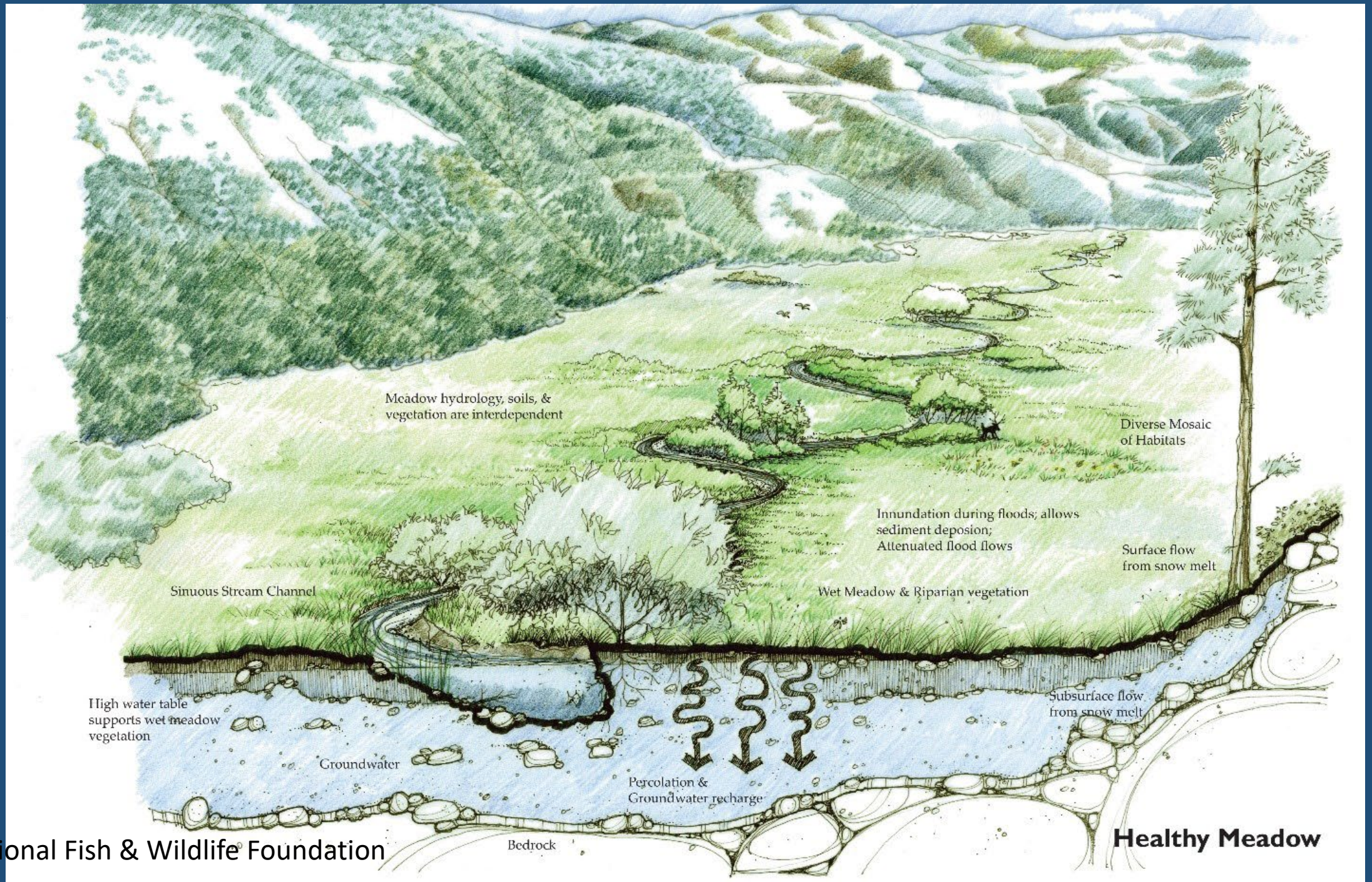
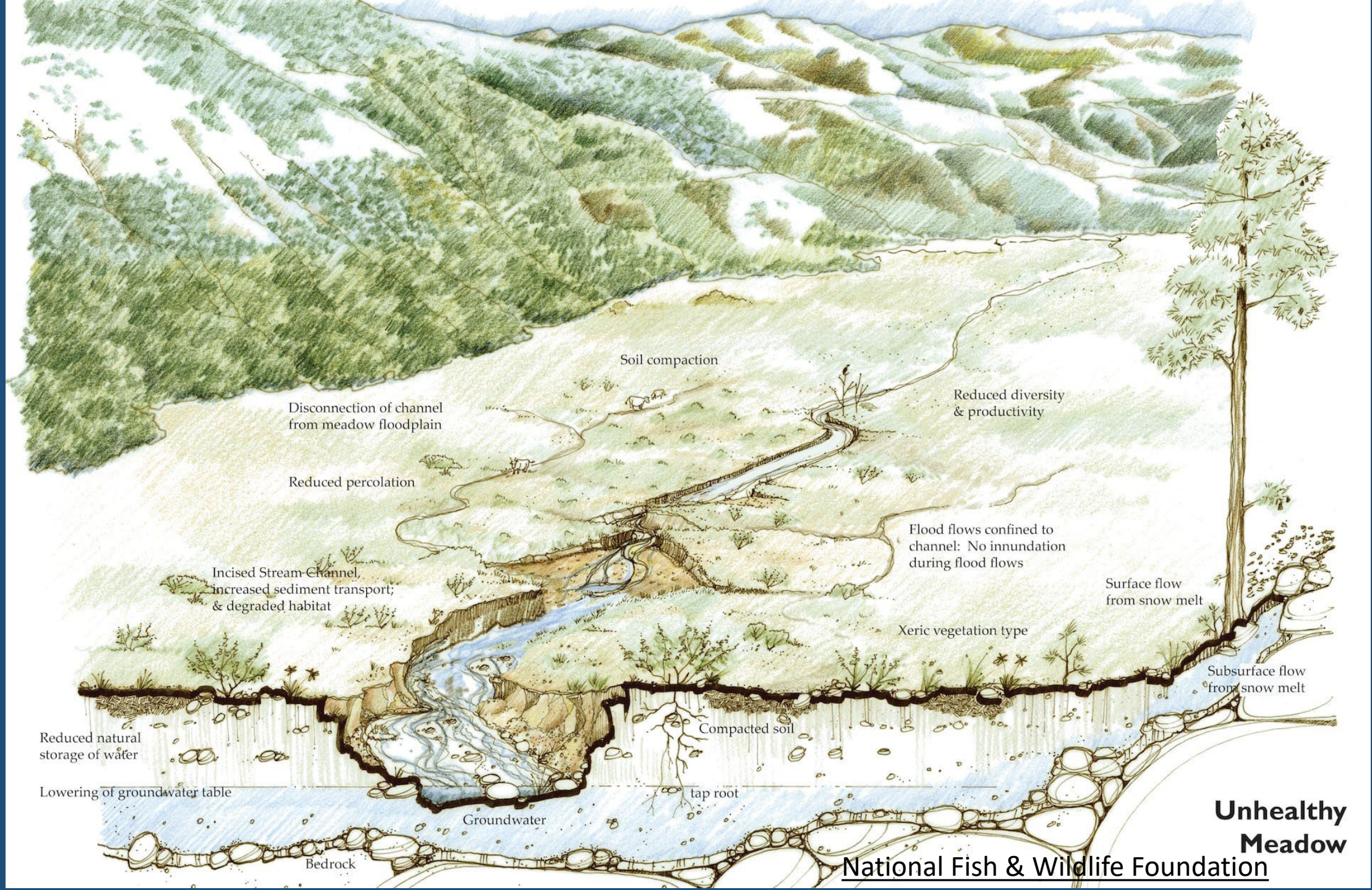
Tuolumne River Trust

