

The long road
ahead...*responding to
climate change from
one extreme to
another*

Maureen McCarthy, PhD

NOAA/NIDIS Workshop

26 Sep 2023



Native Climate

Strengthening Climate Resilience on Tribal Lands



Seeing and adapting to a
changing climate through
two eyes...western science
and traditional knowledges



Native “Lifeways” perspective...the **reciprocal connections** of people, nature, culture and spirit through time

Habitat for human and non-human relations

Inherent spiritual and cultural value of nature

Protecting Mother Earth for seven generations

Time is cyclic, not linear – read the seasons for change



A. Individual / Family B. Community / Culture C. Tribe D. Nation E. World

Understanding and managing drought on tribal lands

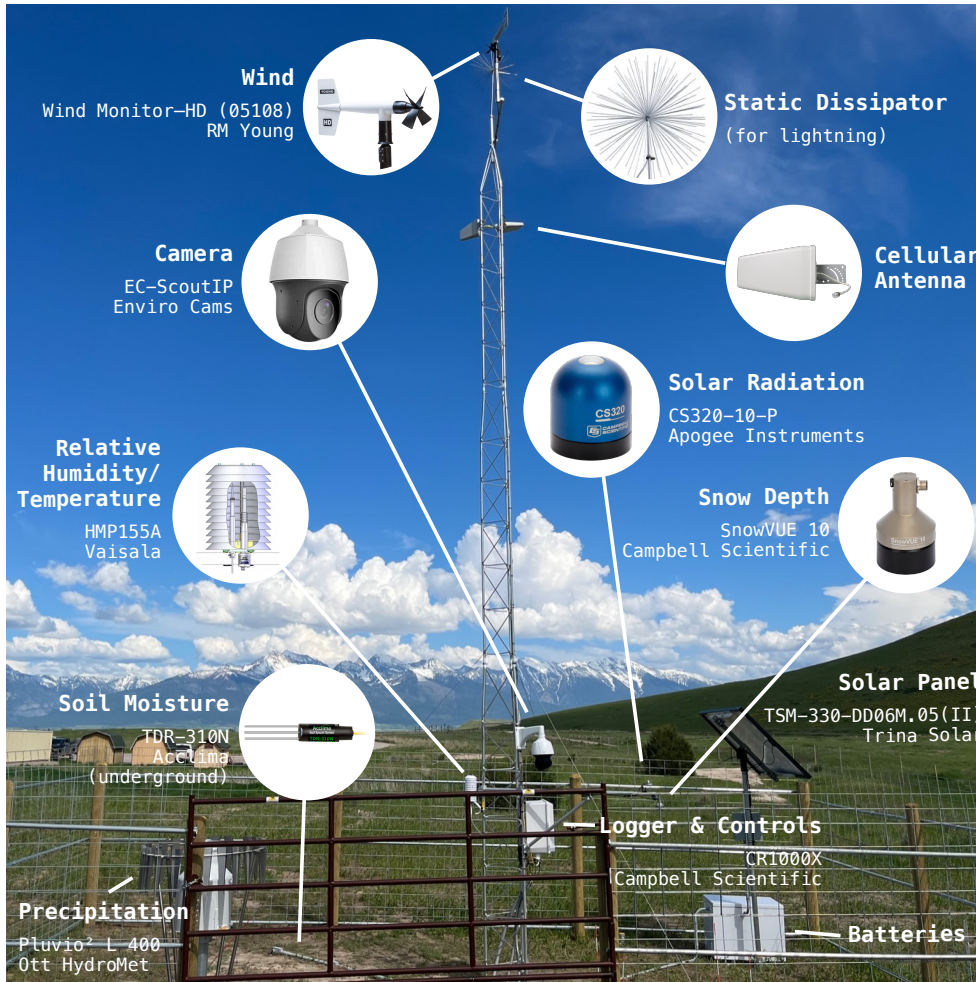
- ❖ Traditional Ecological Knowledges are key
- ❖ Western science of past/future climates
- ❖ Sparse monitoring of weather-climate on tribal lands
- ❖ Tribal drought resilience over millennia
- ❖ Acting now for seven generations in the future
- ❖ Seeing with both eyes





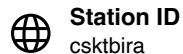
Seeing the cycle of extremes...drought, flood, heat...repeat





