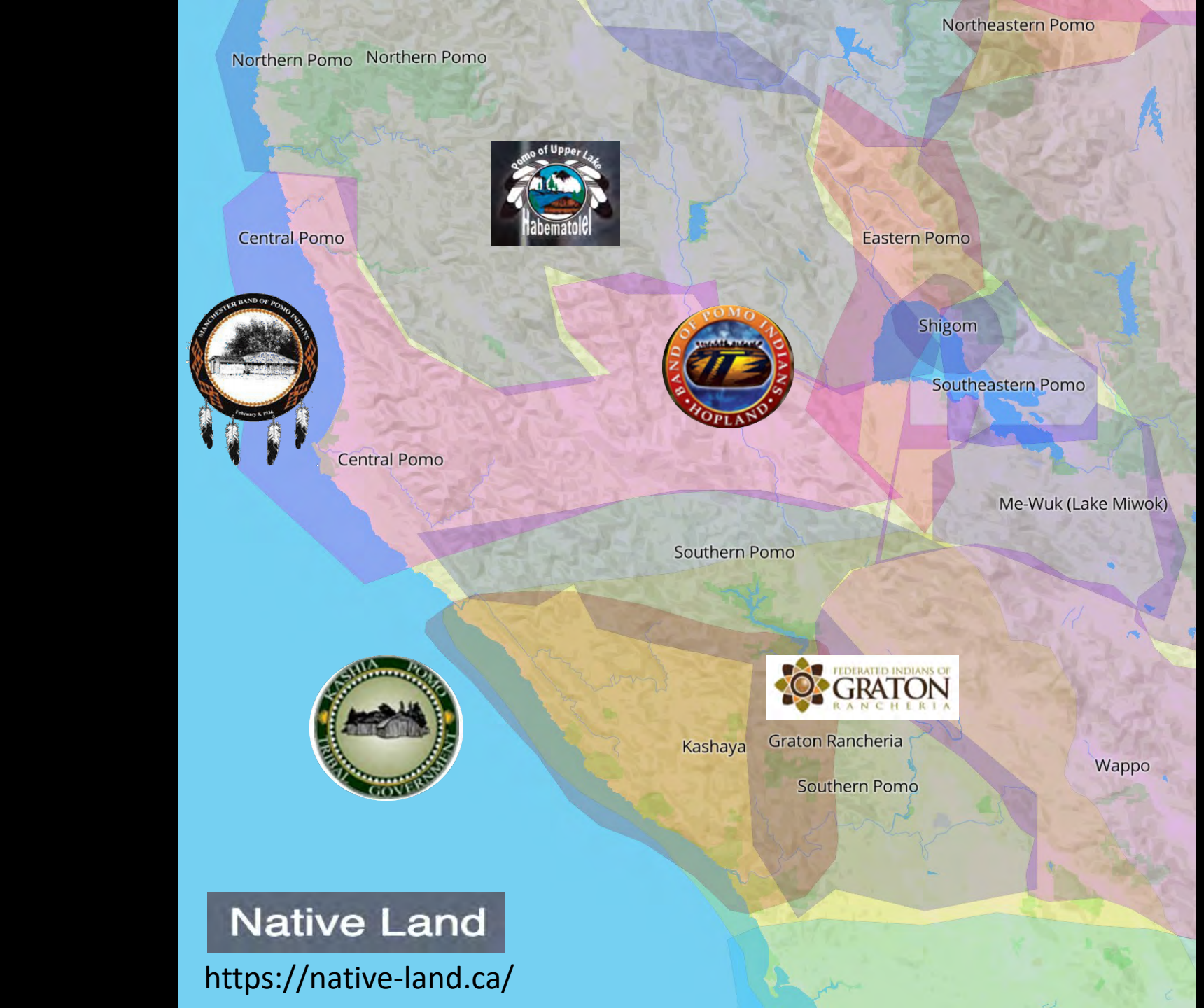
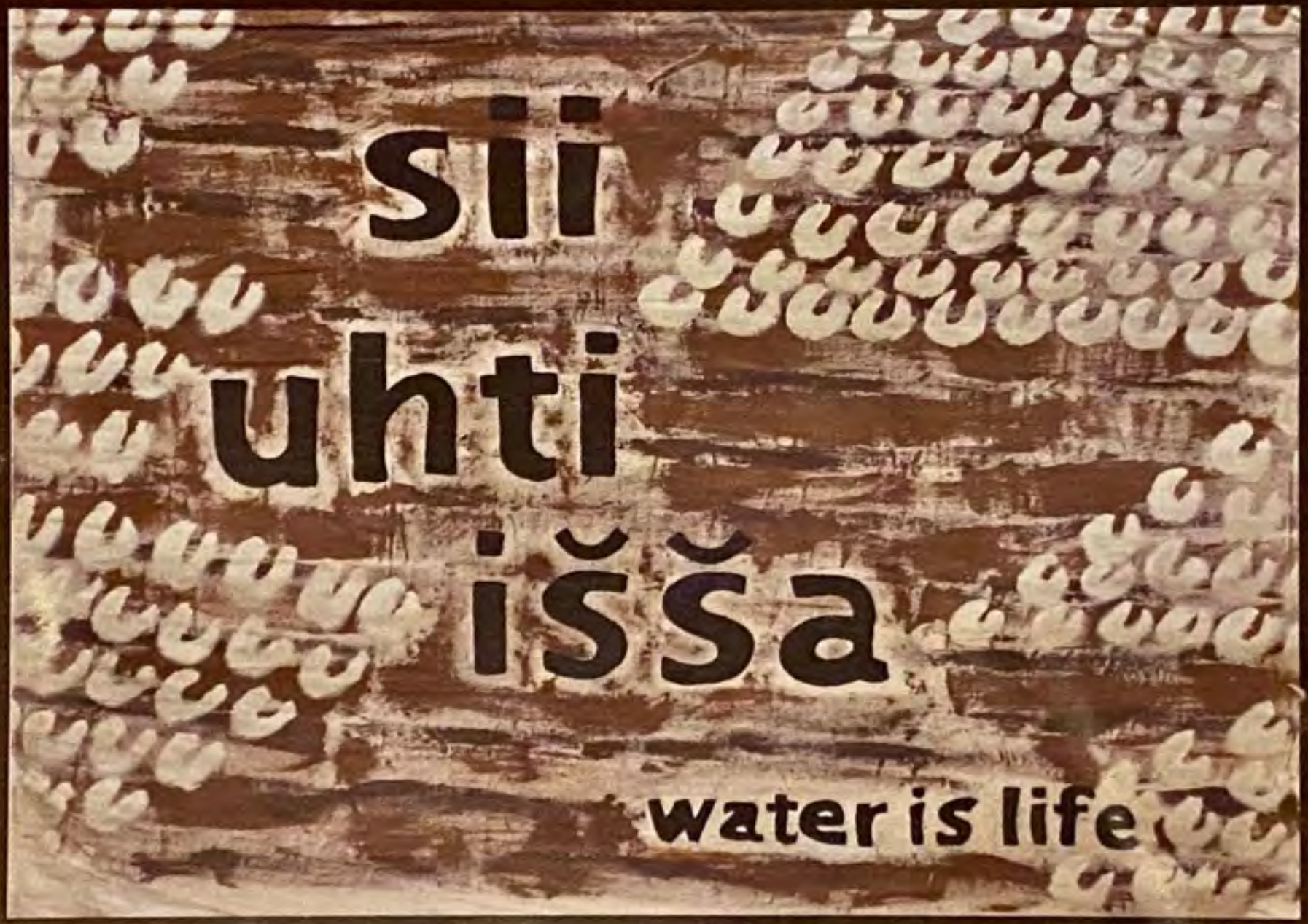

Northeastern Pomo
Northern Pomo
Northern Pomo
Pomo of Upper Lake
Habematolel
Central Pomo
Eastern Pomo
Shigom
Band of Pomo Indians
Hopland
Southeastern Pomo
Central Pomo
Me-Wuk (Lake Miwok)
Southern Pomo
Kashia Pomo Tribal Government
Federated Indians of Graton Rancheria
Kashaya
Graton Rancheria
Wappo
Southern Pomo
Native Land
https://native-land.ca/

WATER INSTITUTE

OCCIDENTAL ARTS & ECOLOGY CENTER

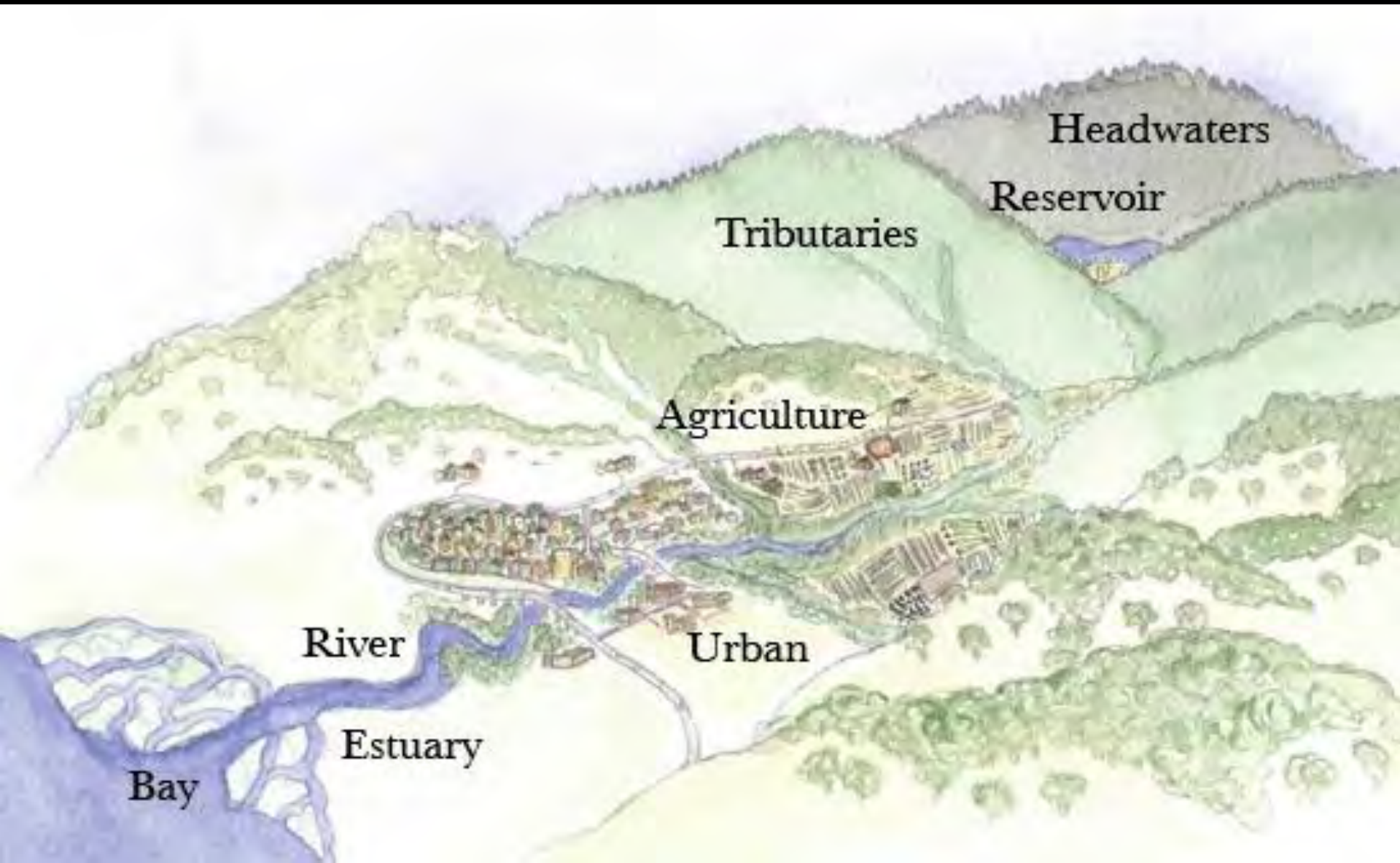
3 year old rice paddy tadpole hunter
Iwakuni, Japan June 1968


Welcome to Planet Water!
Only place in the known Universe where…
LIFE
IS
ENDEMIC!



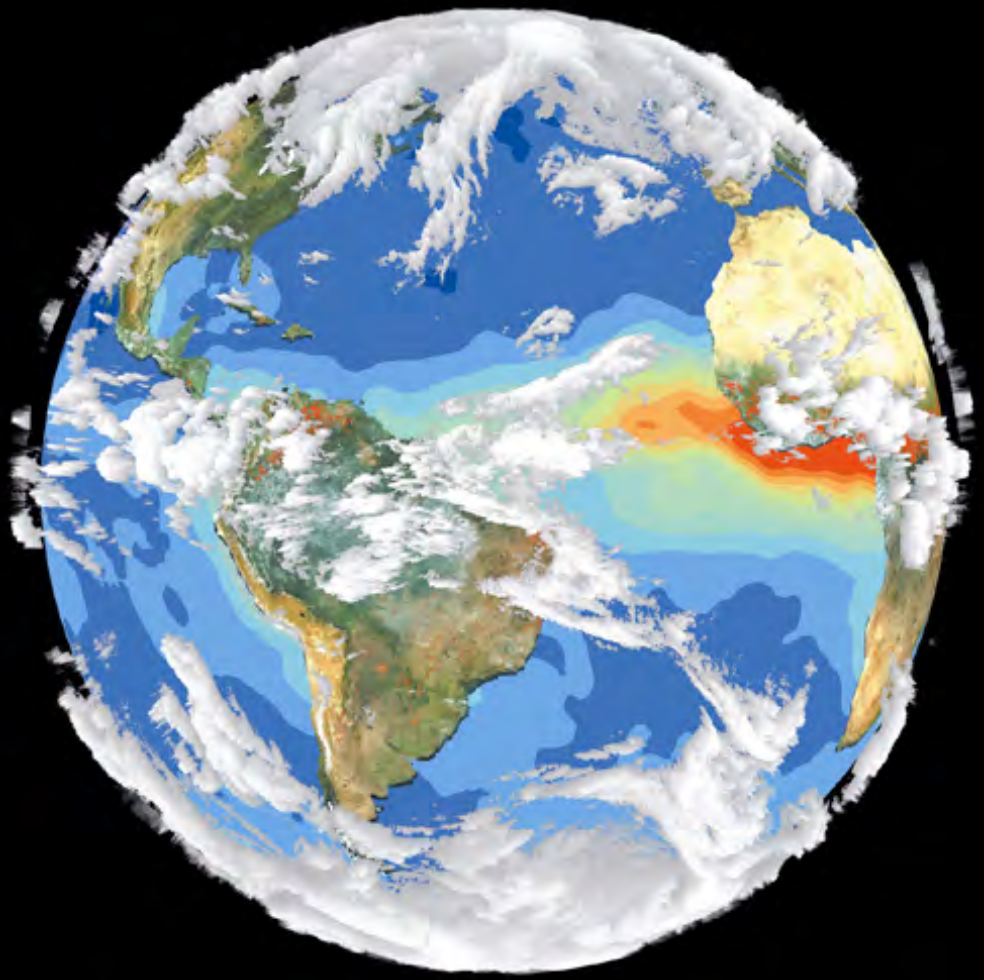
sogoreate-landtrust.com

Watersheds are Basins of Relations
Rethink from Ridge to River to Reef
For a Reverential & Resilient Rehydration Revolution Retrofit



“The health of our waters is the principal measure of how we live on the land"

Luna Leopold



The health of *Planet Water* is the principle measure of how we have been living on the Planet!

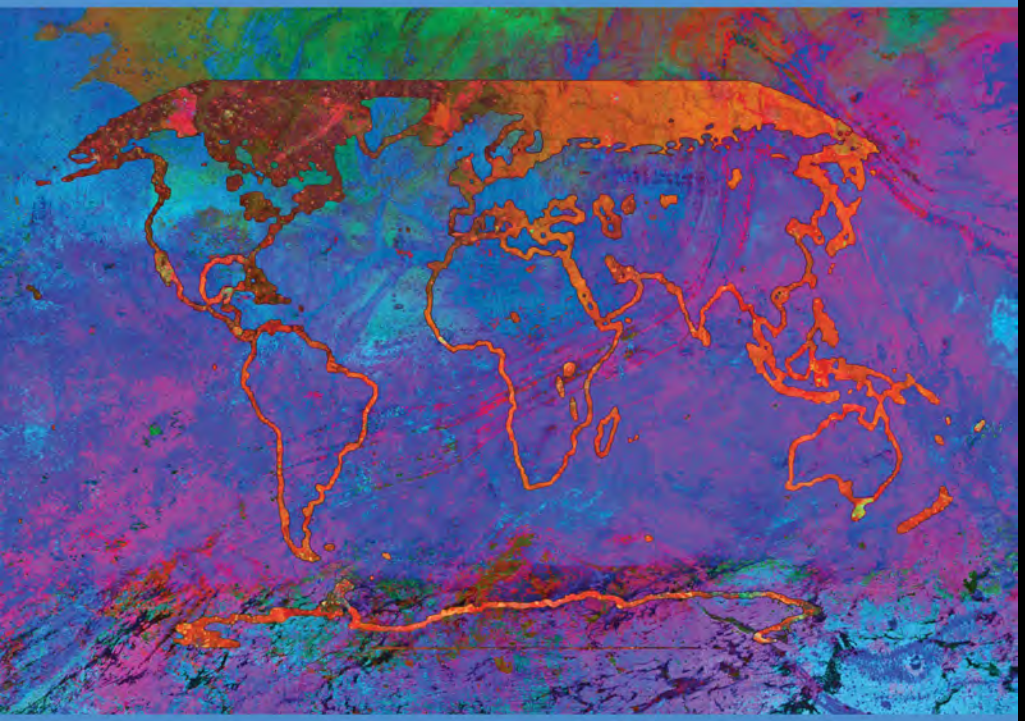
ipcc

INTERGOVERNMENTAL PANEL ON climate change

Climate Change 2021

The Physical Science Basis

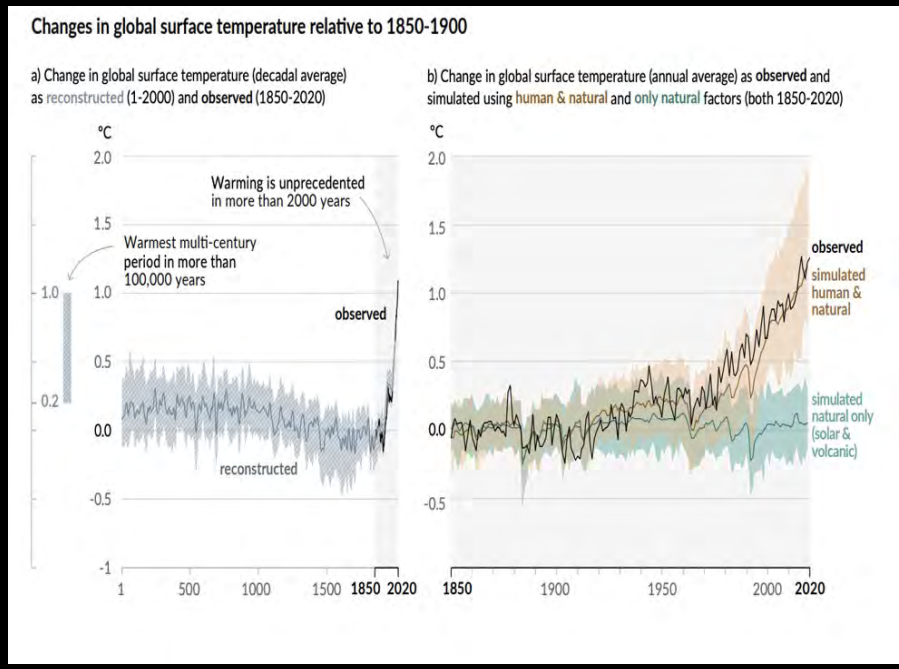
Summary for Policymakers



WGI

Working Group I contribution to the
Sixth Assessment Report of the
Intergovernmental Panel on Climate Change

WMO UNEP



"Climate Change is synergistically exacerbating and amplifying the cumulative impacts of fragmented and deranged watershed conditions, functions and processes at all temporal & spatial scales!"
Sal. E Mander

And just when you thought you already had enough on your plate with the need to rewild the keystone verbs…

Forms Follow Functions

…& Forms Follow Dysfunctions!