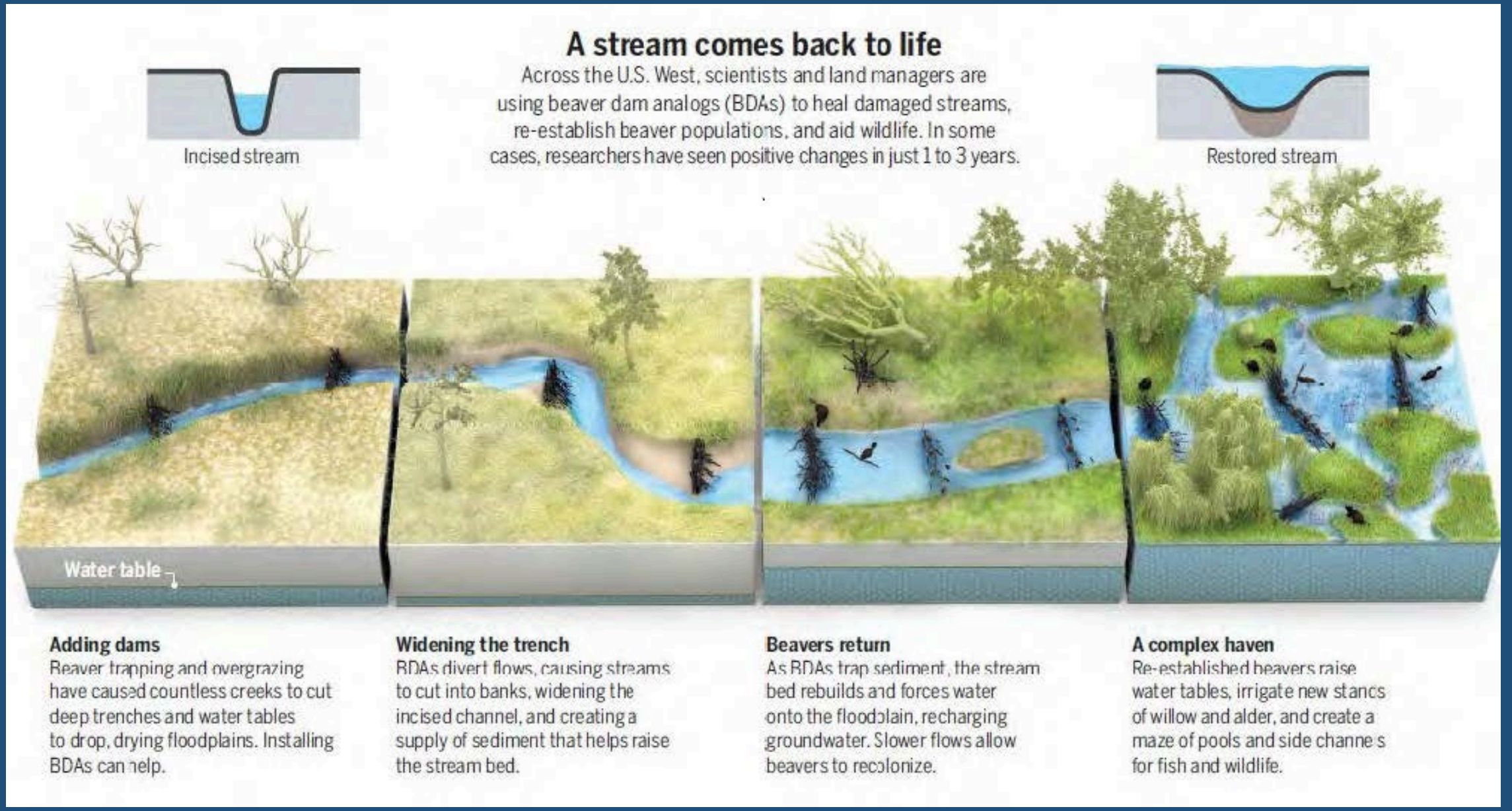
Process-Based Restoration – an overview



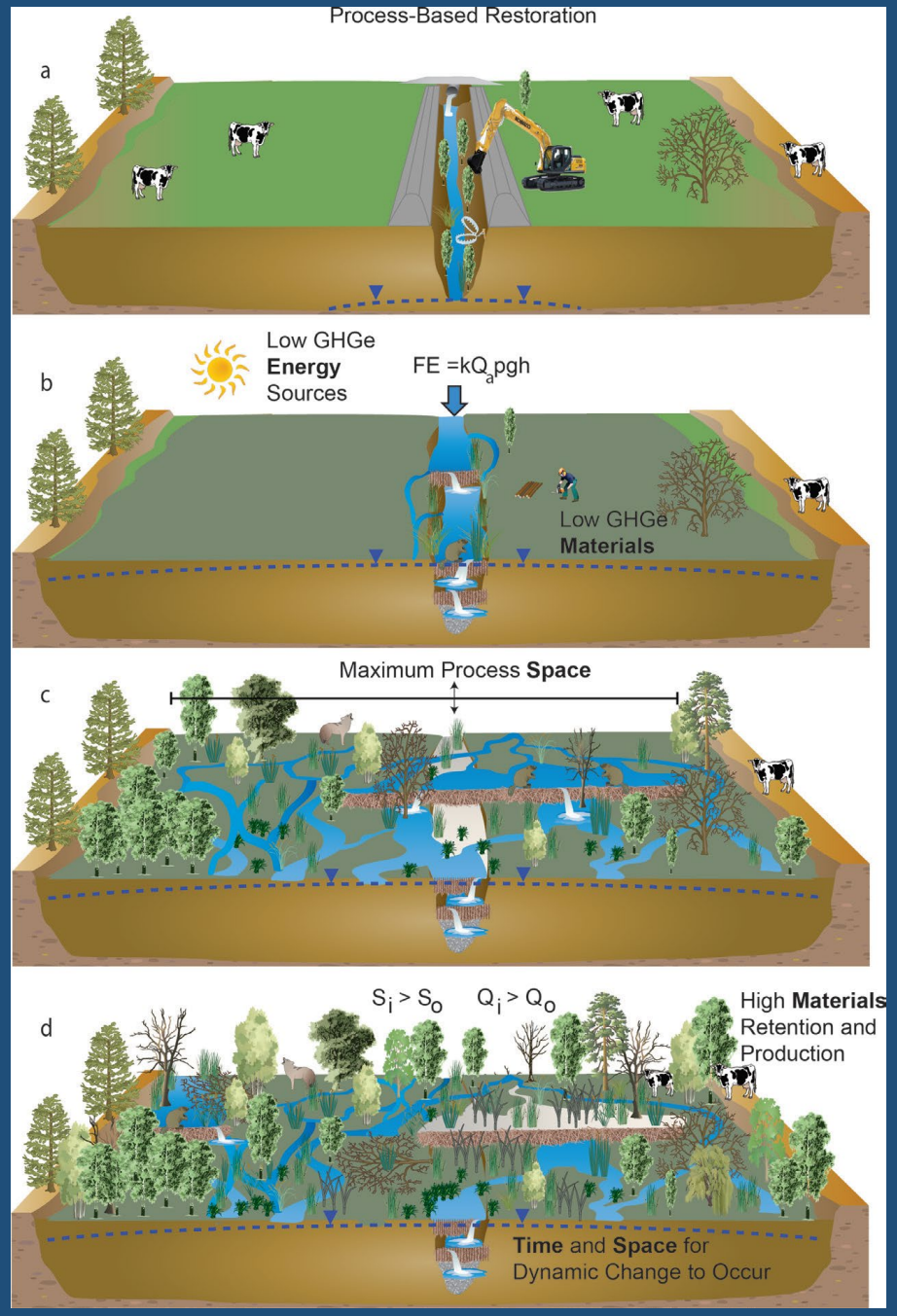
National Fish & Wildlife Foundation



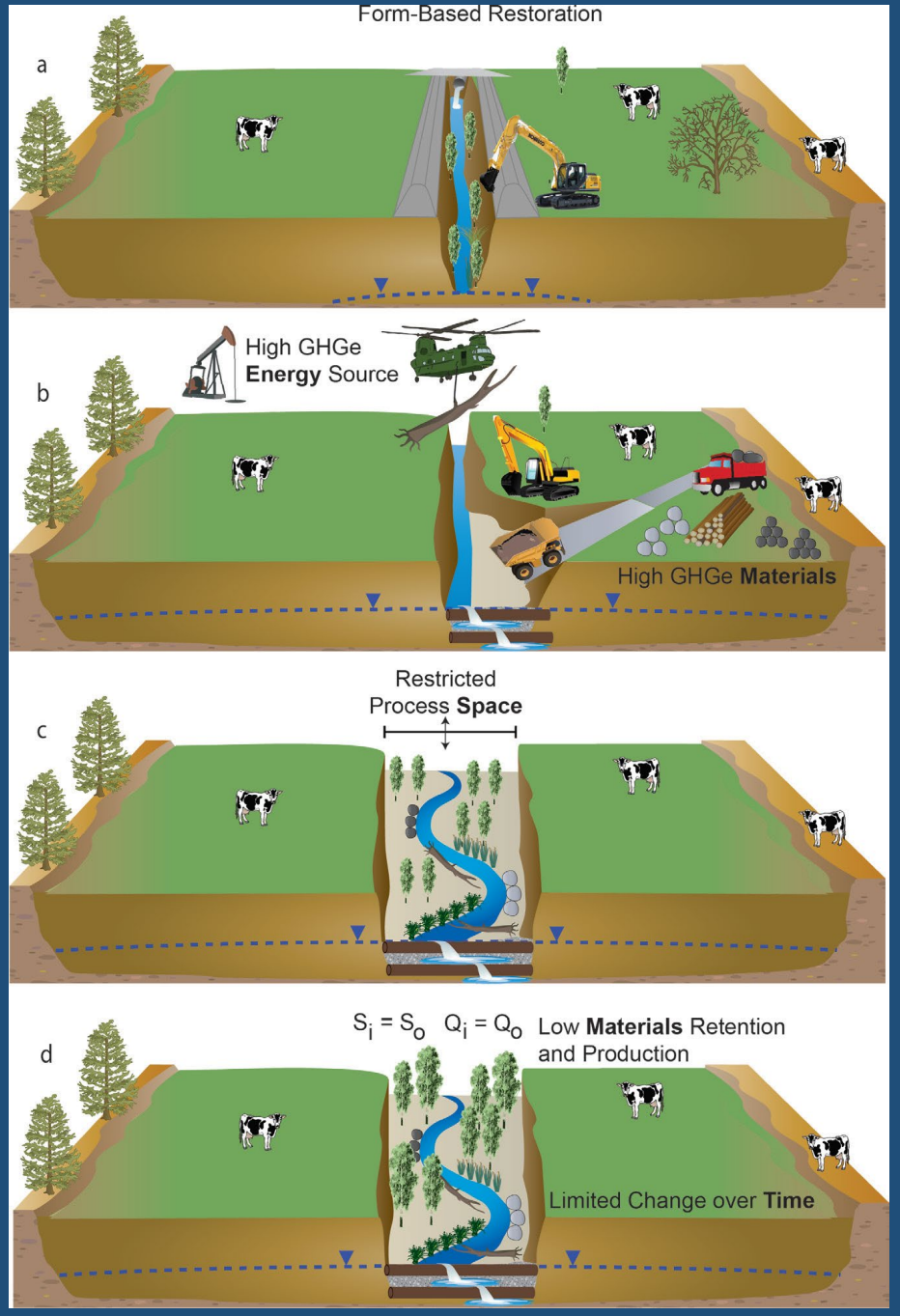
National Fish & Wildlife Foundation



Joe Wheaton, Creative Commons



Ciotti et. al



Ciotti et. al

Joe Wheaton, Creative Commons

Image sources: Wheaton, et.al, and Plumas Corp

Meadow Projects

CDFW 2024 –

- Boney Flat Implementation

Tuolumne Band of Me Wuk Indians – grant through Sierra Meadow Partnership (Wildlife Conservation Board)

- Murphy Ranch planning and design

WCB 2020 planning, design, and permitting grant (to be done in 2021, project area is 67 acres meadow and .5 acre riverine)

- Boney Flat
- Cottonwood
- Boggy
- Little Rattlesnake Creek Tributary

WCB 2016 grant (20 meadows restored, approximately 157 acres total)

1-8. Reynolds Meadows (**8** small) - 2018-2019
9. Upper Femmons
10. Lower Femmons
11. 1751 - 2018
12. 2N55 - 2017
13. Rackerby Jack Springs - 2019
14. Thompson - 2018
15. Walton Cabin Springs - 2018
16. Wet Meadow Springs - 2018-2019
17. Wet Meadow -
18. Indian Springs- 2020
19. Upper Fahey - 2017
20. Lower Fahey -2019

SNC grants 813, 816, and 856 (took place 2014 through 2019) - (3.25 acres spring and 20 acres meadow habitat restored)

