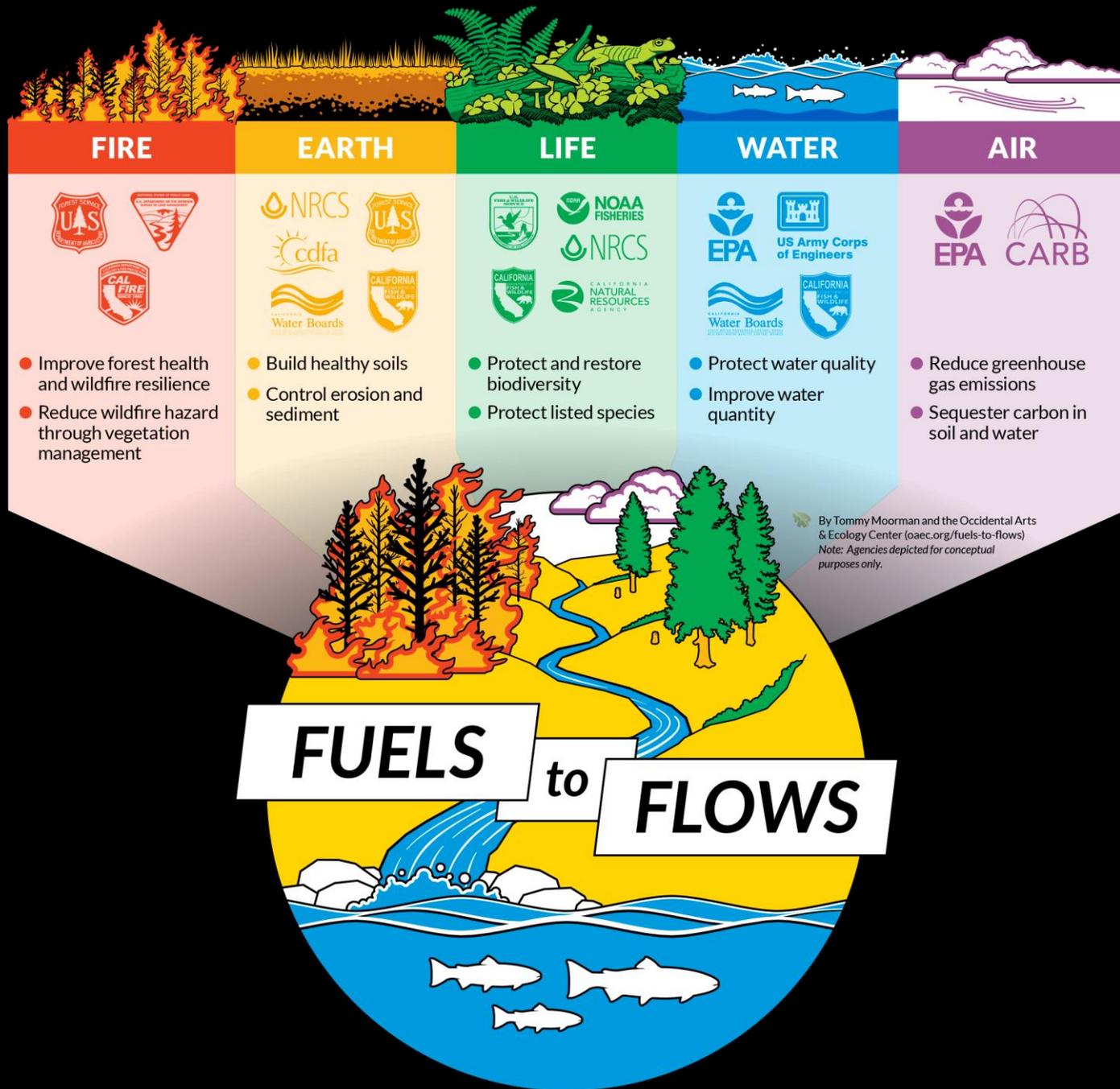
m³ volume lost from 2013 to 2022

Elevation along line

- Draw line instead of moving map (holding the **shift** key temporarily enables this; **two clicks** for a straight line and **drag** for a curve)

<https://oaec-found-gully.vercel.app>

CalVTP update
& Forest Health Grants



CARB will be update
the 2022 Scoping Plan



FUELS TO FLOWS

OAEC's Fuels to Flows Campaign advances climate-smart, nature-based restoration solutions at the nexus of fire and water.



- 1. OAEC Fuels to Flows Campaign web portal: www.oaec.org/fuels-to-flows (launched end of March 2025)
- 2. OAEC Wildlands Preserve: <https://oaec.org/our-work/projects-and-partnerships/wildlands/>
- 3. OAEC Stewardship Plan: <https://oaec.org/projects/wildlands-preserve-stewardship-plan/>
- 4. Tending The Land website (multi-partner Sonoma County collaboration): <https://tendingtheland.org/>
- 5. NBC Bay Area TV news story on OAEC's fir & water nexus projects: <https://oaec.org/nbc-news/intersection-of-fir-water-at-oaec/>
- 6. Fire Safe Sonoma May 2023 Speaker Series - Brock Dolman of the Occidental Arts & Ecology Center talk: <https://www.youtube.com/watch?v=2kdWBLCTxI>
- 7. OAEC's upland PBR "Slash Ain't Trash It's Beneficial Biomass" projects: <https://oaec.org/forest-thinning-and-gully-repair/>
- 8. Ecological Restoration based Worker Training via our collaboration with North Bay Jobs w/ Justice: <https://oaec.org/why-we-cant-build-a-fir-resilient-future-without-worker-justice/>
- 9. YES Magazine highlights Climate Justice in Sonoma County: <https://oaec.org/yes-magazine-highlights-climate-justice-in-sonoma-county/>
- 10. Strategically using Prescribed Fire at OAEC as an upland PBR tool: <https://oaec.org/oaec-conducts-winter-prescribed-burn/>
- 11. Collaboratively using planned grazing at OAEC as an upland PBR tool: <https://oaec.org/community-grazing-project-at-oaec-two-sisters-place-mighty-arrow-ranch/>
- 12. Long term Coastal Prairie & Geophyte regeneration efforts: <https://oaec.org/oaec-featured-fremontia-journal/>
<https://oaec.org/wp-content/uploads/2017/04/Geophytes.pdf>
- 13. OAEC's Rewilding California efforts PBR powerpoint show - "Elemental Rewilding with Keystone Processes": <https://oaec.org/oaec-oranizer-rewilding-california-convening/>
<https://www.youtube.com/watch?v=wghn3BrXc8>
- 14. Link to CA's new Process-based Restoration (CalPBR) Network: <https://www.calpbr.org/>
- 15. Blog on CA PBR Network Workshops: <https://oaec.org/cal-pbr-workshops/>
- 16. OAEC's Upland rural Stormwater PBR efforts with "Slow It Spread It Sink It Store It Share It": <https://oaec.org/publications/integrated-stormwater-retention-system/>
<https://sonomard.org/wp-content/uploads/2017/06/Slow-It-Spread-It-Sink-It-Store-It.pdf>
- 17. Biodiversity observations at OAEC via iNaturalist: <https://oaec.org/join-oaec-on-inaturalist/>



How to Stuff a Gully

Turn Slash into Beneficial Biomass!

GULLY STUFFING

A NATURE-BASED SOLUTION FOR FIRE & WATER





Thank You