Is your Settlement Pattern based on regimes of:
Degenerative Disturbance?
Or
Regenerative Disturbance?

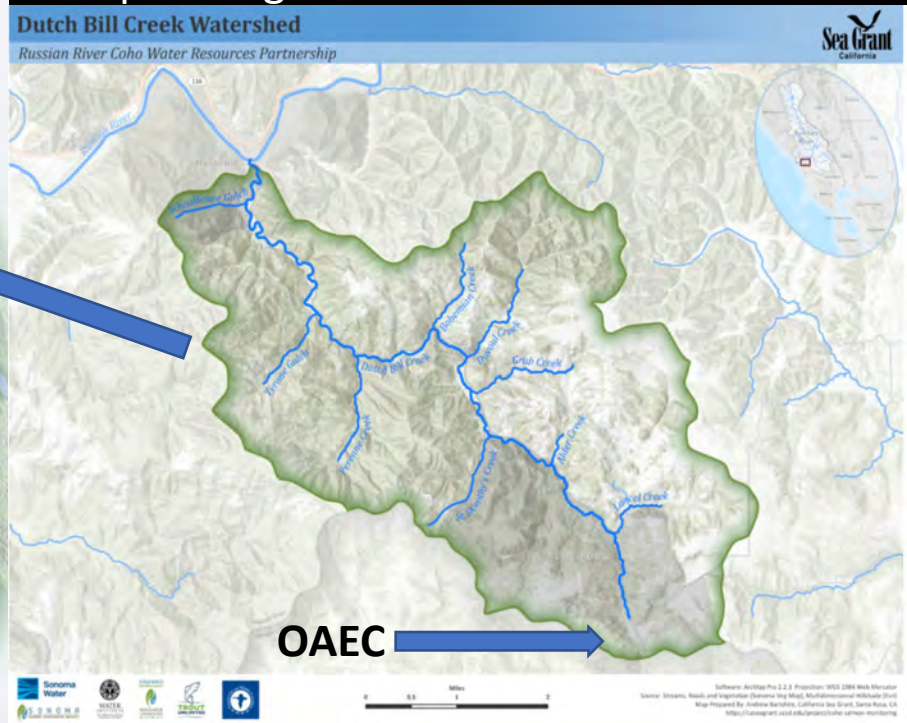
Winter Dirty & Summer Dry

From Ridgeline to River to Reef!

Watershed conditions are a direct indictment of all historic and current land uses, & abuses.

Dirty & dry creeks with nearly extinct salmonids don't lie!

Spawning the Truth of Totem Salmon



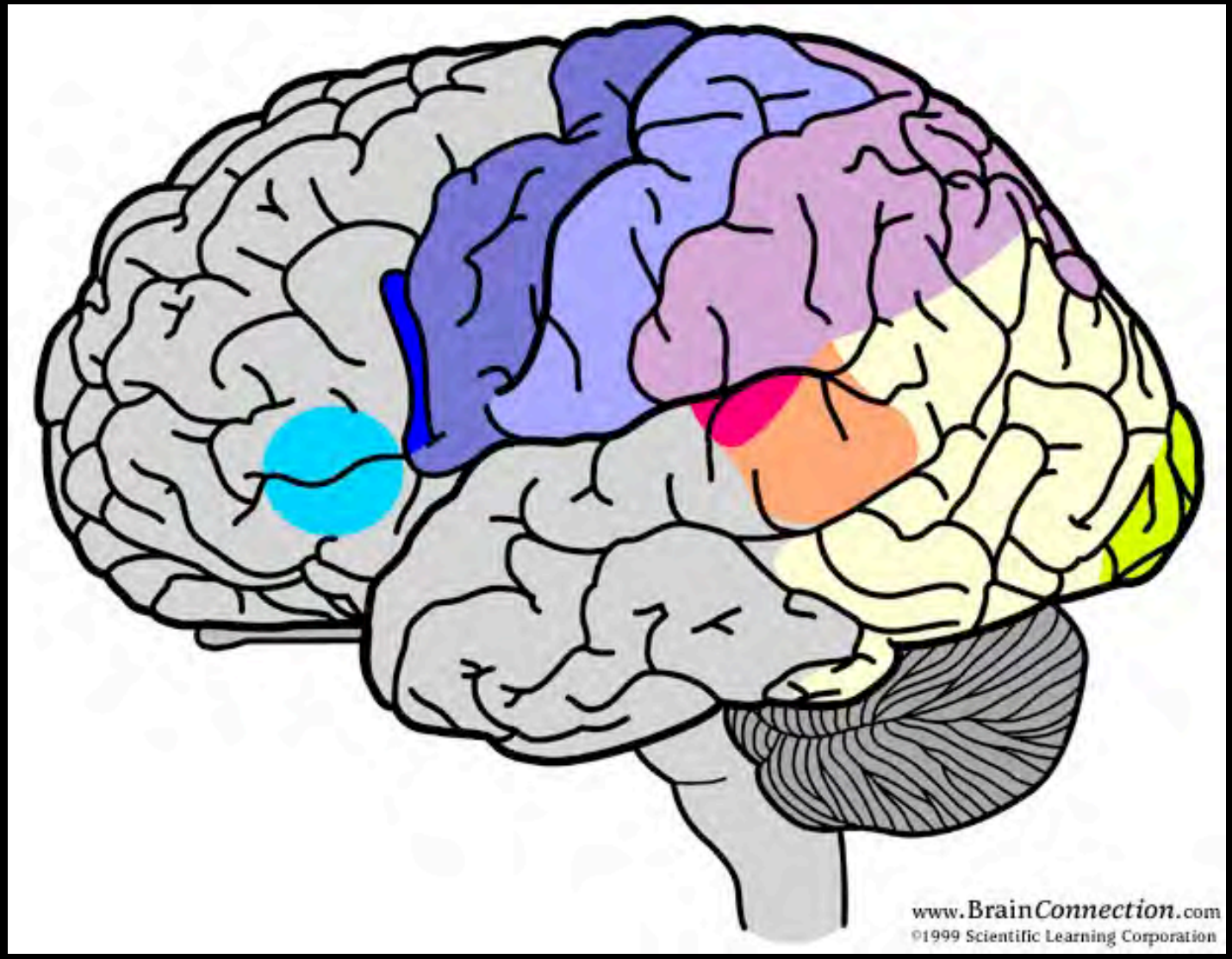
Coho Salmon Reintroduced into Salmon Creek

Photo by: Jim Coleman

2008 ReWilding of Coho Salmon back into Salmon Creek Watershed

“The first thing we learned from salmon was the importance of the watershed as a unit of perception”

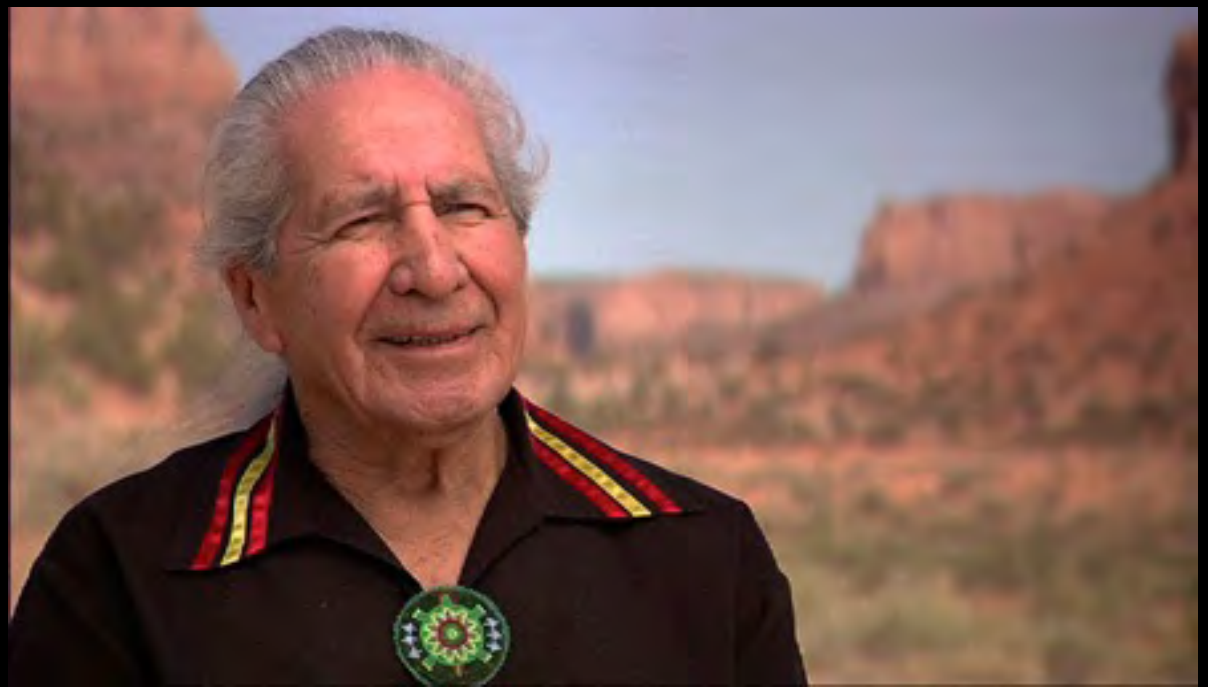
Freeman House in TOTEM SALMON



The critical Head-Waters in need of Ego-System Re-Storyation!

“What you people call
your natural resources
our people call
our relatives.”

Oren Lyons - **Faith keeper of the Onondaga**



Yurok Salmon Bake at the 11th Annual Coho Confab on SF Smith River 2008

M. KAT ANDERSON

Tending the Wild

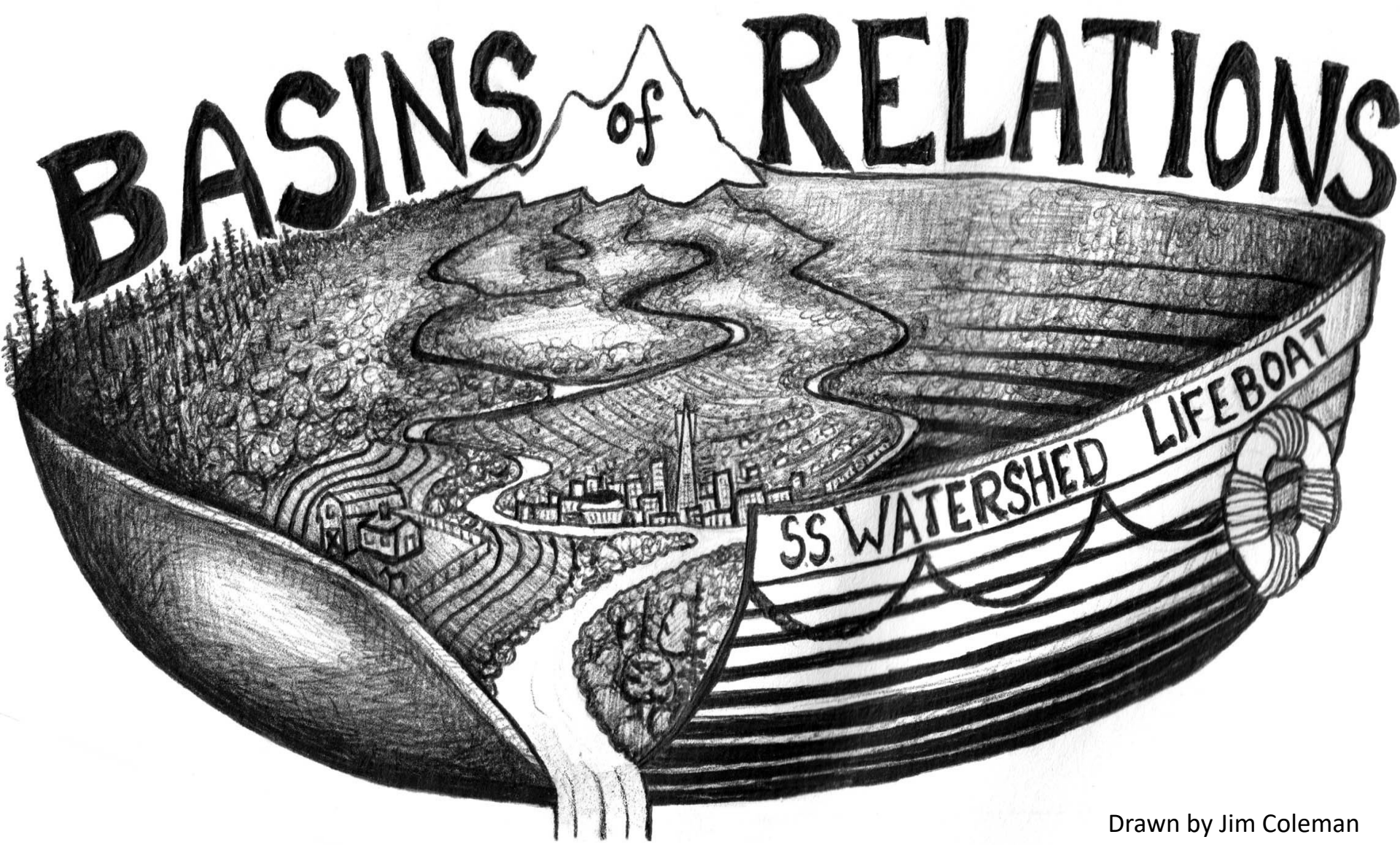
Native American Knowledge and the Management of California's Natural Resources

TRADITIONAL ECOLOGICAL KNOWLEDGE

Learning from Indigenous Practices for Environmental Sustainability

EDITED BY

Melissa K. Nelson and Dan Shilling

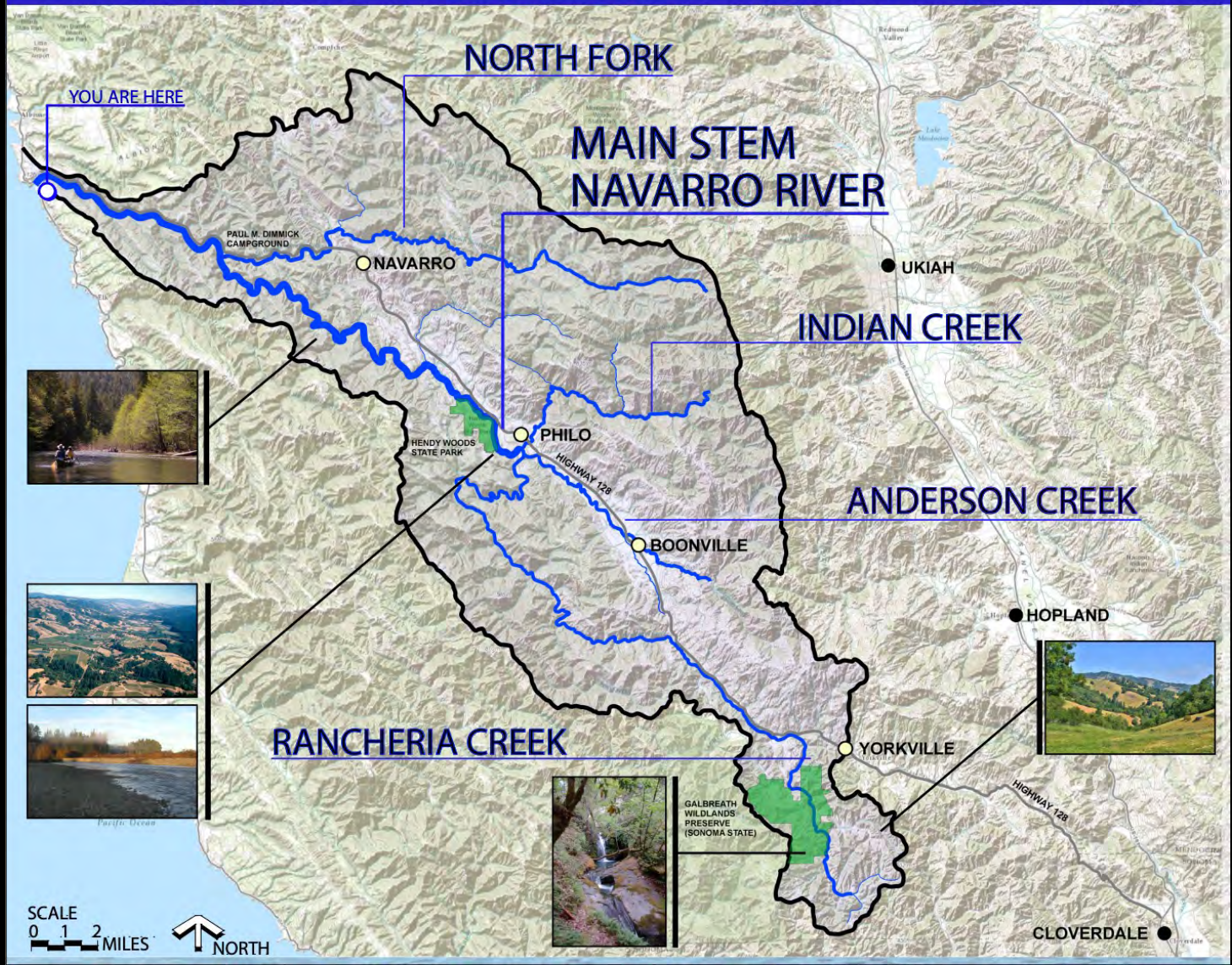


Drawn by Jim Coleman

"The major problems in the world are the result of the difference between how nature works and the way people think" Gregory Bateson

Navarro River Watershed

The largest coastal basin in Mendocino County
Approximately 315 square miles in size (201,600 acres)



BASINS OF RELATIONS

A Citizen's Guide to
Protecting and Restoring Our Watersheds

WATER INSTITUTE

OCCIDENTAL ARTS & ECOLOGY CENTER

DO YOU KNOW WHERE YOUR WATERSHED IS TONIGHT?