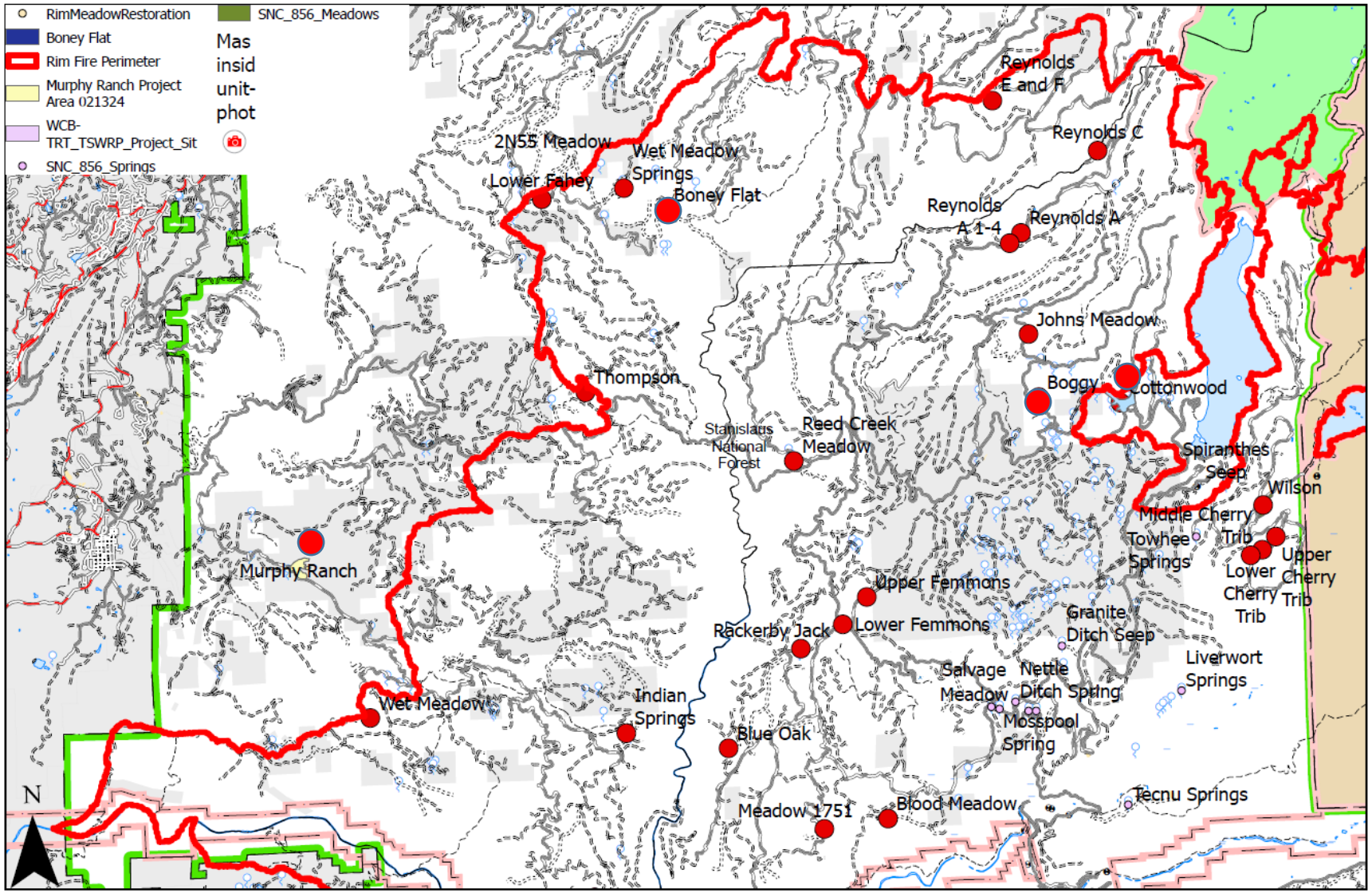
- ***Springs: 112 spring were visited and assessed, 10 were selected/funded for restoration planning, design, permitting and implementation - of which 8 were restored and 2 were prescribed adaptive management/monitoring:***

  - Mosspool spring
  - Nettle Ditch spring
  - Cordulegaster spring
  - Hopeful spring
  - Tecnu spring
  - Salvage Meadow spring
  - Granite Ditch seep
  - Towhee spring
  - Spiranthes spring
  - Liverwort spring

- ***Meadows: 4 meadows were selected/funded for restoration planning, design, permitting and implementation***
  - Wilson Meadow
  - Upper Cherry Creek Meadow
  - Middle Cherry Creek Meadow
  - Lower Cherry Creek Meadow

(Also under the SNC 813,816, 856 grants, 205 acres were thinned (with piling for burning) habitat for deer migration, and 2 culverts were replaced.)

Meadow Projects

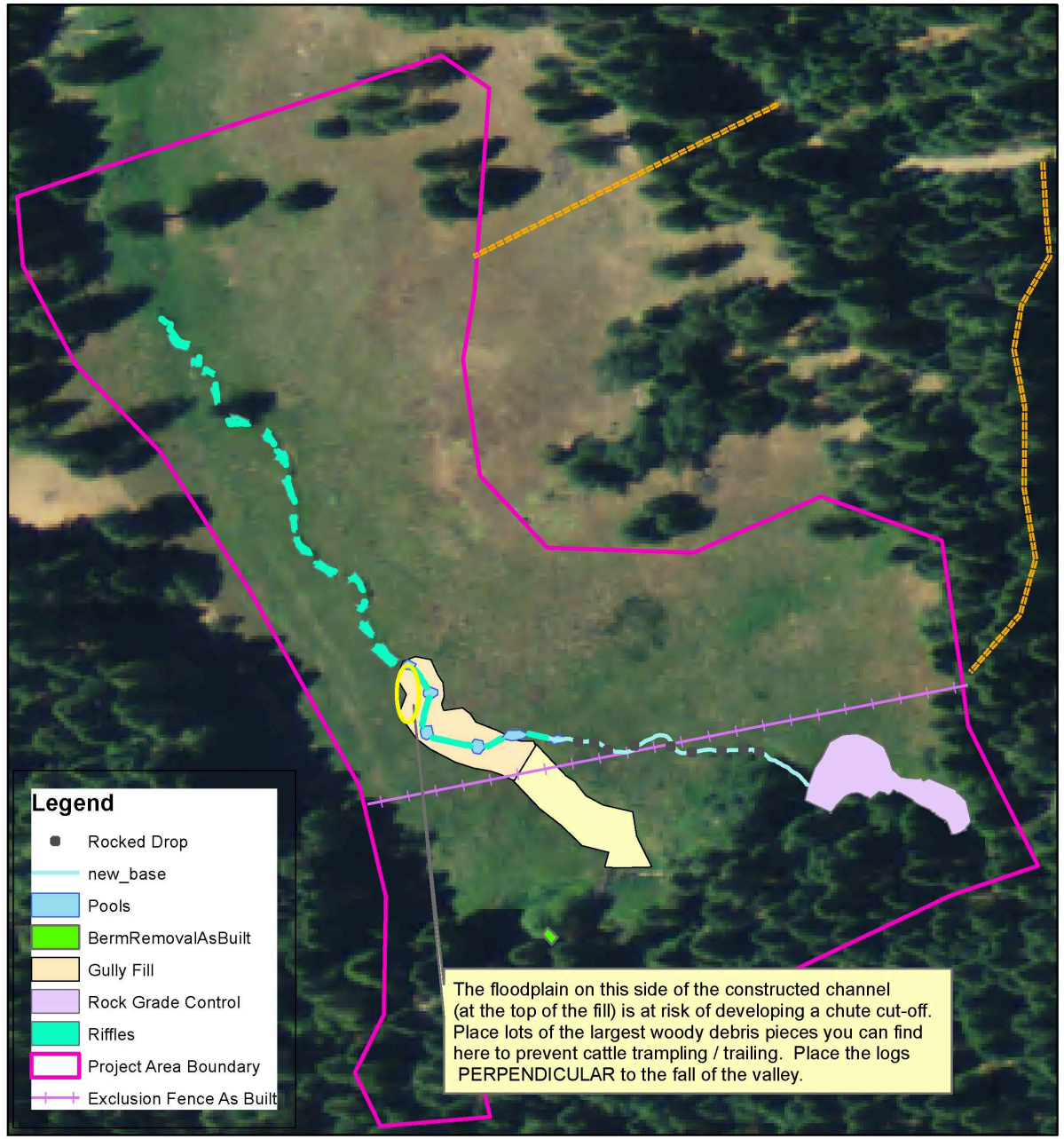


Tuolumne River Trust

0 0.25 0.5 1 Miles

Mechanized Meadow Restoration

- Regrade and reshape stream channels to slow water down in the meadow
- Replant native plant species
- Remove invasive plants
- Exclude livestock for several years post-project work
- Install stabilizing log and rock features to prevent accelerated erosion of stream channel


W
E
S
LHM 11/7/18
1 inch = 133 feet
0
65
130
260
Feet
Legend
Rocked Drop
new_base
Pools
BermRemovalAsBuilt
Gully Fill
Rock Grade Control
Riffles
Project Area Boundary
Exclusion Fence As Built
The floodplain on this side of the constructed channel (at the top of the fill) is at risk of developing a chute cut-off. Place lots of the largest woody debris pieces you can find here to prevent cattle trampling / trailing. Place the logs PERPENDICULAR to the fall of the valley.