What watershed supplies your water? What watershed do you live in?
Are they the same? What do you use water for?
How safe do you believe your water supply to be?
Where do you get your drinking water?
How long have you been dependent on bottled water?
Would you like to restore your own local drinking water supply?

For more information and additional copies of this publication please contact:

WATER INSTITUTE

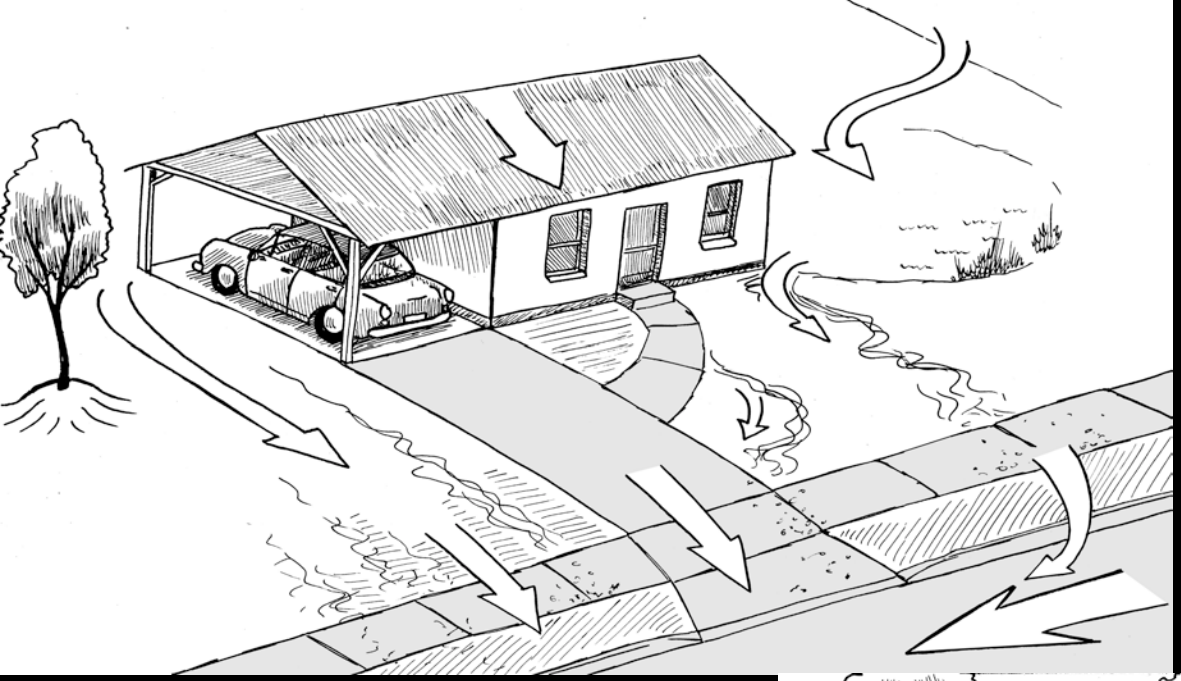
WATERSHED · ADVOCACY · TRAINING · EDUCATION · RESEARCH

OCCIDENTAL ARTS & ECOLOGY CENTER
15290 Coleman Valley Road, Occidental CA 95465
(707) 874-1557 • www.oaec.org/water

3rd Edition (2018)

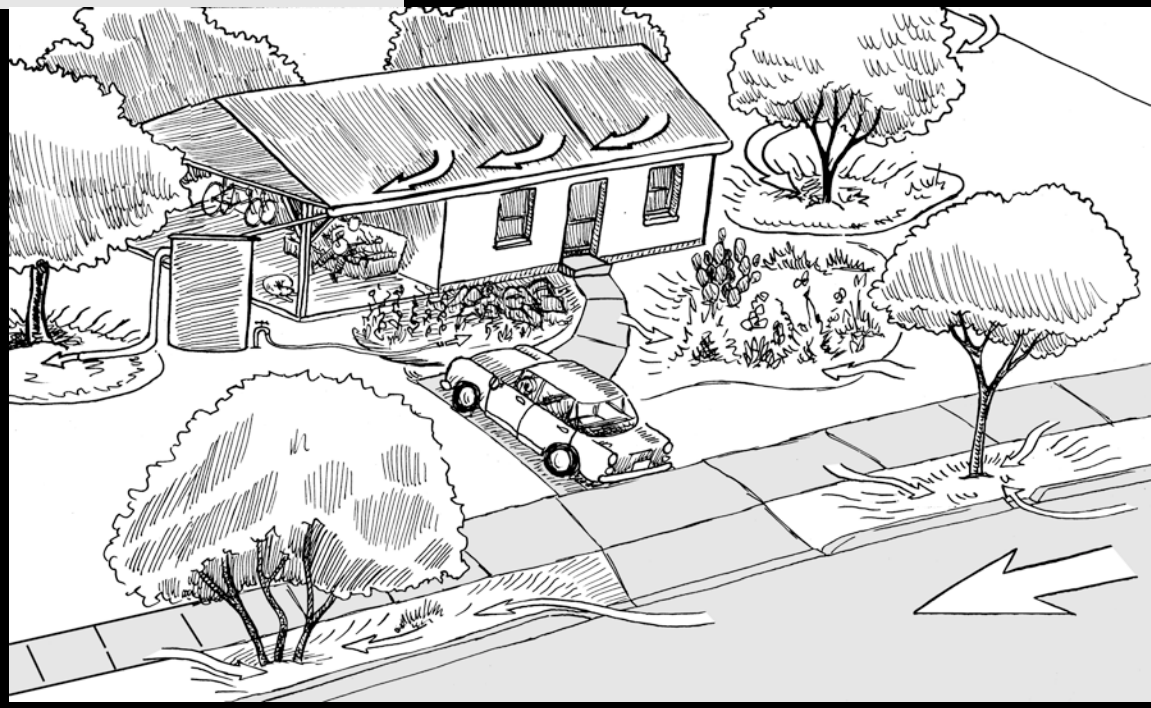
“Don’t pray for rain, if you can’t take care of what you get.”

R.E. Dickson - 1937 Superintendent
Texas Agricultural Experiment Station



DrainAge?

RetainAge!



From: Rainwater Harvesting for Drylands By Brad Lancaster

Deluge!

De-Nile apparently not only River in Egypt?

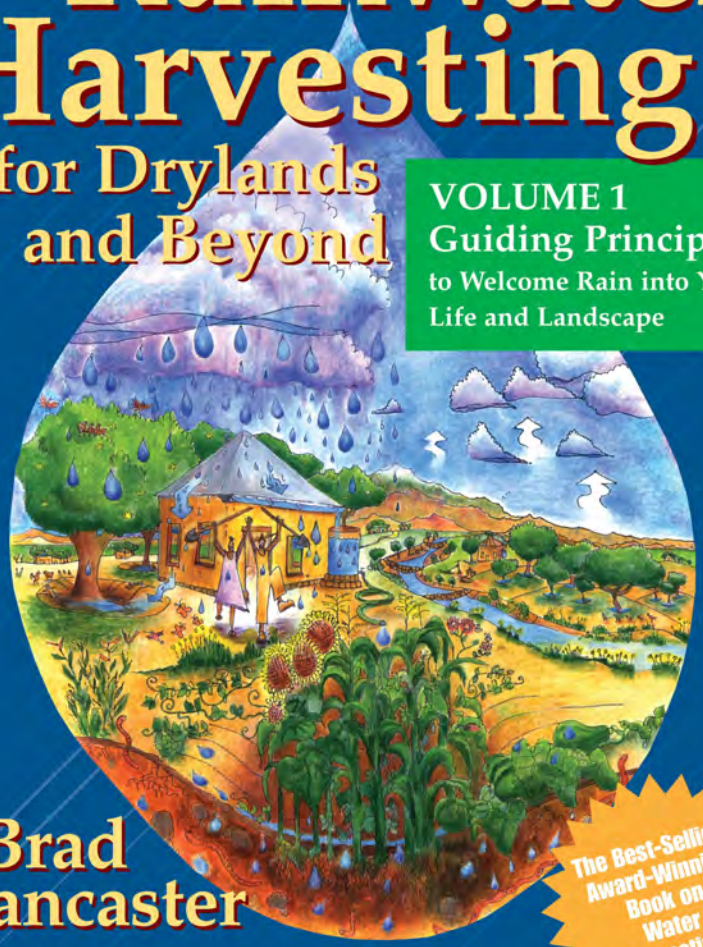
February 27, 2019

Drought!

May 2021 (Kent Porter/The Press Democrat via AP)

Rainwater Harvesting for Drylands and Beyond

VOLUME 1
Guiding Principles
to Welcome Rain into Your Life and Landscape



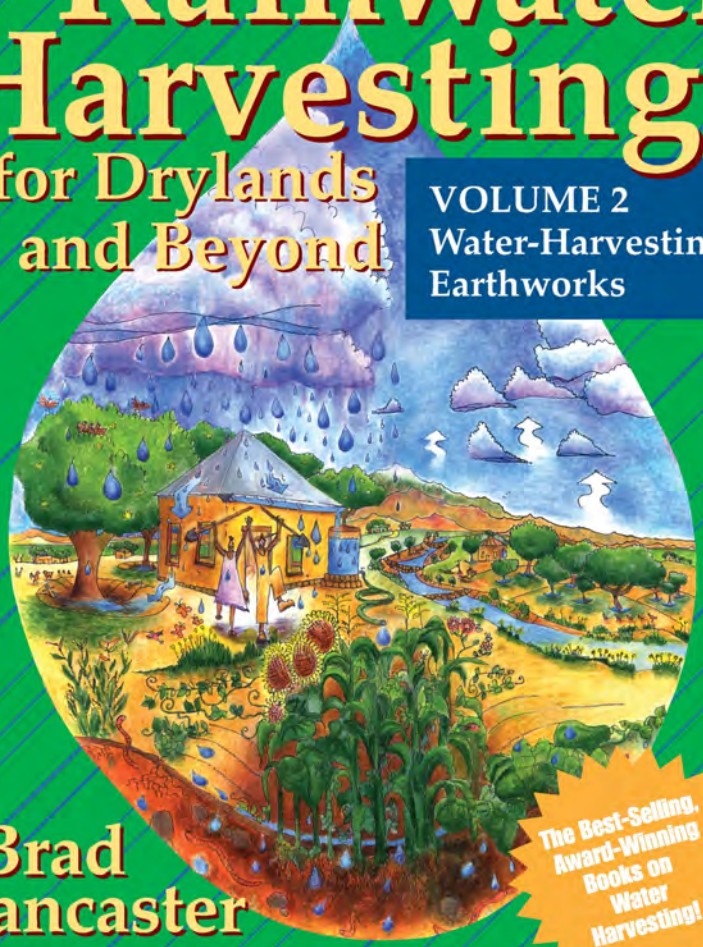
Brad Lancaster

The Best-Selling, Award-Winning Book on Water Harvesting!

Foreword by Gary Paul Nabhan

Rainwater Harvesting for Drylands and Beyond

VOLUME 2
Water-Harvesting Earthworks



Brad Lancaster

The Best-Selling, Award-Winning Books on Water Harvesting!

Foreword by Andy Lipkis

LOCALIZING CALIFORNIA WATERS

A HANDS-ON INTENSIVE FOR WATER CONSERVATION & REUSE

LOCALIZING
CALIFORNIA
WATERS
californiawaterreuse.org

‘Waters’ Working Groups:

Black-Water

Grey-Water

Rain-Water

Roof-Water

Storm-Water

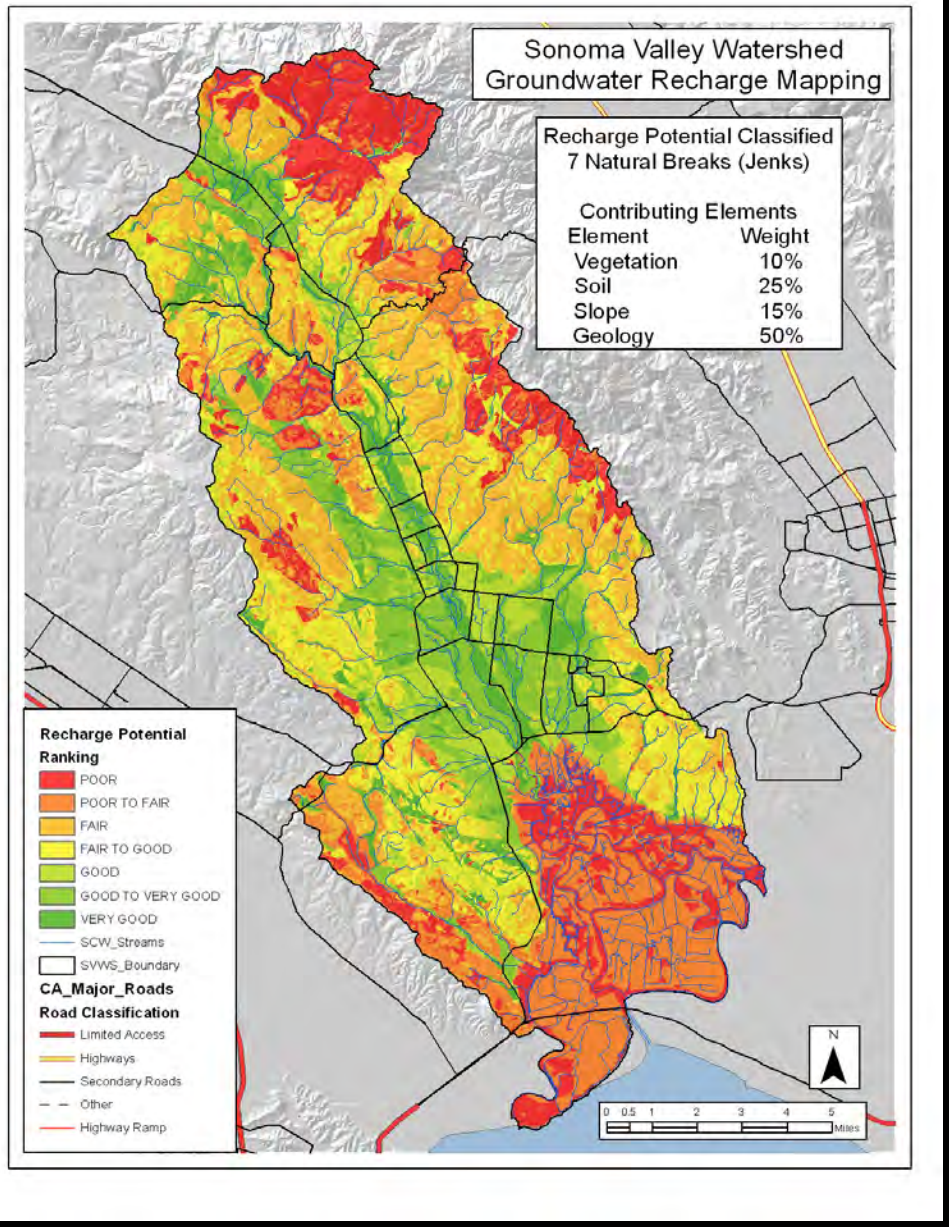
Surface-Water

Ground-Water

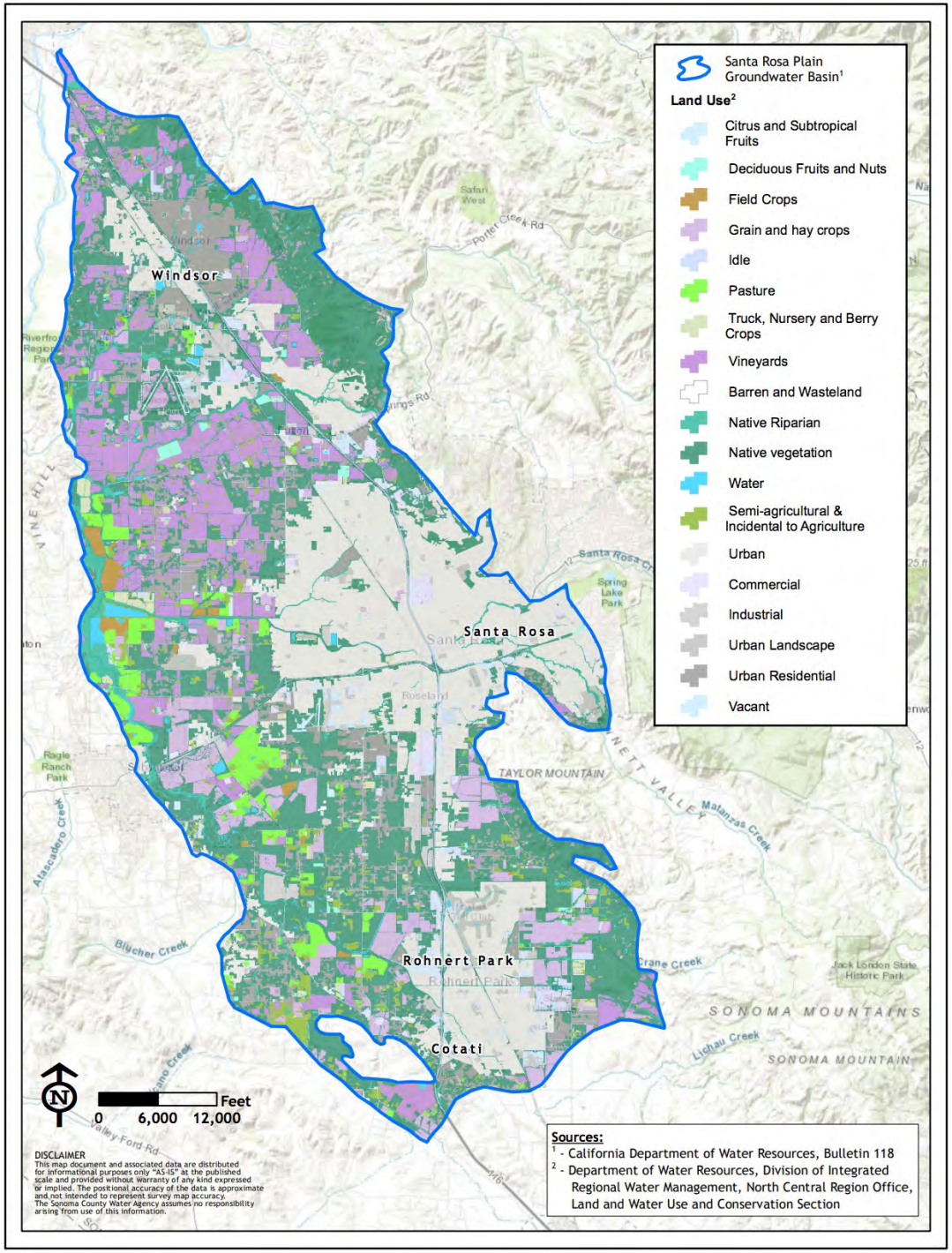
Toilets-Water-less

Slow it. Spread it. Sink it. Store it!

Guide to Beneficial Stormwater Management and Water Conservation Strategies



Slow it Spread it Sink it Store it Share it – But Where?



SANTA ROSA PLAIN • PETALUMA VALLEY • SONOMA VALLEY

GROUNDWATER SUSTAINABILITY AGENCIES

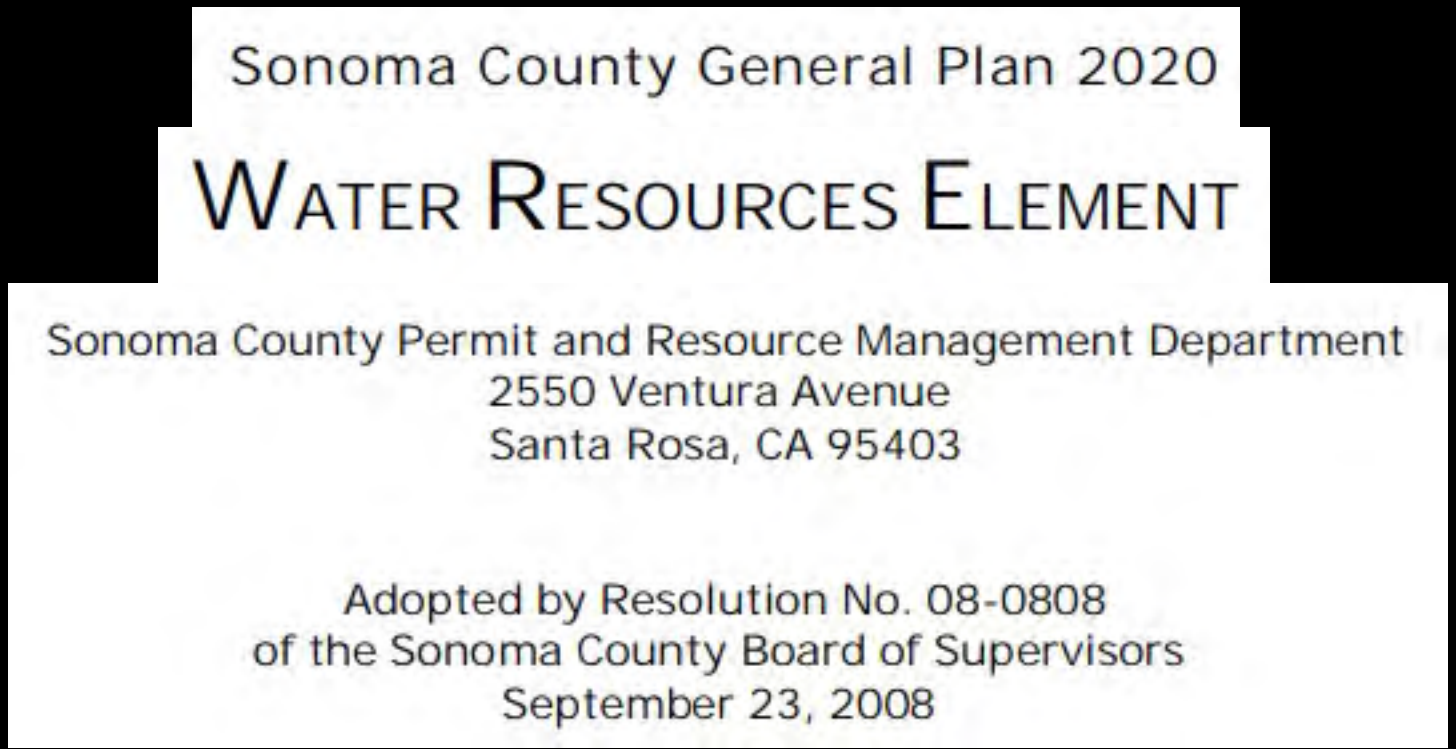
Table 1. Proposed Groundwater Sustainability Fee

WHO	HOW MUCH
Rural residential well owners who use their wells for drinking, landscaping and gardening would pay:	$8 - $13 per parcel annually
Cities, towns, mutual water districts, agriculture, golf courses, and other commercial users would pay:	$16-26 per acre foot of actual or estimated groundwater used annually
Urban well owners who get drinking water from a city or water district but use well water for irrigation would pay:	$1-$3 per parcel annually

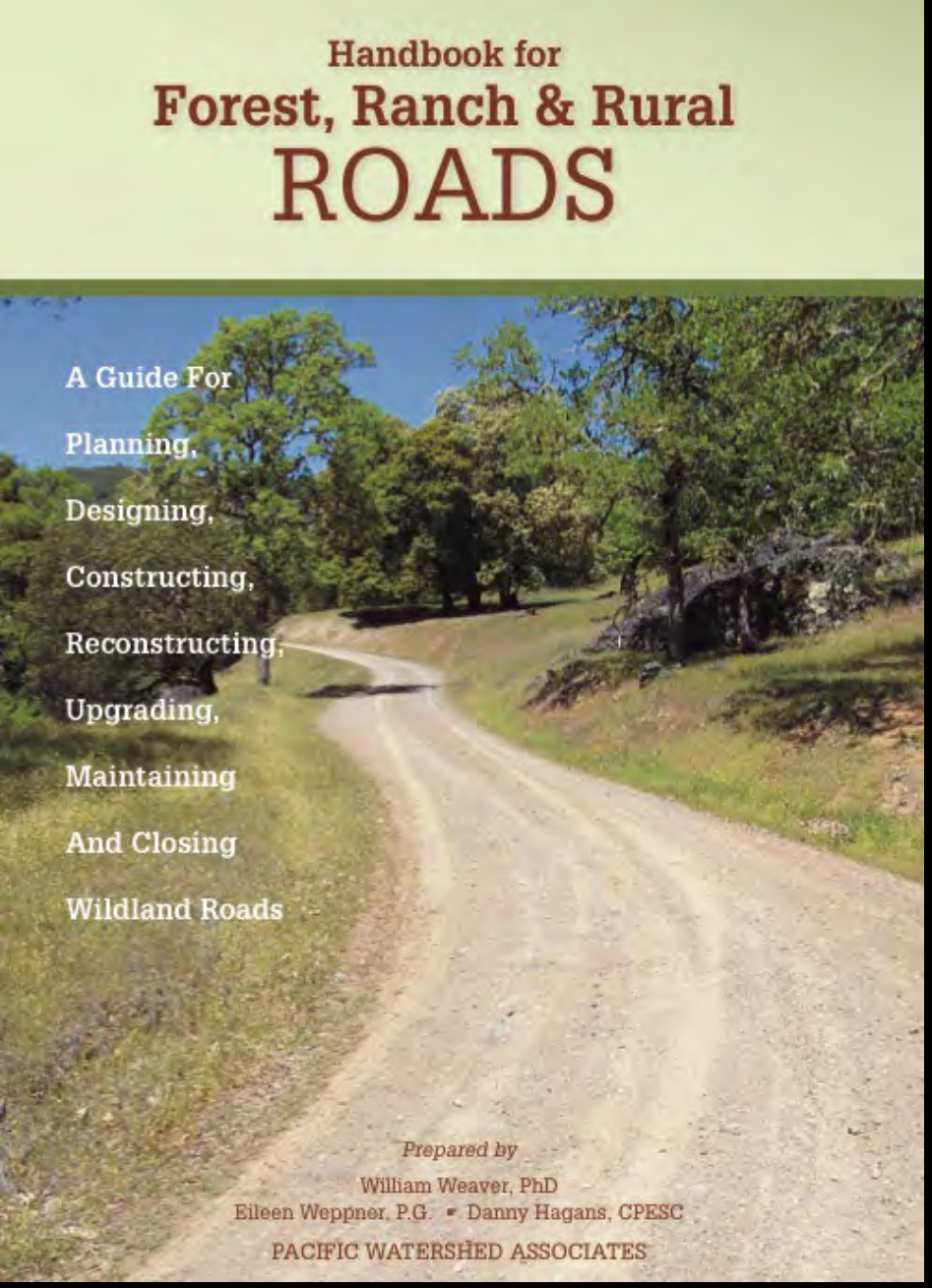
"Water Use" Planning

We are making water decisions whenever we are making land use decisions"

Prof. David Getches
University of Colorado School of Law



Seattle's Street Edge Alternatives



"Nothing in Nature Mimics a Road" Danny Hagans

WATERSHED BEST MANAGEMENT PRACTICES

for

CANNABIS GROWERS

and other

RURAL GARDENERS

2018 EDITION

PRÁCTICAS ÓPTIMAS DE GESTIÓN DE CUENCAS HIDROGRÁFICAS

para

CULTIVADORES DE CANNABIS

y otros

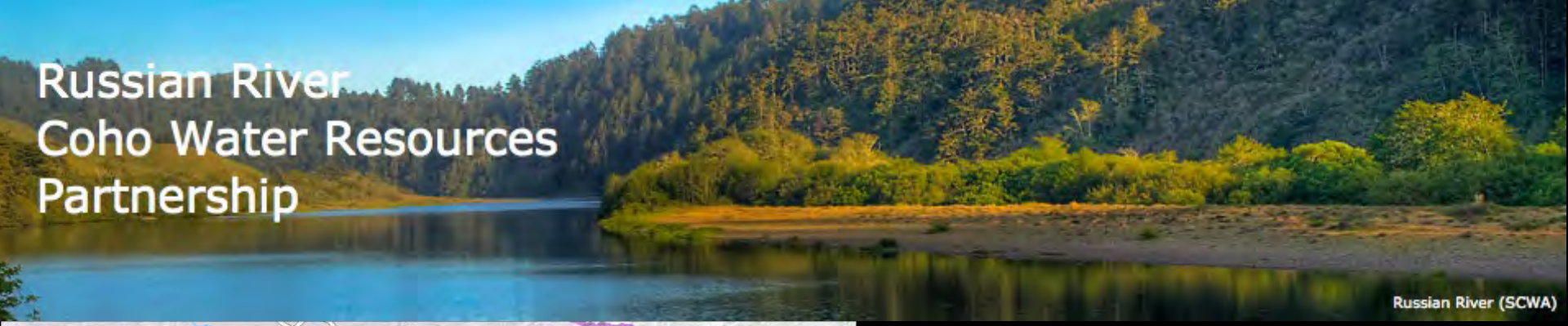
JARDINEROS RURALES

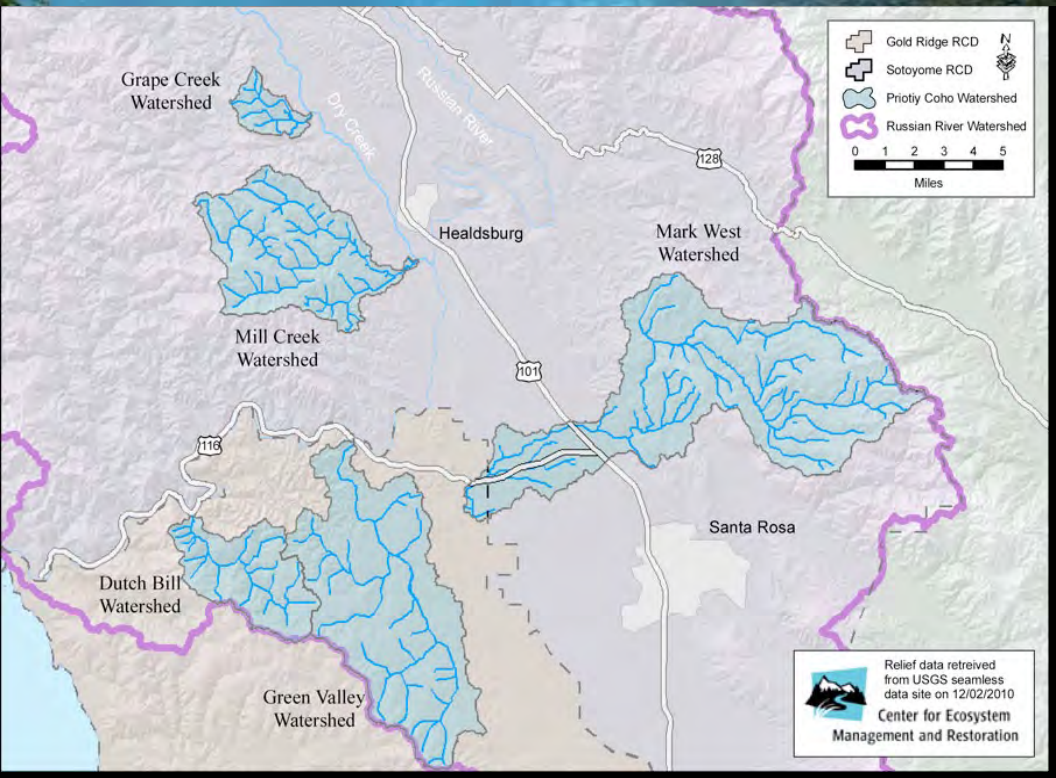
EDICIÓN DE 2018

Replanting a vineyard involves more than digging holes. We start by plucking out the old vines. After adding soil amendments, the vineyard is deep cultivated to loosen compacted soil then new drain tile and culverts are installed. We replace all the irrigation, frost protection and trellising systems before we can finally plant. This wine is a blend of 7 different Pinot clones from 17 lots, some of them from our latest plantings.

Turning Water into Wine:
Drain Tile
& Irrigation
& Frost Protection…

Russian River Coho Water Resources Partnership





SONOMA RESOURCE CONSERVATION DISTRICT

TROUT UNLIMITED

UCCE University of California Cooperative Extension

Sea Grant California

WATER INSTITUTE
OCCIDENTAL ARTS & ECOLOGY CENTER

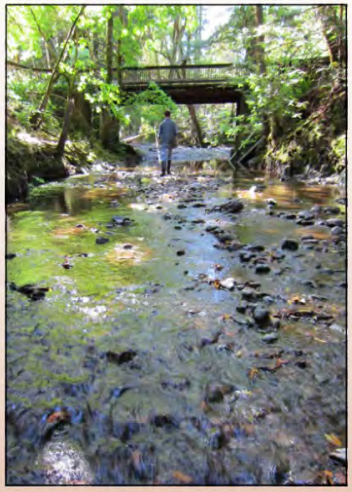
SONOMA COUNTY WATER AGENCY

National Fish and Wildlife Foundation

Gold Ridge Resource Conservation District

Formed 2009

Dutch Bill Creek
Streamflow Improvement Plan



Prepared by:

The Russian River Coho Water Resources Partnership

With Support from:

March 2017

LAND STEWARDSHIP GUIDE

Reducing Runoff and Increasing Infiltration in the Mediterranean Climate of Northern California

Written by Kyle Keegan
Technical Drawings by Evan Walbridge

Artwork by Val McKee ©

This educational publication was produced by Sanctuary Forest in February 2017 with funding and critical support by the California Department of Fish & Wildlife's Fisheries Restoration Grant Program.