Boney Flat Hydrology Improvement Project
Revised Plan View

1 inch = 200 feet
0 50 100 200 300 400
Feet

Project revision replaces rock riffles with a greater number of biogenic structures, all of which would be installed by a hand crew. Logs would be used as barriers for OHVs and cattle trailing. Headcut treatments would utilize individual logs for small nicks, and Post-Assisted Log Structures (PALS) for larger cuts. Coir logs would be used in small tributary channels, reinforced with wood in larger incisions, or where needed for trailing. PALS in the main channel would be installed partially across the channel (for widening and generation of material (PALS_Semi)), or would completely span the channel to capture sediment (PALS_Full). Revision includes clearing brush above the meadow for cattle trailing to discourage further channel crossing in the meadow, additional fencing to allow revegetation, removal of existing dilapidated fence, some conifer removal and revegetation.

Legend

- Boney Flat Project Area
- RoadExisting
- Channel Existing
- Wet Meadow Existing (fen)
- ProposedBrushClear
- Proposed Fence

Proposed Biogenic Structures:

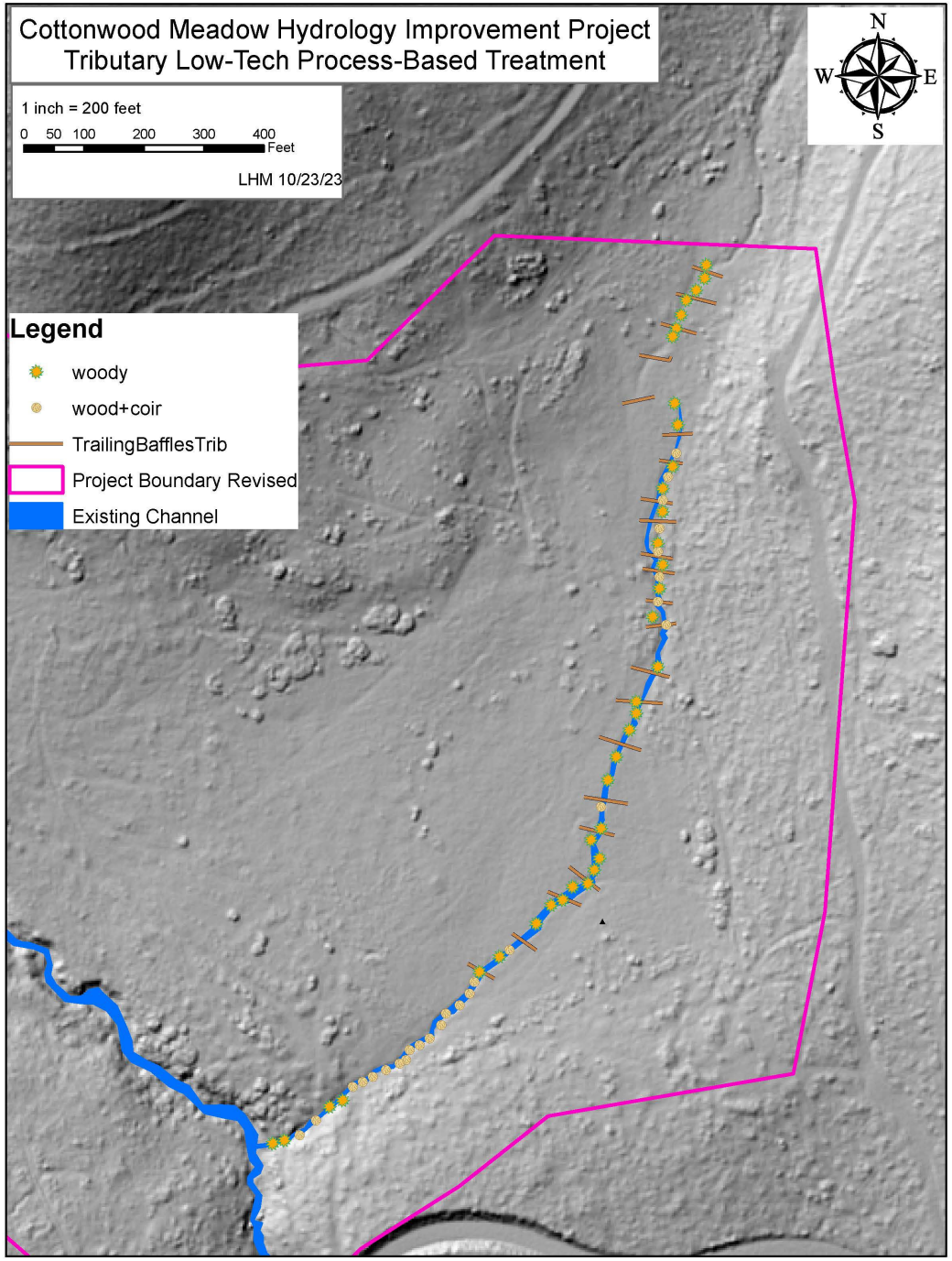
- Coir
- CoirWood
- Log
- PALS
- PALS_Full
- PALS_Semi

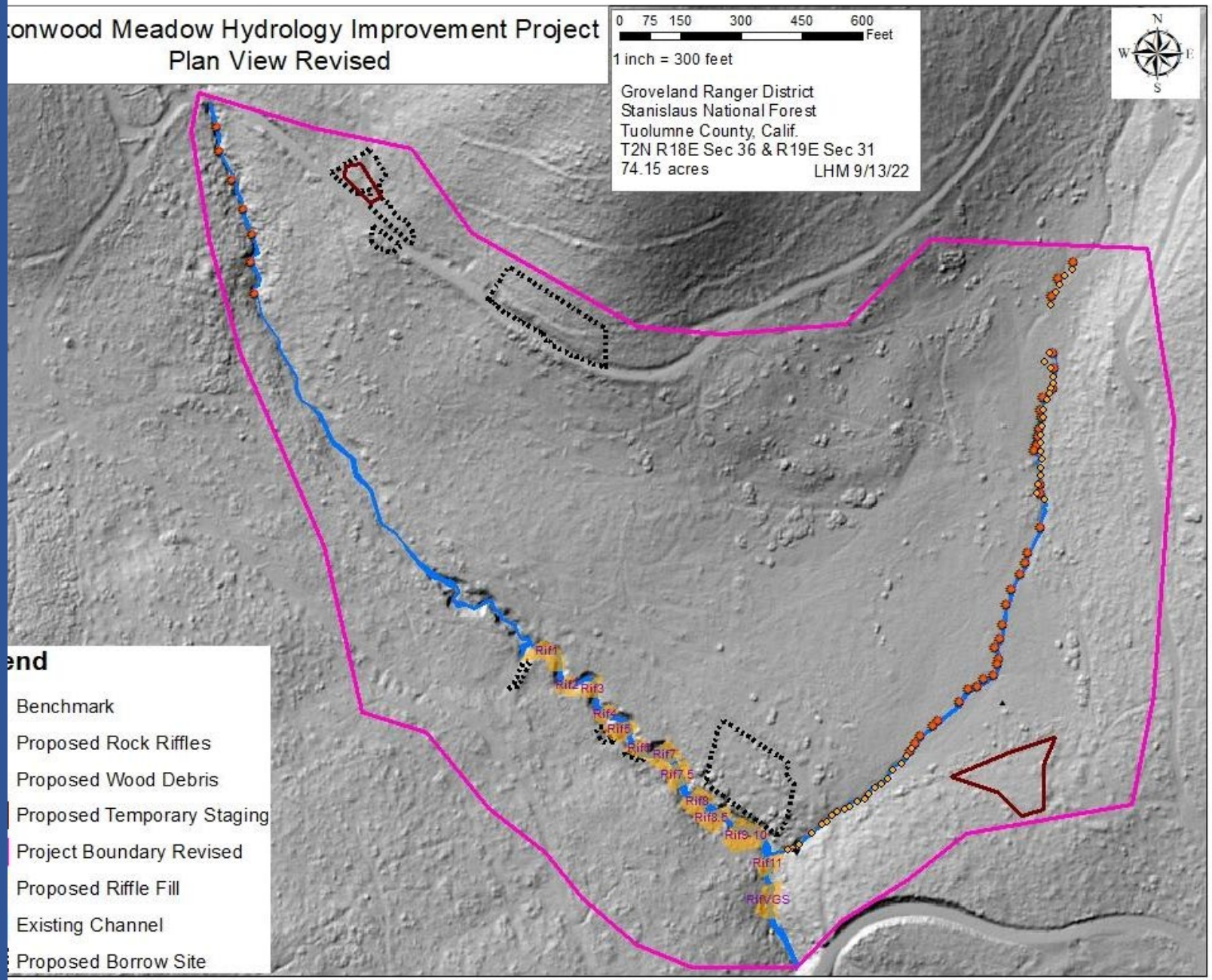
N W E S

LHM 2023_04_7

Boney Flat Meadow

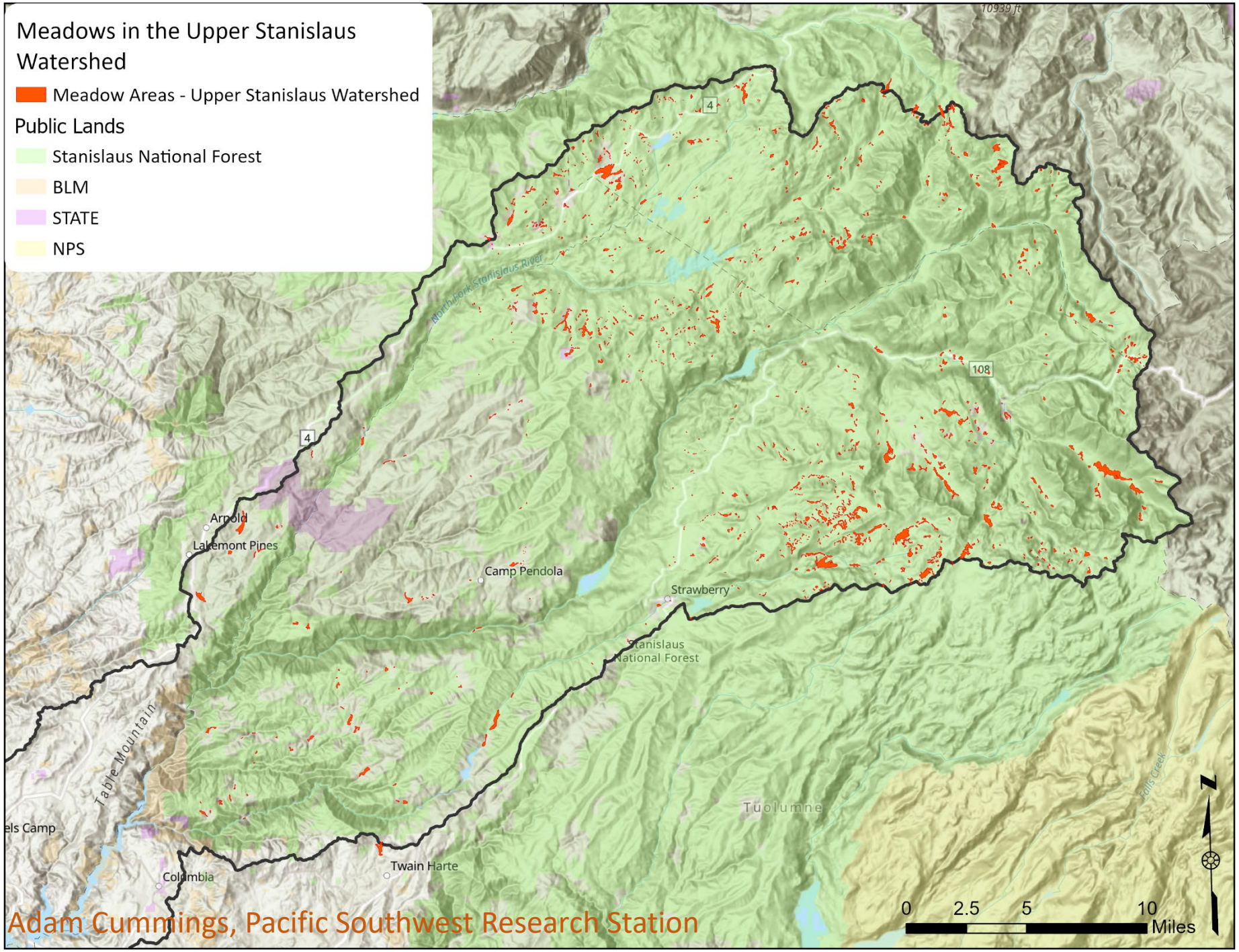
- Post-Assisted Log Structures (PALs) and coir logs for slowing erosion and restoring stream channel
- Conifer encroachment, invasive plant removal and fencing other project components
- Funded through CDFW
- Implementation this summer
- Project effectiveness monitoring will continue for a few seasons out
- Volunteer days will be scheduled for folks who want to be involved


Cottonwood Meadow Hydrology Improvement Project
Tributary Low-Tech Process-Based Treatment
1 inch = 200 feet
0 50 100 200 300 400
Feet
LHM 10/23/23
N
W
E
S
Legend
woody
wood+coir
TrailingBafflesTrib
Project Boundary Revised
Existing Channel


onwood Meadow Hydrology Improvement Project
Plan View Revised
0 75 150 300 450 600
Feet
1 inch = 300 feet
Groveland Ranger District
Stanislaus National Forest
Tuolumne County, Calif.
T2N R18E Sec 36 & R19E Sec 31
74.15 acres
LHM 9/13/22
N
W
E
S
end
Benchmark
Proposed Rock Riffles
Proposed Wood Debris
Proposed Temporary Staging
Project Boundary Revised
Proposed Riffle Fill
Existing Channel
Proposed Borrow Site
Rif1
Rif2
Rif3
Rif4
Rif5
Rif6
Rif7
Rif7.5
Rif8
Rif8.5
Rif9-10
Rif11
RifVGS

References and Resources:

- Wheaton J.M., Bennett S.N., Bouwes, N., Maestas J.D. and Shahverdian S.M. (Editors). 2019. Low-Tech Process-Based Restoration of Riverscapes: Design Manual. Version 1.0. Utah State University Restoration Consortium. Logan, UT. 286 pp. DOI: 10.13140/RG.2.2.19590.63049/2.
- Damion C Ciotti, Jared Mckee, Karen L Pope, G Mathias Kondolf, Michael M Pollock, Design Criteria for Process-Based Restoration of Fluvial Systems, *BioScience*, Volume 71, Issue 8, August 2021, Pages 831–845, https://doi.org/10.1093/biosci/biab065
- Tuolumne River Trust website: https://www.tuolumne.org/restore
- Sierra Meadow Partnership: https://www.sierrameadows.org/
- Plumas Corp: https://plumascorp.org/