WATER STEWARDSHIP GUIDE

Conserving and Storing Water to Benefit Streamflows and Fish in North Coast Creeks and Rivers

Written by Sanctuary Forest
With Conservation Gardening Techniques by Kyle Keegan

Artwork by Val McKee ©

This educational publication was produced by Sanctuary Forest in February 2017 with funding and critical support by the California Department of Fish & Wildlife's Fisheries Restoration Grant Program.

From: Minding Nature: September 2017, Volume 10, Number 3

WELCOME TO PLANET WATER: TIME FOR A REVERENTIAL REHYDRATION REVOLUTION!

By: Brock Dolman · 789 Words · 3 Comments · PDF (284KB)

water

MDPI

Article

Restoring Summer Base Flow under a Decentralized Water Management Regime: Constraints, Opportunities, and Outcomes in Mediterranean-Climate California

Matthew J. Deitch [1,*] and Brock Dolman [2]

Integrated Stormwater Retention System

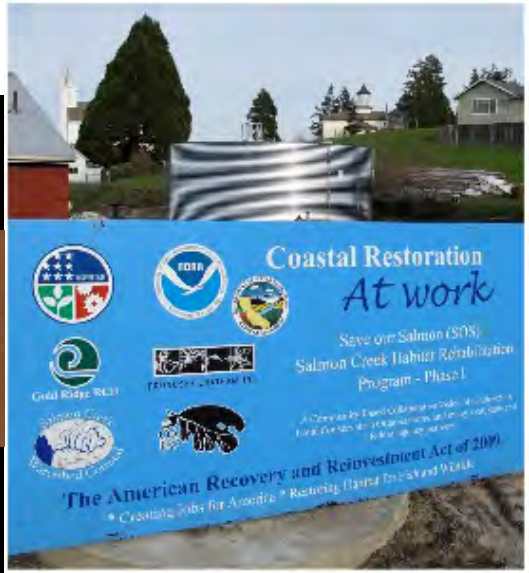
A Demonstration of Innovative Stormwater Management Solutions for Rural Landowners at the Occidental Arts and Ecology Center

WATER
INSTITUTE
OCCIDENTAL ARTS & ECOLOGY CENTER

Bodega Valley Rainwater Catchment & Alternative Water Supply Program

AG INNOVATIONS NETWORK | DECEMBER 2013

The estuary study found that "...opportunities for synergy and cooperation among the many active groups in the watershed abound."



Innovative solutions require an understanding of the habitat, climate, and history that contributed to the initial problems.

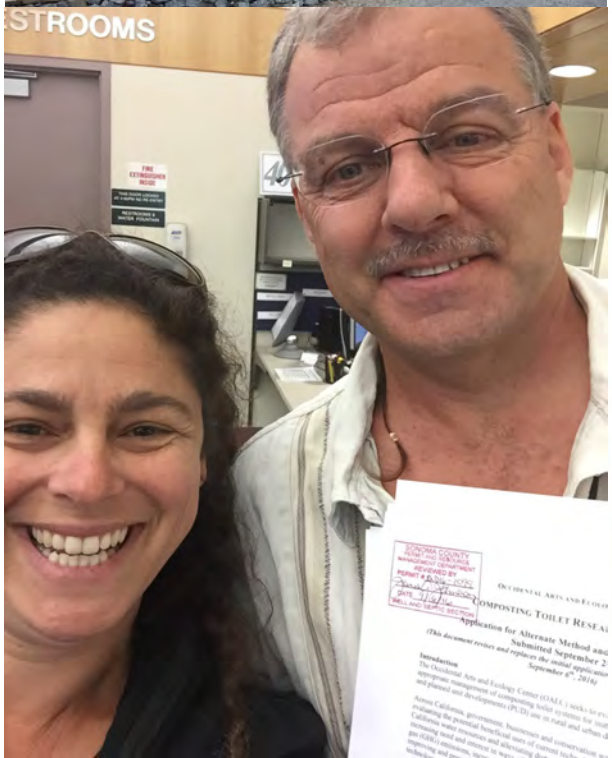
Legal Graywater Design For Small Scale Applications In California

A Demonstration of Laundry to Landscape and Branched Drain Systems
At The Occidental Arts and Ecology Center

OAEC's Compost Toilet Research Project

phoenix composting toilets

Phoenix R-200



Crapping into clean drinking water is a crappy idea!

CALIFORNIA CAN'T AFFORD TO

FLUSH

WATER

We're in a drought. Yet the average Californian flushes 16 to 24 gallons of clean drinking water down the toilet every day! And that doesn't include the countless gallons lost through leaky pipes & outdated infrastructure.

ENERGY

20% of California's energy is used for water related uses, including transport and treatment. So when we waste water, we waste energy. When we waste energy, we contribute to greenhouse gas emissions and climate change.

SOIL

Deforestation, industrial agriculture, and over-development have broken the natural carbon cycle by polluting, paving over, and eroding California's precious topsoils without putting anything back in return. Aging centralized wastewater treatment facilities are inefficient & ineffective at removing contaminants and degrade the soil nutrient cycle rather than restoring it.

DOWN THE TOILET

Occidental Arts & Ecology Center

Don’t forget your Toilet-Trees

WWW.OAEC.ORG/
COMPOST-TOILET-RESEARCH-PROJECT

Fewer Trees – More Forest

Fewer trees – More Forest

Does that functionally reduced net Evapotranspiration
& actually augment Streamflow?

Stand Age & Forest Evapotranspiration:
Implications for Forest Management,
Streamflow, and Salmonid Recovery

Jeremy Kobor, MS, PG
Senior Hydrologist, OEI
jeremyk@oe-i.com

Matt O'Connor, PhD, CEG
CEO, Coast Range Watershed Institute
coastrangeceo@sonic.net

Low Frequency – High Intensity

High Frequency – Low Intensity

Marin Conservation Corps at OAEC in 2001

Eroded gully to be filled with freshly cut invasive Scotch Broom (Cytisus scoparius)

Students filling gully

Invasive French & Scotch Broom biomass stuffed to mitigate headcut migration, reduce channel incision & sediment delivery to coho & steelhead bearing Dutch Bill Creek below while sequestering carbon as compost towards amplifying upland water holding capacity.
OAEC 2002

Received: 17 July 2020 | Accepted: 2 October 2020

DOI: 10.1002/hyp.13932

WILDFIRE AND HYDROLOGICAL PROCESSES

WILEY

Hillslope sediment production after wildfire and post-fire forest management in northern California

Ryan P. Cole[1] | Kevin D. Bladon[1] | Joseph W. Wagenbrenner[2] | Drew B. R. Coe[3]

They specifically mentioned the benefit of laying slash strategically along contour to increase the surface runoff capture benefits from slash.

They also found that after 5 years of monitoring they found no statistical difference between sediment transportation rates in any of their study types, so most of the need for slash/mulch treatment is going to be front loaded to the first major rains.

Slash is not Trash it's Beneficial Biomass Full-Filling Fir-Real Gully Stuffing Food!

Tribal EcoRestoration Alliance

The Tribal EcoRestoration Alliance is a cross-cultural, multi-organizational collaborative that works to revitalize ecology, economy, and culture through indigenous-led stewardship.

Through partnership, we are working together towards a vision of healing our land and communities.

ROBINSON RANCHERIA POMO INDIANS
CALIFORNIA

Robinson Rancheria
Pomo Indians of California

SCOTTS VALLEY

Scotts Valley Band of Pomo Indians

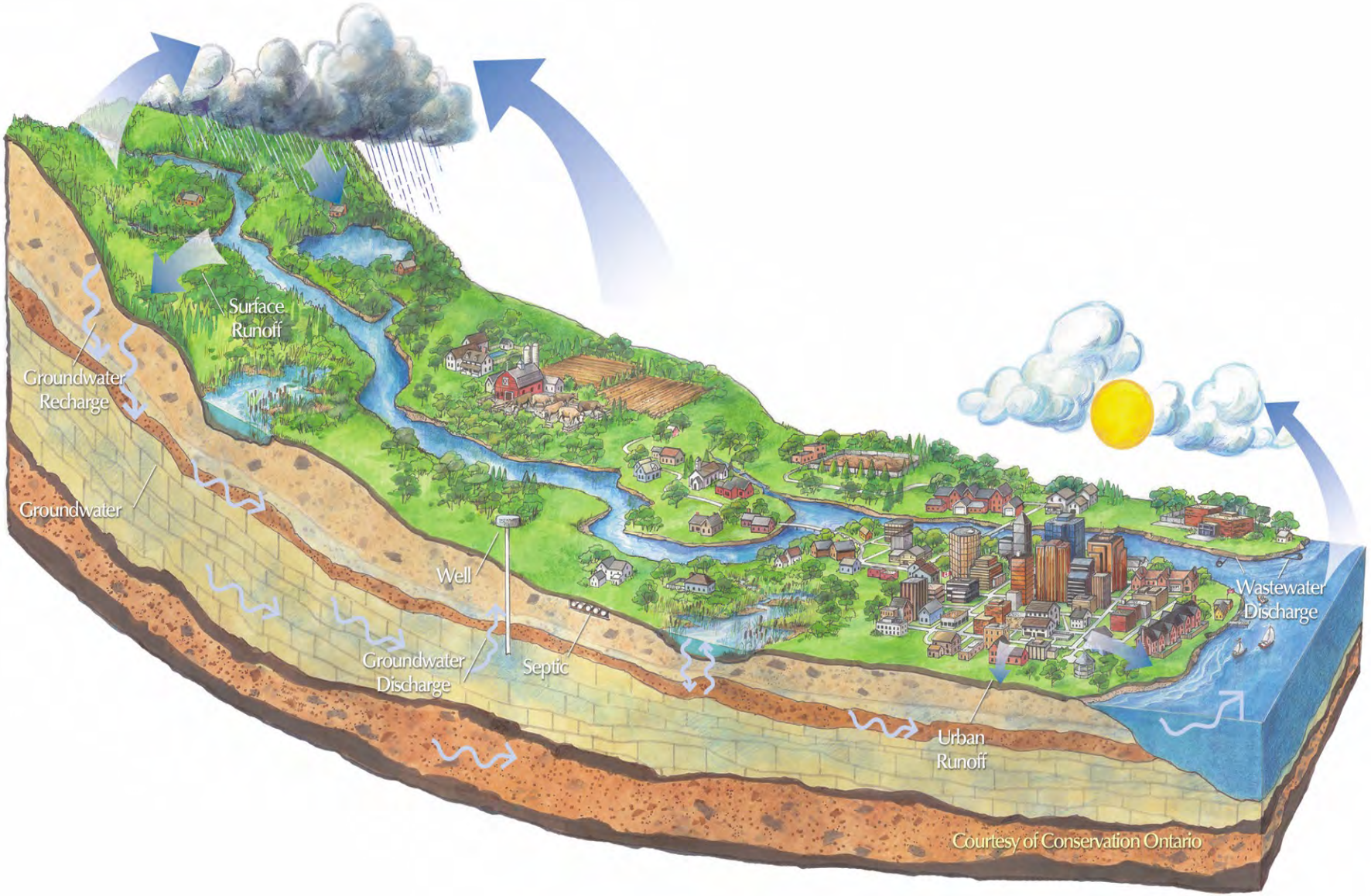
ABOVE: Early fall bloom of a yampah (*Perideridia gairdneri* and *P. kelloggii*) dominated prairie at OAEC. With what began as a relatively small patch of yampah over 20 years ago, we have actively expanded its size and density through targeted mowing, weed whipping, hand removal of velvet grass (*Holcus lanatus*), seed collection, and seed sowing. We also distribute seeds to other favorable seasonally saturated wet prairies at OAEC, which previously lacked representation with either yampah species. Photograph by Brock Dolman. • BELOW: Gairdner's yampah (*Perideridia gairdneri)* has delectable seeds and tuberous roots, which were and still are highly coveted by indigenous peoples, and the land stewards at OAEC. The root when eaten raw is nutty, earthy and sweetens up when cooked. The delicious seeds have a spicy flavor reminiscent of coriander. Some of the seeds will be saved for hand dispersal later in the season. Photograph by Brock Dolman.

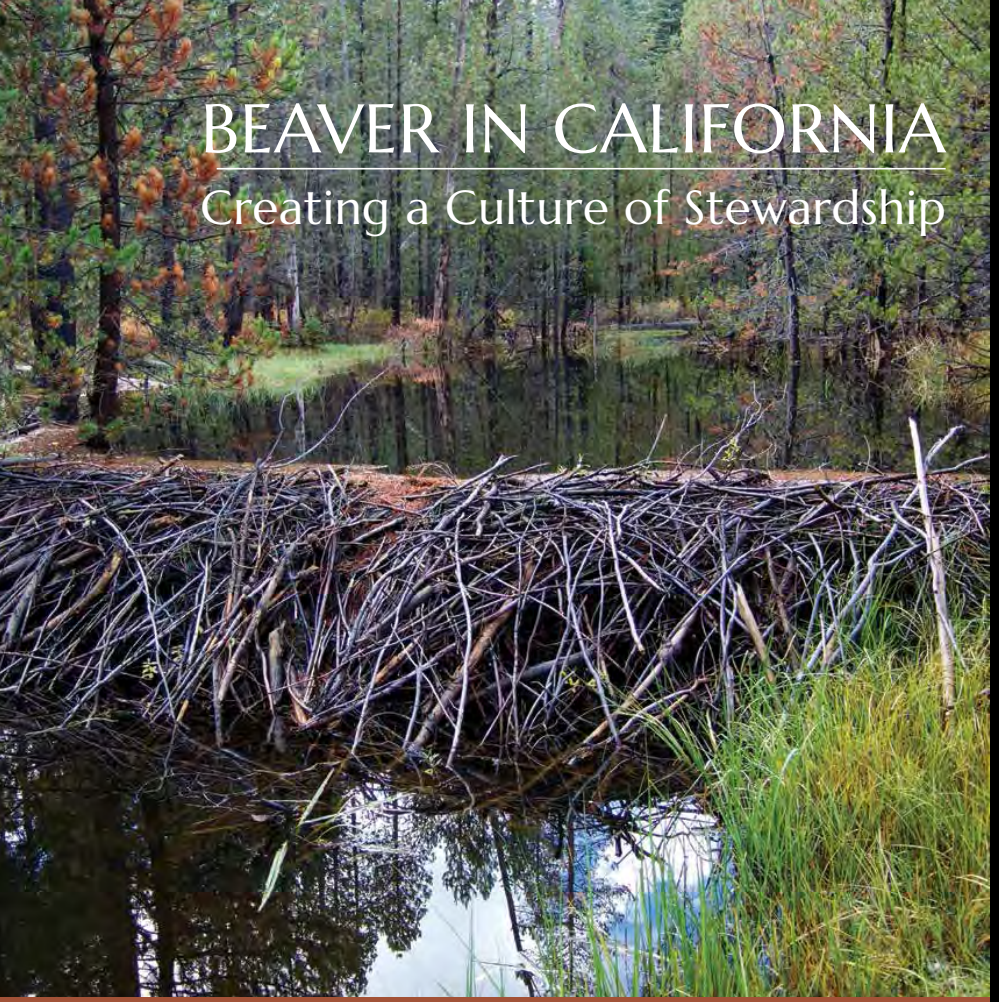
MENDING THE WILD AT THE OCCIDENTAL ARTS AND ECOLOGY CENTER

by Brock Dolman

For over 20 years, members of the residential community Sowing Circle LLC in collaboration with staff biologists of the non-profit Occidental Arts and Ecology Center (OAEC) have been restoring geophyte habitat on our 70-acre Wildlands Preserve in western Sonoma County using guidelines derived from both indigenous traditional practices and horticultural techniques. Through ecological and observational studies, we have concluded that the geophytes on our land, including yampah (*Perideridia* spp.), bluedicks (*Dichelostemma* spp.), *Triteleia* spp., *Brodiaea* spp., and yellow mariposa lily (*Calochortus luteus*) need management at different scales. First, management has to be

TOP: Using prescribed fire on a cool windless early morning at the Occidental Arts and Ecology Center to restore geophyte habitat in coastal prairie, November 11, 2005. The timing of this fire was in the fall after initial rains had moistened the landscape for general safety concerns. Goals of the burn were to reduce the exotic grass seedlings, and remove extensive dense thatch so as to open up soil space between native bunch grass crowns for onsite collected native geophyte and grass seeds to be thrown and sown, or "shucked and hucked." Photograph by Brock Dolman. • ABOVE LEFT: Yellow mariposa lily (*Calochortus luteus*) flower with red yarn tied on it, which significantly enhances the process of locating the dry pod for seed collection several months later when it blends into the dense standing stalks of various grasses. Photograph by Brock Dolman. • ABOVE RIGHT: Yellow mariposa lily (*C. luteus*) pods and seeds were hand collected, or "shucked" in September. The seeds were stored in paper bags in a cool dark location and subsequently sown several months later with the first rains, after the prescribed burn. Photograph by Jim Coleman.


Surface Runoff
Groundwater Recharge
Groundwater
Well
Septic
Groundwater Discharge
Urban Runoff
Wastewater Discharge
Courtesy of Conservation Ontario



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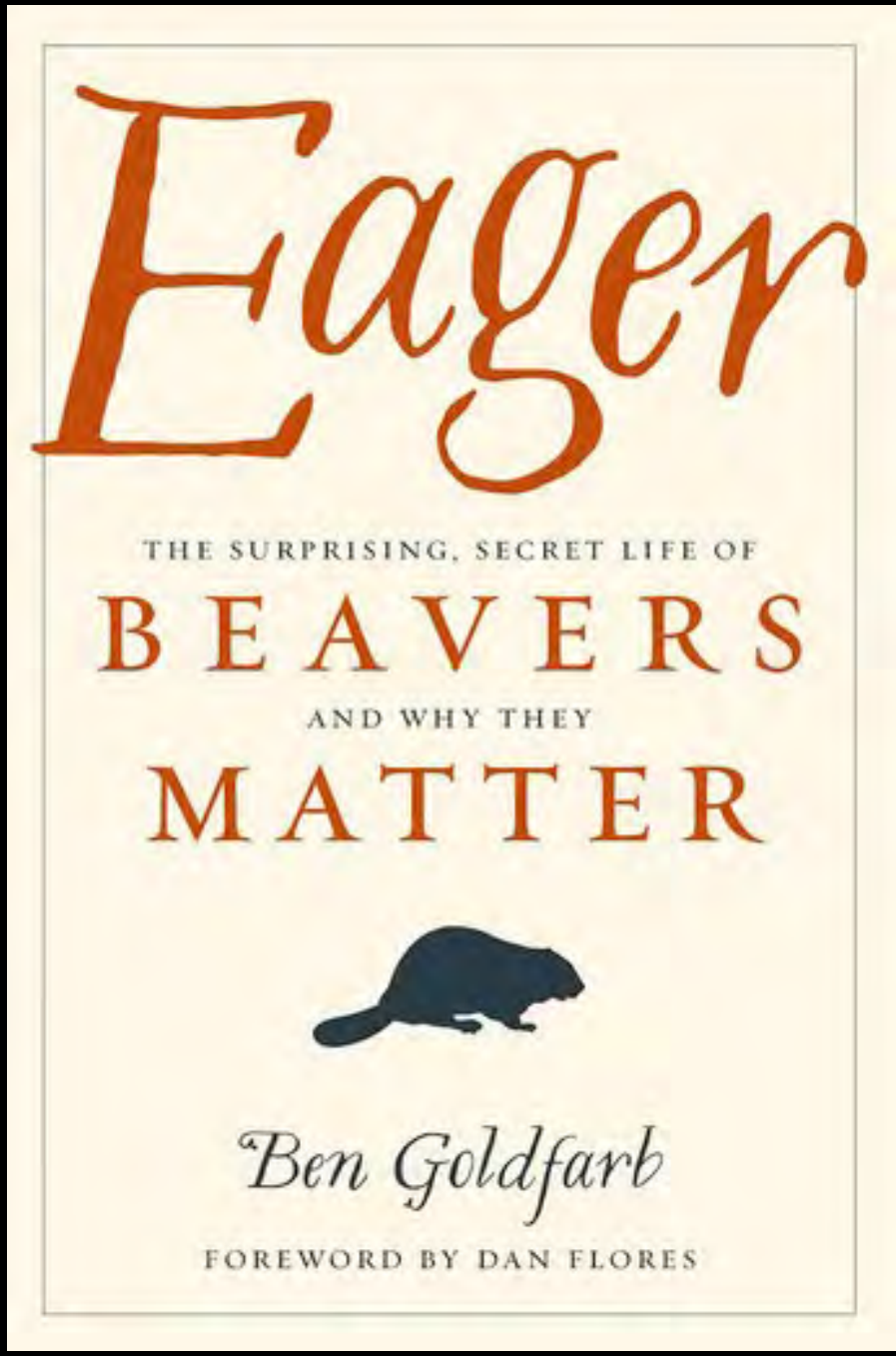
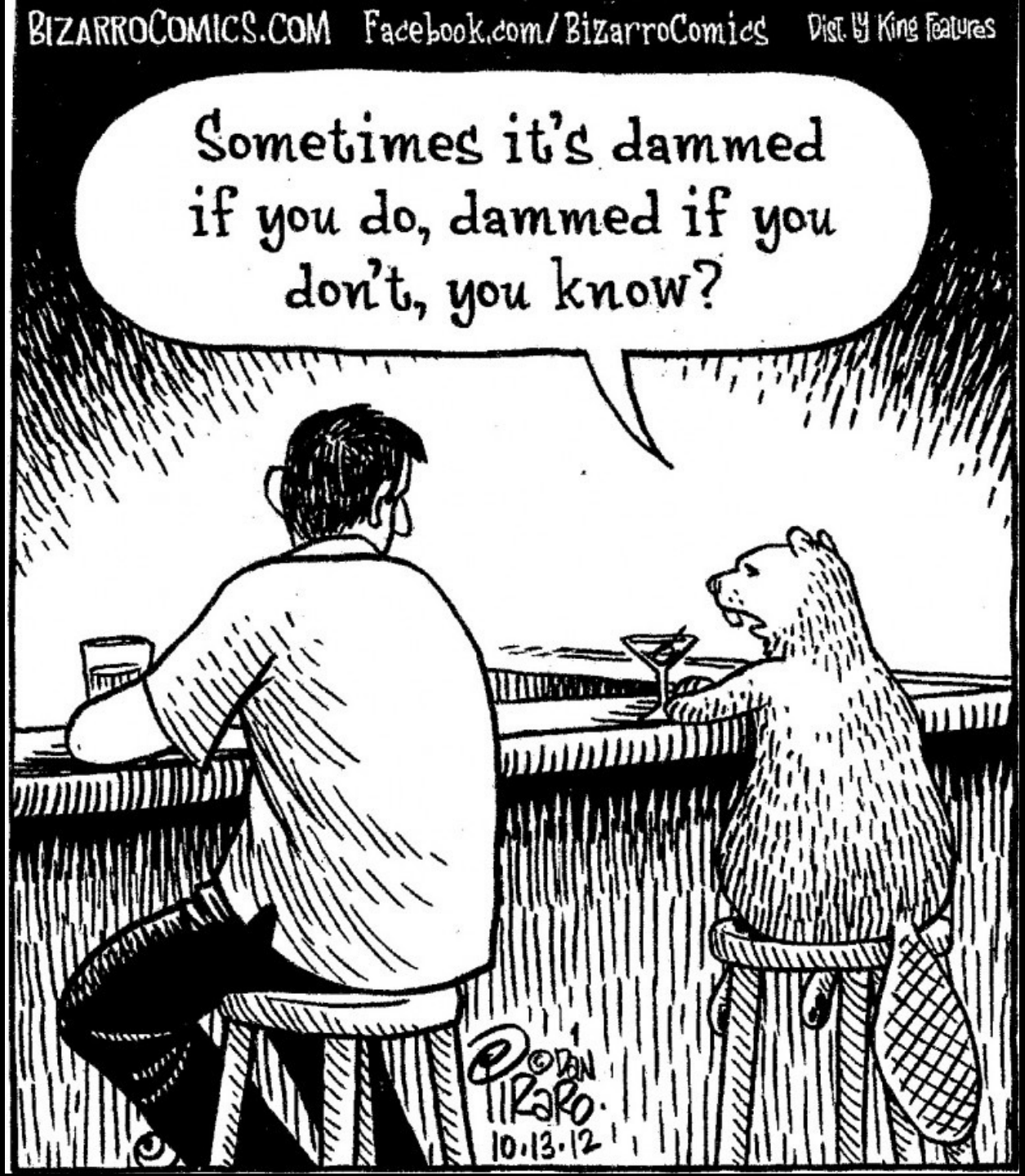
KATE LUNDQUIST with BROCK DOLMAN

Occidental Arts and Ecology Center WATER Institute

www.oaec.org/publications/beaver-in-california



www.chelseagreen.com/product/eager/


BIZARROCOMICS.COM Facebook.com/BizarroComics Dist. by King Features
Sometimes it's dammed if you do, dammed if you don't, you know?
©DAN PIRARO
10.13.12

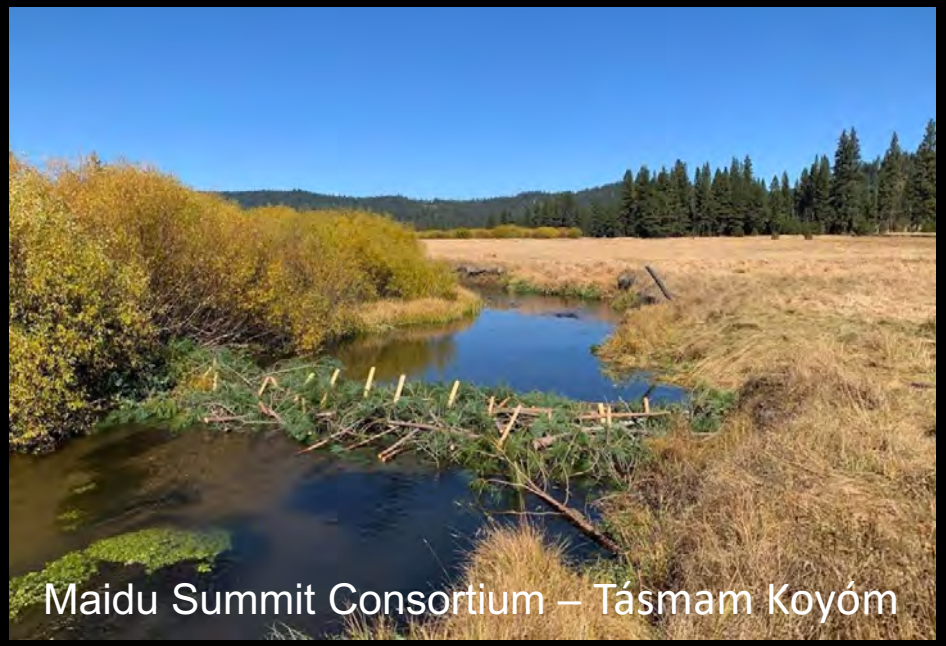
Restoring Coho Salmon in the Klamath River, One Beaver At A Time

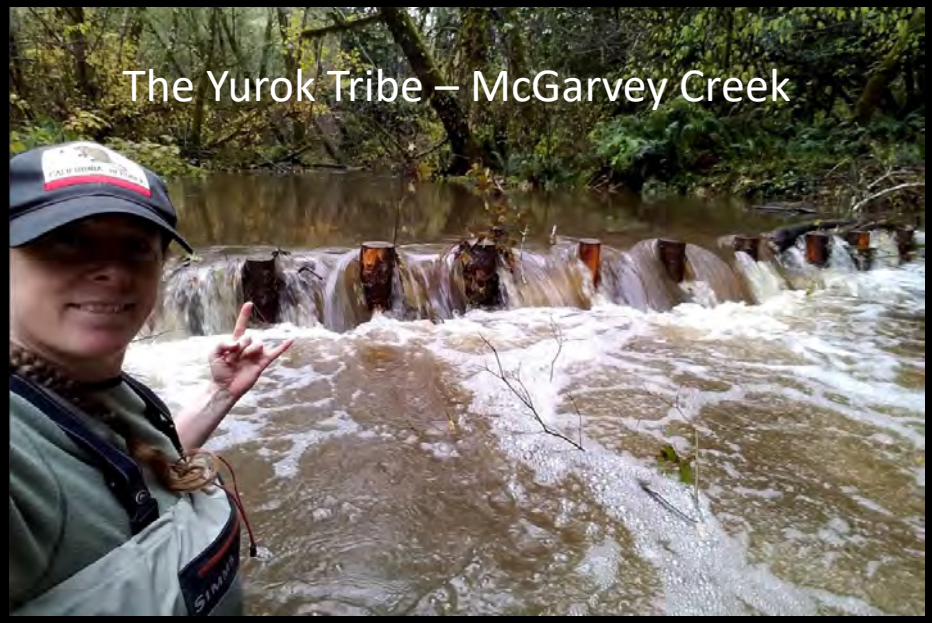
By Will Harling, Executive Director, Mid Klamath Watershed Council

Photos by Brock Dolman

ACTIVE BEAVER RESTORATION IN CALIFORNIA

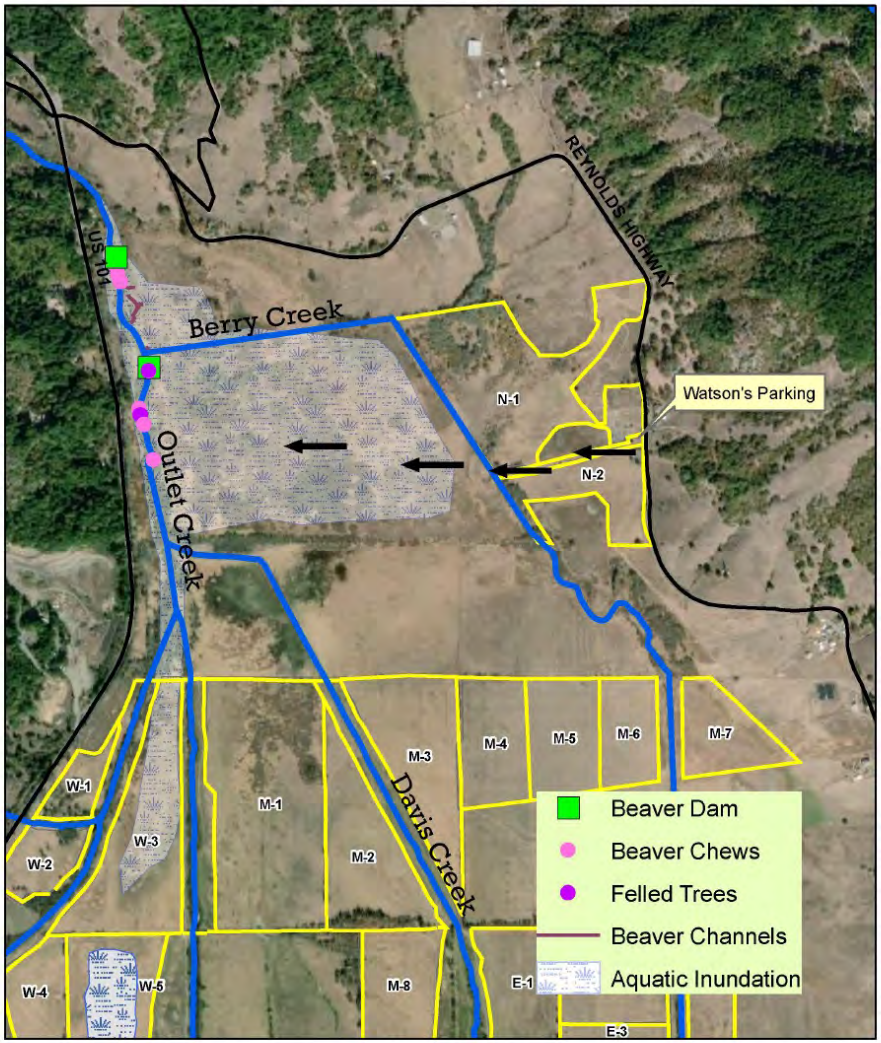

Scott River Watershed Council – Scott River


Maidu Summit Consortium – Tásmam Koyóm


The Yurok Tribe – McGarvey Creek


UCD Watershed Sciences – Child's Meadow

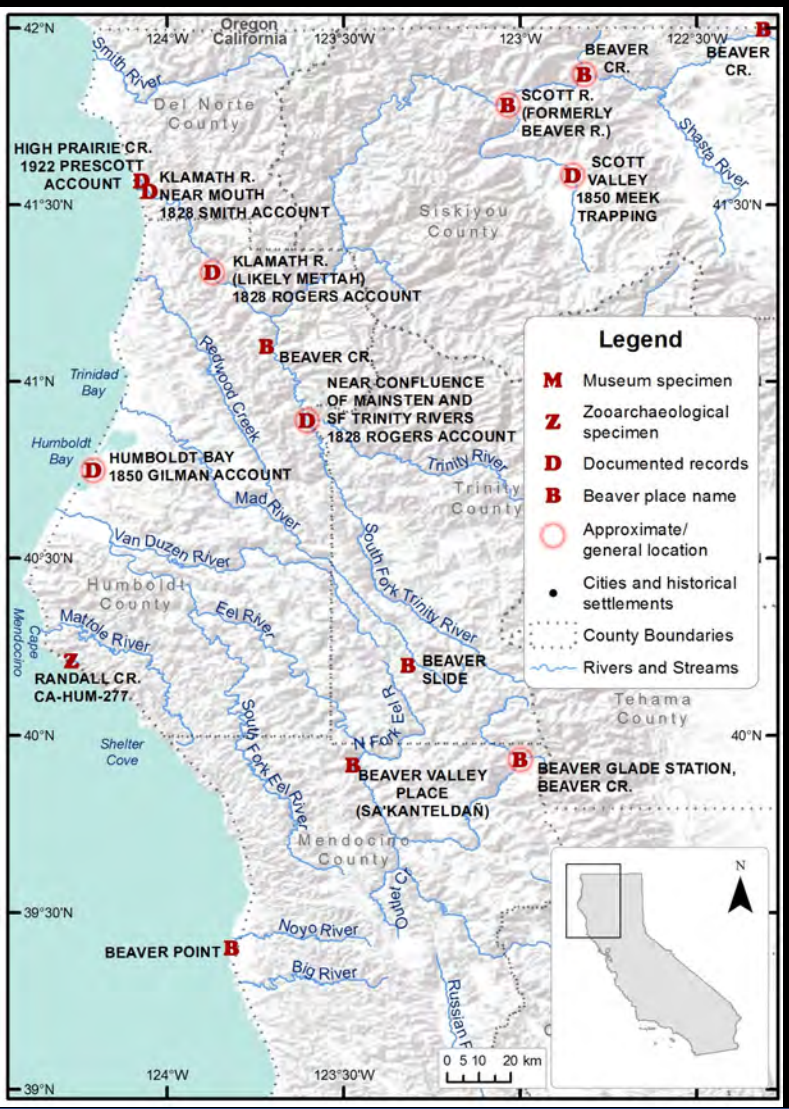
Beaver Dam Site Visit February 2021
Willits Bypass Mitigation Project
North End



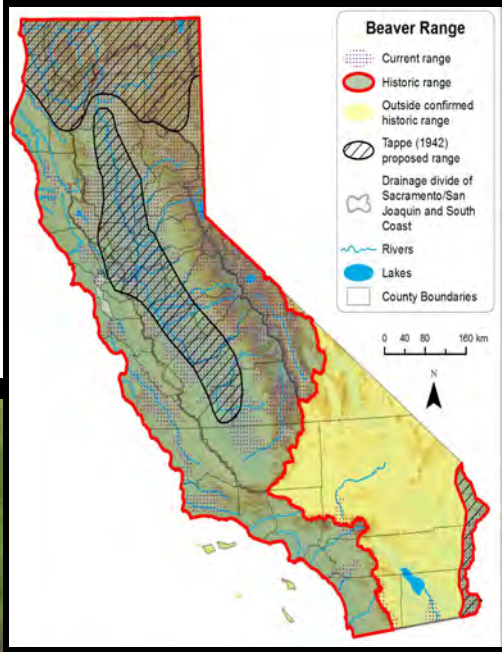
Mendocino County Resource Conservation District

Figure 3. Aerial view of Little Lake Valley showing the morning route and extent of inundation.