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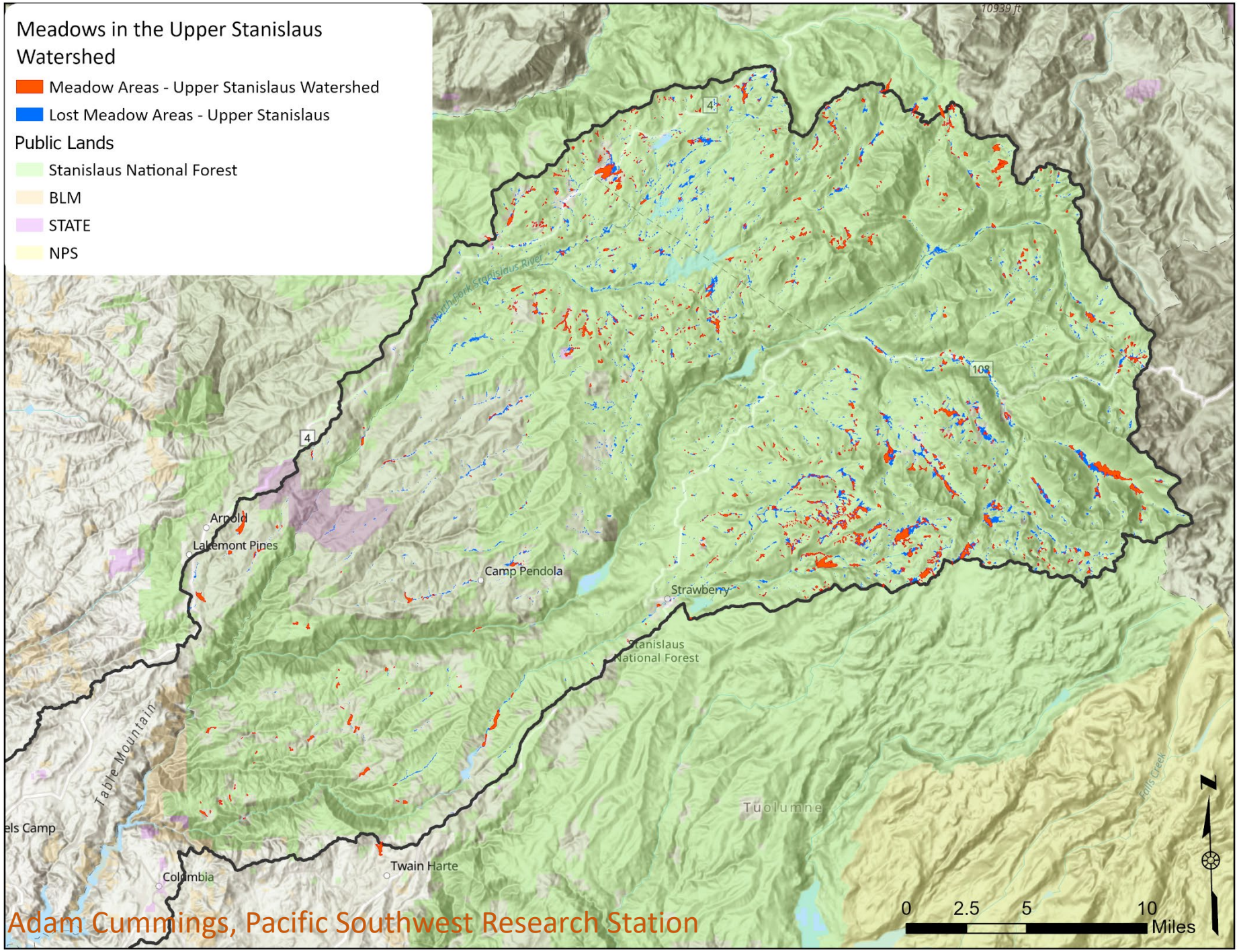

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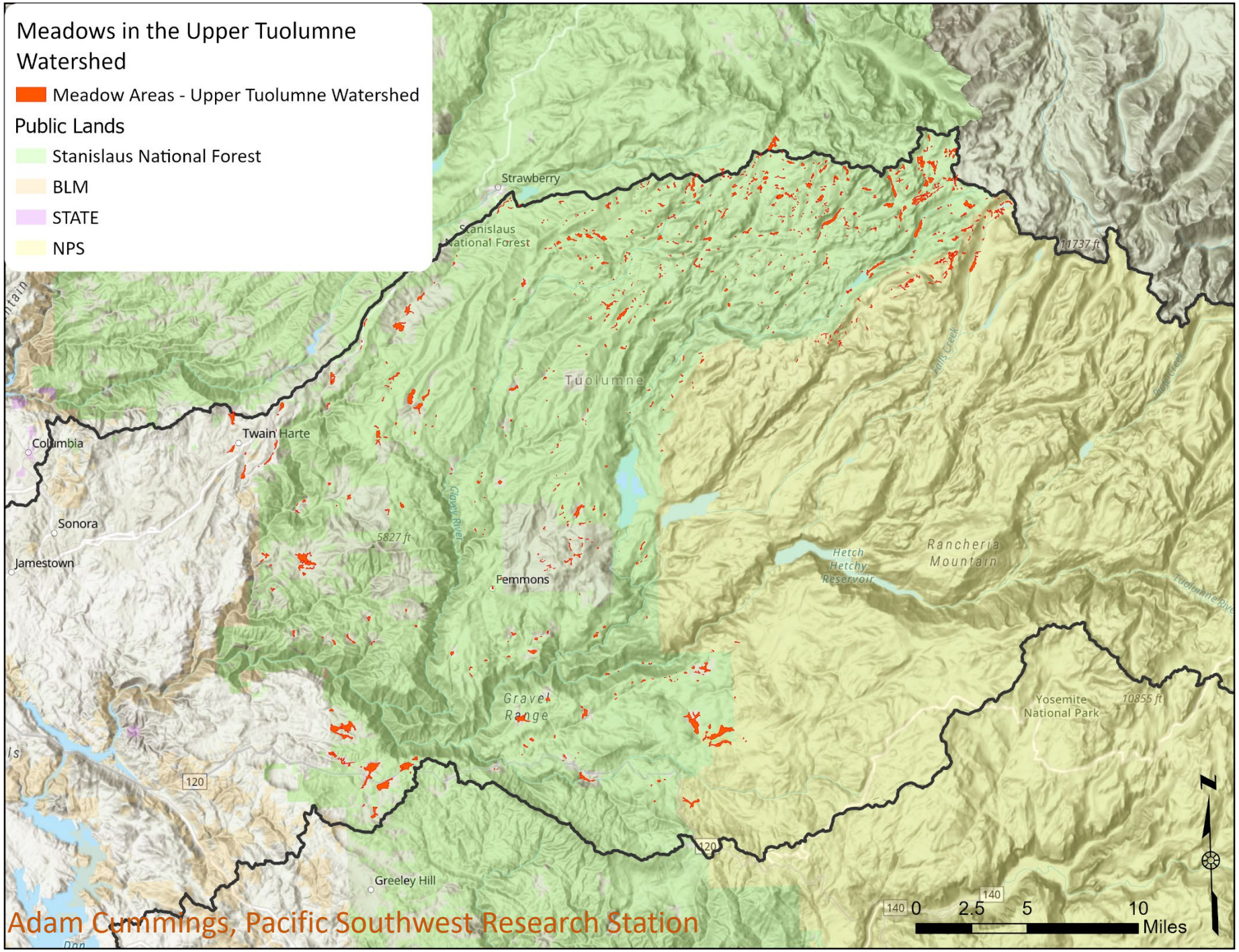