HISTORIC EVIDENCE OF BEAVER ON THE NORTH COAST OF CALIFORNIA



Tribe	Counties from North to South	Coastal Watershed or Bay/Channel	Indian Word
Lolangkok/ Sinkyone	Humboldt	South Fork Eel River	*ba-chen'-tel*
Huchnom	Mendocino	Eel River (Round Valley)	*tik-keh*
Pomo	Mendocino	Eel River (Round Valley)	*kat-si-keh'*
Northern Pomo/ Tabate	Mendocino	Navarro River (Anderson Valley)	*kah-ke'*
Central Pomo/ Yokaia/Yukai	Mendocino	Russian River (Ukiah)	*kah-ke' ka-tai-u-ki'ah ko-o'*
Northern Pomo/ Kaiyu	Lake	Tule Lake, Blue Lakes	*chin-nor chi-nor*
Central Pomo/ Shanel	Mendocino	Russian River (Hopland)	*kaht'-ka*



https://oaec.org/publications/historical-range-of-beaver-update/

BEAVER HELP RECHARGE GROUNDWATER AND DELAY RELEASE INTO THE DRY SEASON

WATER SCARCE?

STORAGE SCARCE?

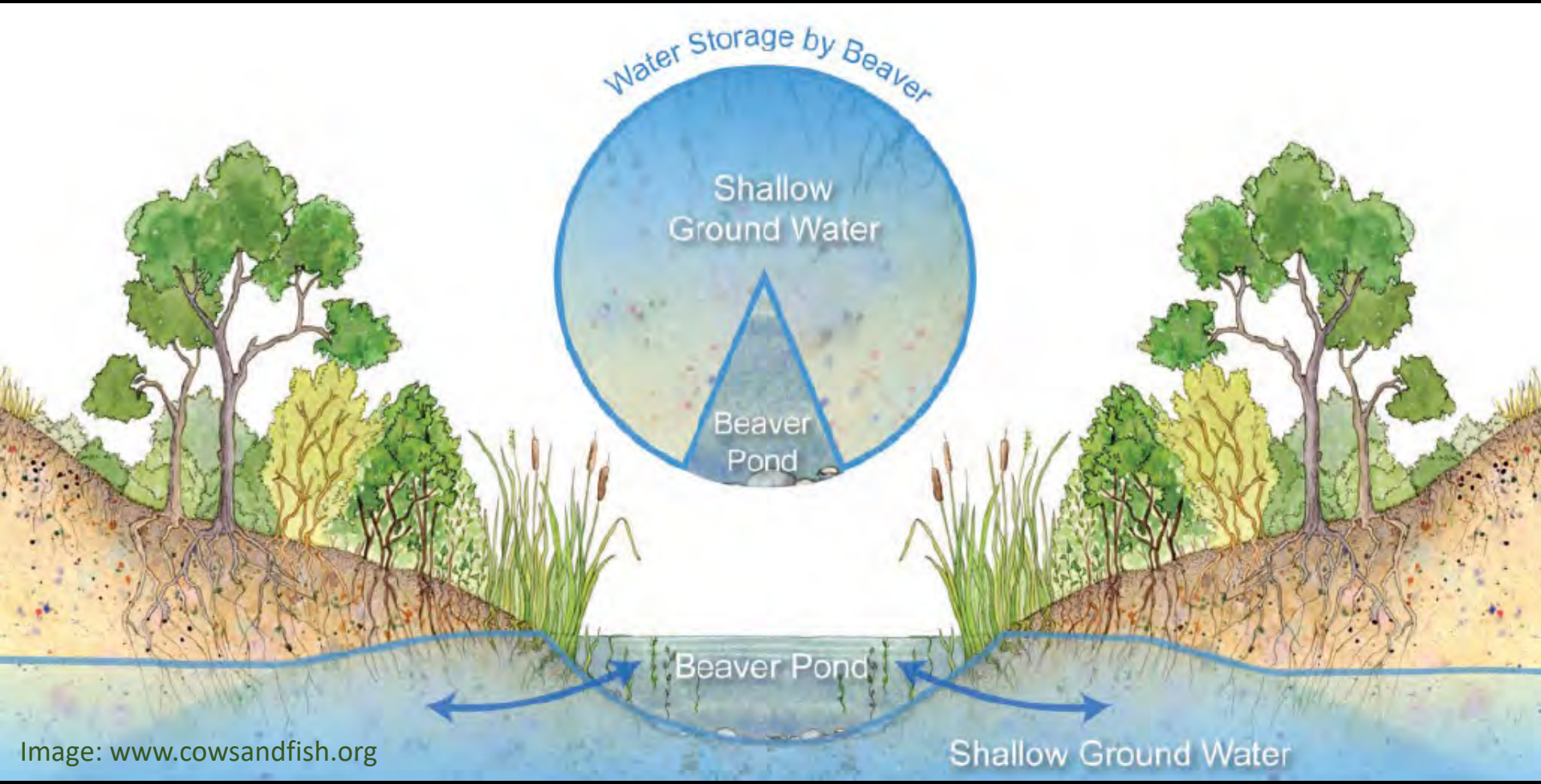
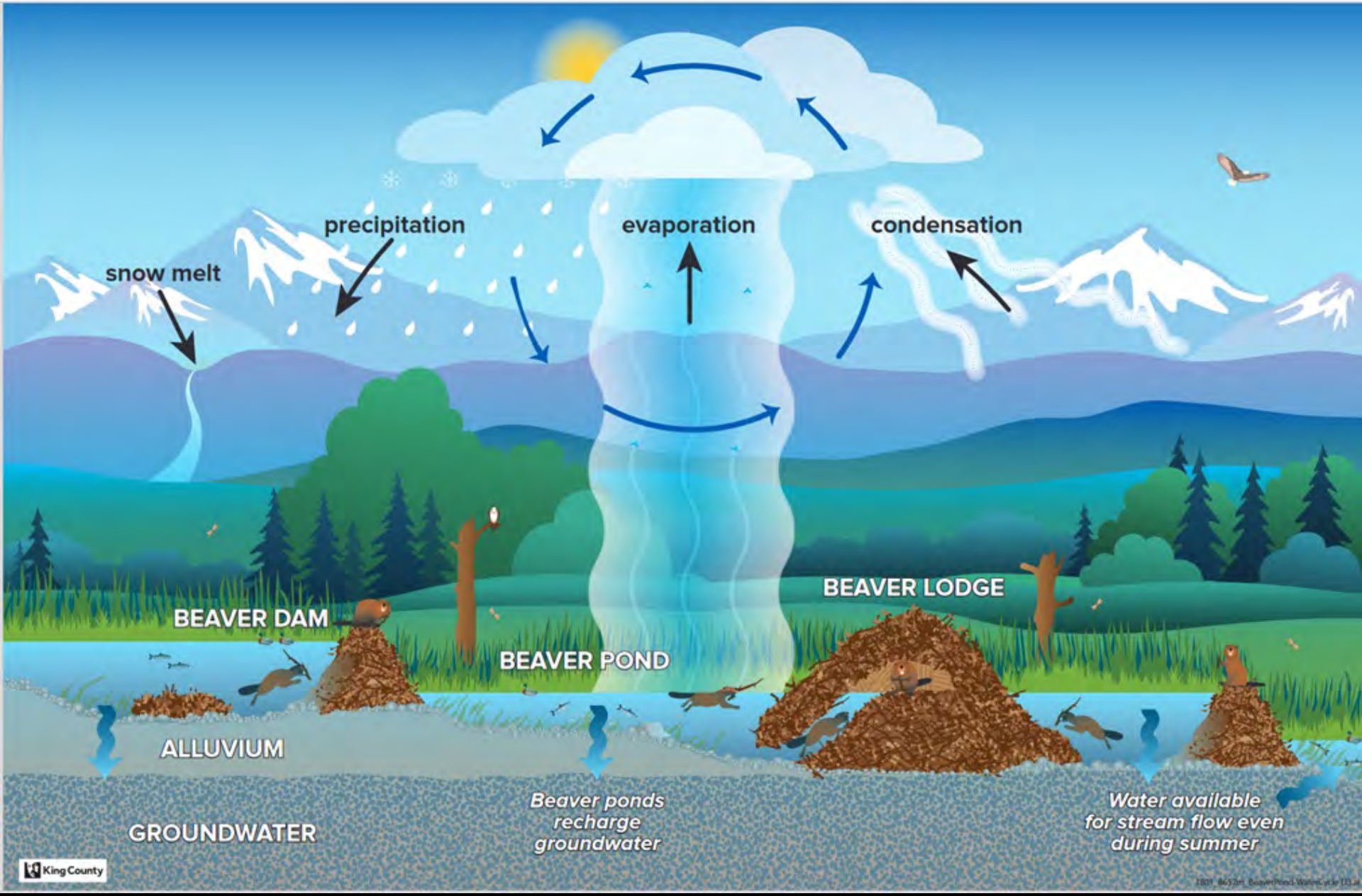


Image: www.cowsandfish.org

BEAVER DAMS IMPROVE WATER QUALITY, TRAP NUTRIENTS AND BUILD SOILS

Muskopf 2007 – Beaver dam removal and phosphorus study on South Lake Tahoe

KEEP TAHOE BLUE



Small Beaver-based Water Cycle!

BEAVER & PROCESS-BASED RESTORATION SCIENCE

LOW-TECH PROCESS-BASED RESTORATION OF RIVERSCAPES

DESIGN MANUAL

Edited by: Joseph M. Wheaton, Stephen N. Bennett, Nicolaas Bouwes, Jeremy D. Maestas & Scott M. Shahverdian

Utah State University RESTORATION CONSORTIUM

http://lowtechpbr.restoration.usu.edu/

The Beaver Restoration Guidebook

Working with Beaver to Restore Streams, Wetlands, and Floodplains

Version 2.01, April 10, 2018

Photo credit: Worth A Dam Foundation (martinezbeavers.org)

Prepared by

US Fish and Wildlife Service
National Oceanic and Atmospheric Administration
University of Saskatchewan
US Forest Service
Woodruff

Janine Castro
Michael Pollock and Chris Jordan
Gregory Lewallen
Kent

http://www.fws.gov/oregonfwo/ToolsForLandowners/RiverScience/Beaver.asp

BEAVER BASED RESTORATION IN DOTY RAVINE LINCOLN, CA

PLACER LAND TRUST

U.S. FISH & WILDLIFE SERVICE

Swift Water Design


FIGHT INCISION
WITH INCISORS!
Photo: Brock Dolman

Design Criteria for Process-Based Restoration of Fluvial Systems

Damion C Ciotti, Jared Mckee, Karen L Pope, G Mathias Kondolf, Michael M Pollock

BioScience, Volume 71, Issue 8, August 2021, Pages 831–845,
https://doi.org/10.1093/biosci/biab065
Published: 30 June 2021

Cover: The natural energy of a stream and its biological community-including the photogenic beaver-can be harnessed to restore ecosystem functions. In an article in this issue by Damion Ciotti and colleagues, a stream restoration design approach is demonstrated, with a focus on freeing natural processes across the landscape and partnering with nature over time to rebuild complex stream habitat. Photograph: Charnna Gilmore.

CALIFORNIA BEAVER SUMMIT

April 7th & 9th 2021

During two online half-day sessions the summit will explore the many benefits that beavers offer to the ecosystems they occupy.

SESSION ONE
April 7th

Introduction to Beavers; Climate Change; Ecosystem diversity; Restoration & Conservation; Policy; Conflict Management

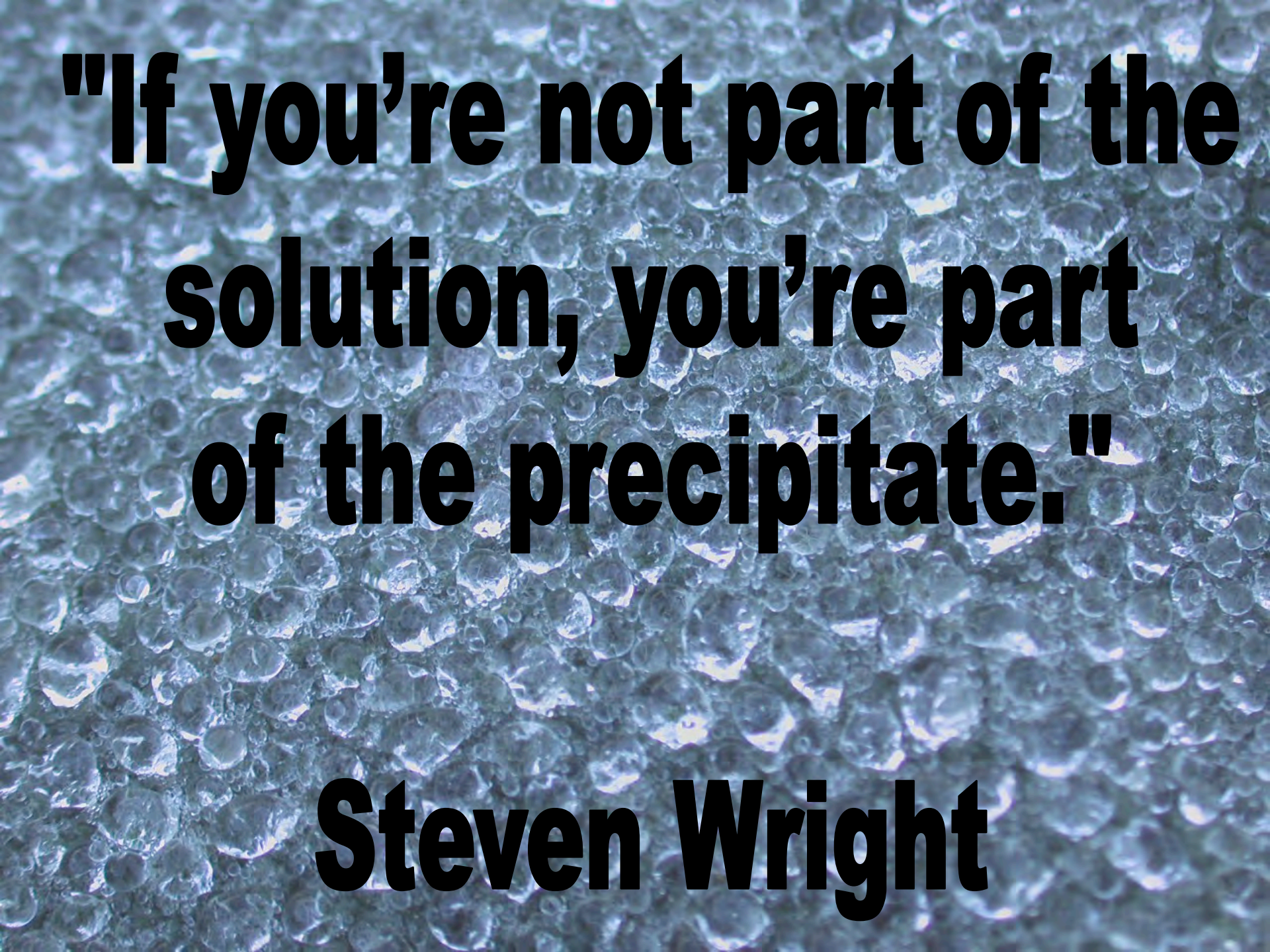
SESSION TWO
April 9th

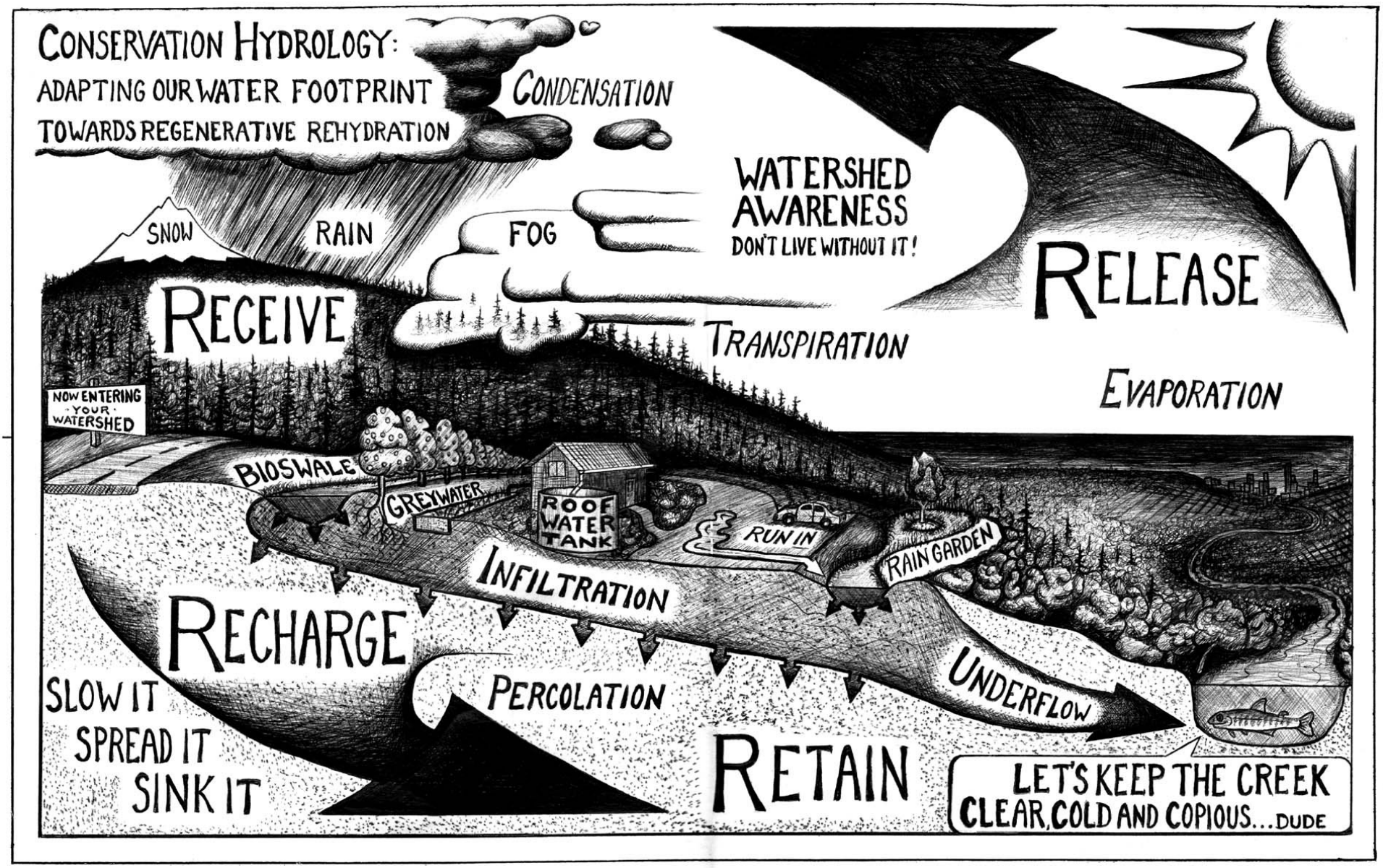
Meadow Restoration; Human Dimensions; Low-Tech PBR; CA Beaver Policy; Community Inovlement

TO LISTEN TO RECORDINGS GO TO:

CABEAVERSUMMIT.ORG

Bring Back the Beaver ★ OAEC.org/beaver


"If you're not part of the solution, you're part of the precipitate."
Steven Wright



By Jim Coleman

IF YOU WANT
TO GO FAST,
GO ALONE.
IF YOU WANT
TO GO FAR,
GO TOGETHER.