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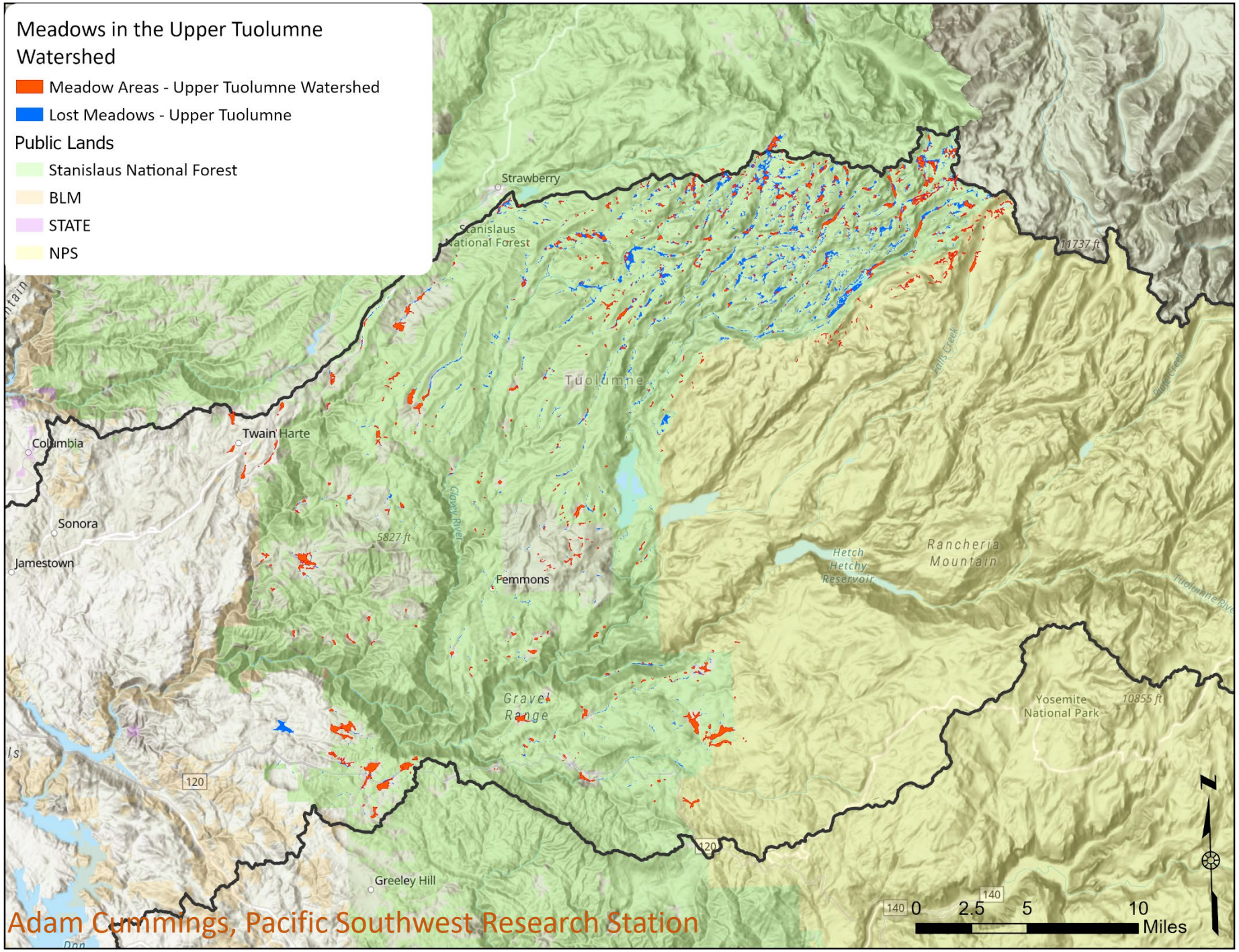

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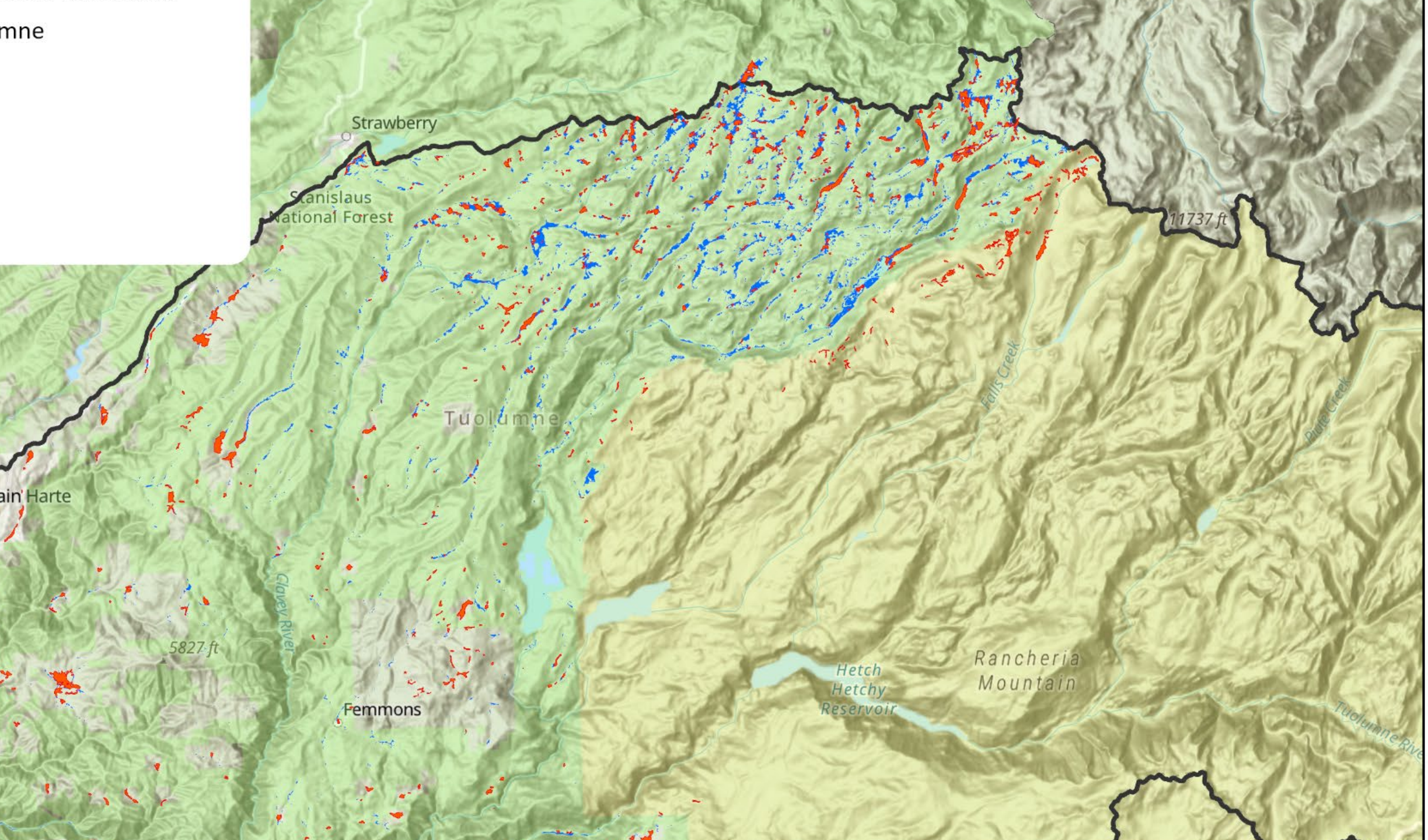
mne
Strawberry
Stanislaus
National Forest
11737 ft
Tuolumne
ain' Harte
Falls Creek
Piute Creek
Clavey River
5827 ft
Femmons
Hetch
Hetchy
Reservoir
Rancheria
Mountain
Tuolumne River

https://www.fs.usda.gov/research/psw/news/featured/researchers-use-machine-learning-find-lost-meadows-restoration