- AFRICAN PROVERB

WATER
INSTITUTE

OCCIDENTAL ARTS &
ECOLOGY CENTER

Thank You!!

www.oaec.org

Honoring Southern Pomo, Coast Miwok & Kashia Pomo upon whose traditional lands we dwell and strive to act as good guests


Water Cycle and Life Cycle are one!

Keystone Process - Anadromous Nutrient Pumps

Native riparian vegetation as well as cultivated wine grapes adjacent to Mokelumne River spawning sites
received 18–25% of foliar N from marine sources,
significantly higher than vegetation along the Calaveras River.

Joseph E. Merz and Peter B. Moyle

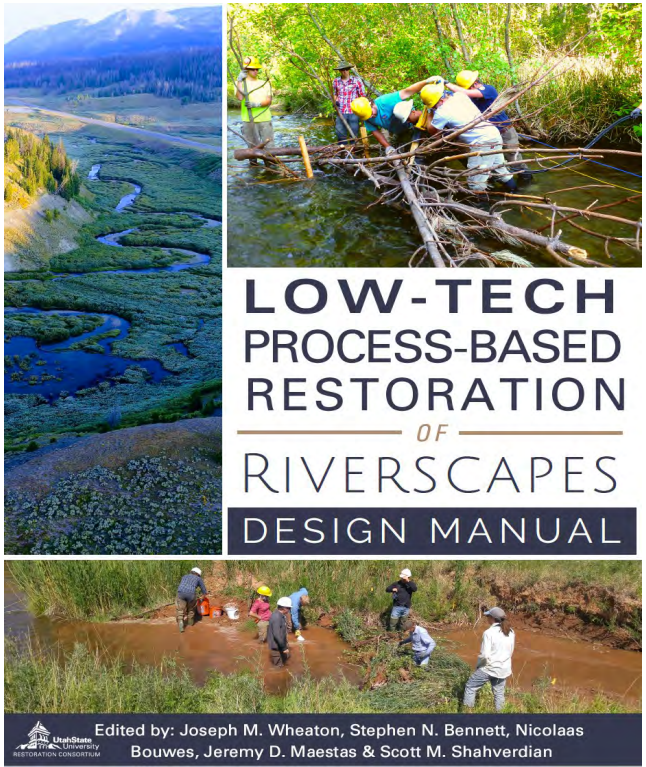
Students tightly stuffing and stomping fir into the gully

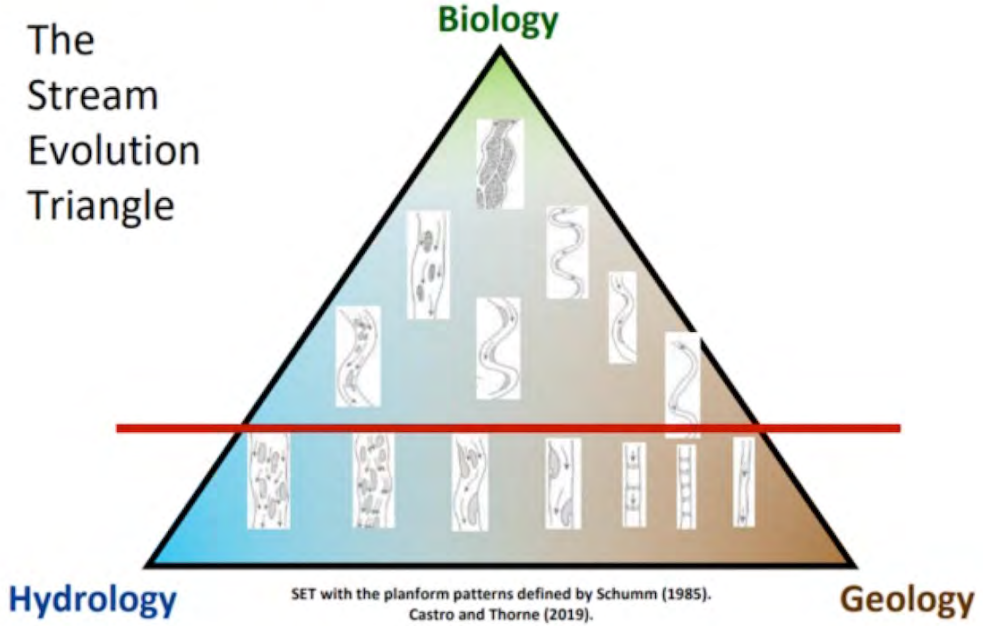
The finished gully, ready for the rainy season

What are some component processes?

Verbs vs. Nouns vs. Adjectives…

- Hydrologic → flood floodplain, attenuate flood flows, augment baseflow
- Hydraulic → slow, deepen, speed up, shunt, split, back up
- Geomorphic → build up, cut down, store topography/sediment
- Biologic → grow, survive, reproduce, die (production)



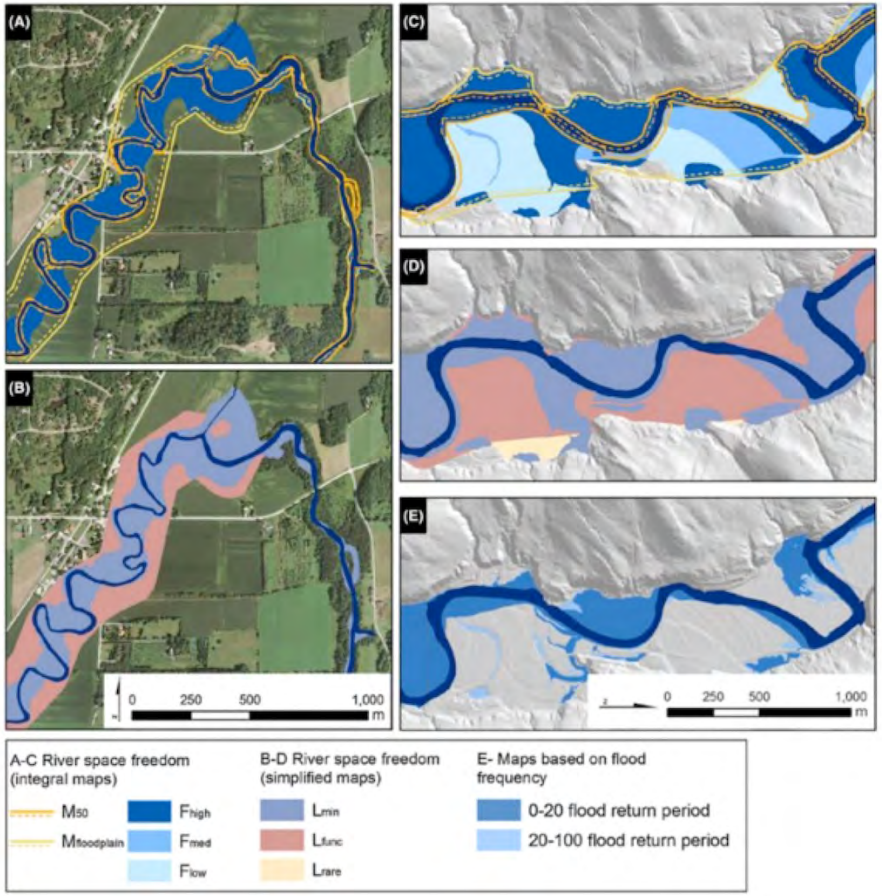


Castro, J.M. and Thorne, C.R. 2019. The Stream Evolution Triangle: linking Geology, Hydrology and Biology, *River Research and Applications*. https://doi.org/10.1002/rra.3421

Streams Need Space

Healthy streams are dynamic, regularly shifting position within their valley bottom, re-working and interacting with their floodplain. Allowing streams to adjust within their valley bottom is essential for maintaining functioning riverscapes.

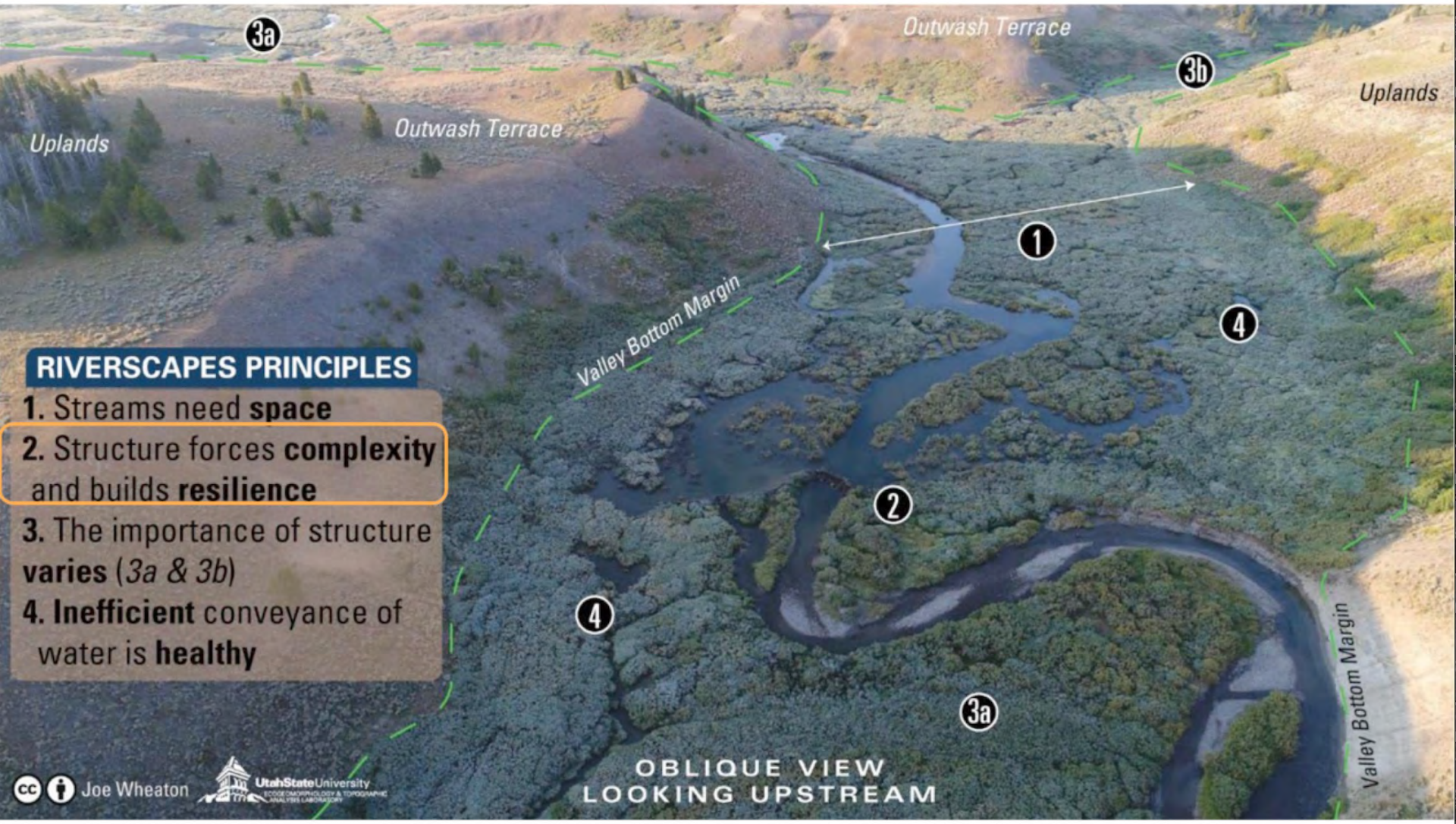
- Give rivers back their floodplains
- Assess what a river needs to *exercise* during floods
- Either reclaim, or conserve space to flood



From pages 1-2 of Pocket Guide; Wheaton et al. (2019)
DOI: 10.13140/RG.2.2.28222.13123/1
See Wheaton et al. (2019, p 61)
Chapter 2 LTPBR Manual for Principles
DOI: 10.13140/RG.2.2.34270.69447

e.g. Biron (2014). Freedom space for rivers: a sustainable management approach to enhance river resilience. DOI: 10.1007/s00267-014-0366-z.

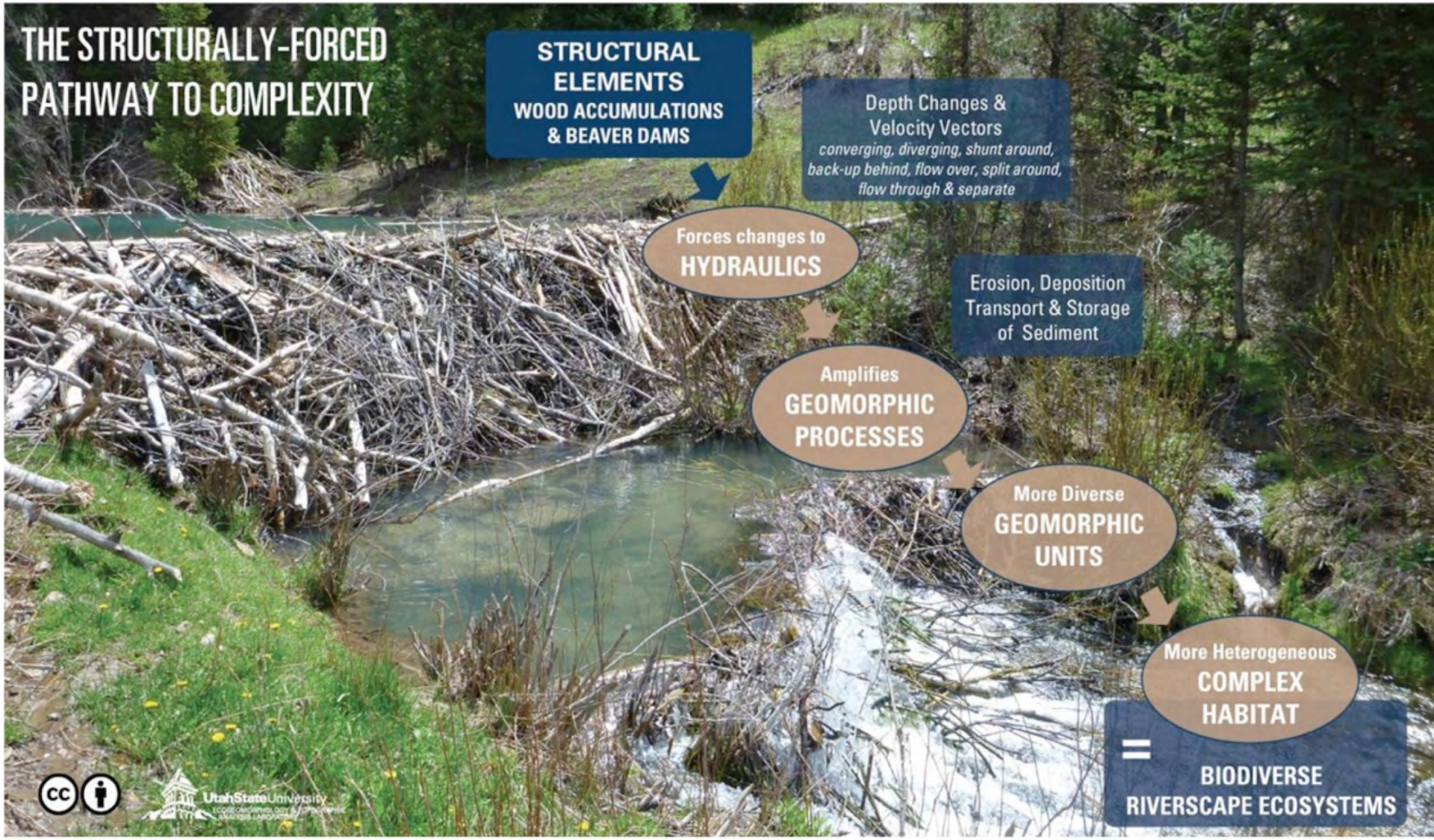
Structure forces Complexity & Builds Resilience



From Wheaton et al. (2019) – LTPBR Manual

DOI: 10.13140/RG.2.2.19590.63049/1

Key Processes are Structurally-Forced



From Wheaton et al. (2019) – LTPBR Manual

DOI: 10.13140/RG.2.2.19590.63049/1.