Native Drought Mesonet
station installed on CSKT
Bison Range in April 2023

Data available at:
<https://mesonet.climate.umt.edu/dash/csktbira>



Station ID
csktbira



Data Dashboard
<https://mesonet.climate.umt.edu/dash/csktbira>



Questions / Assistance
mesonet@umontana.edu



API
<https://mesonet.climate.umt.edu/api/docs>

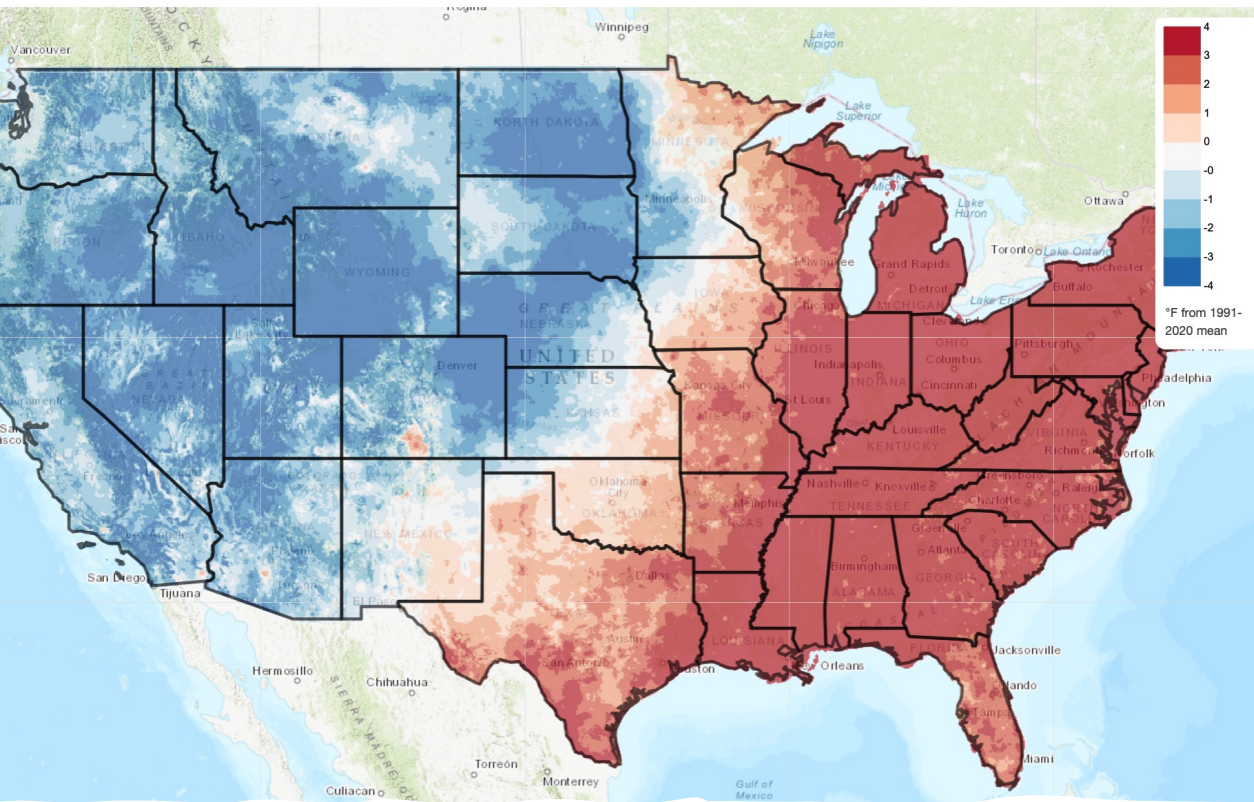
Mesonet Weather Station

Measurement	Device	Comments
Air temperature	High precision thermometer at 2m	
Relative humidity	Relative humidity probe at 2m coupled with thermometer	
Barometric pressure	Pressure device enclosed in logger box	
Wind speed and direction	Anemometer at 10m	10m is standard height for regional weather monitoring
Solar intensity	Pyranometer at 2m	Provides key input for calculating potential evapotranspiration
Precipitation	Weighing pluviometer with antifreeze	Records all precipitation year-round
Snow depth	Cameras record depth at 'snow sticks'; sonic measurement made at fixed pad	Combined snow depth and precipitation provide estimate snow-water equivalent
Soil conditions	Soil probes measure volumetric water content, temperature, and electrical conductivity	Probes placed at 5, 10, 20, 50, and 100 cm; soil sampled at each probe depth



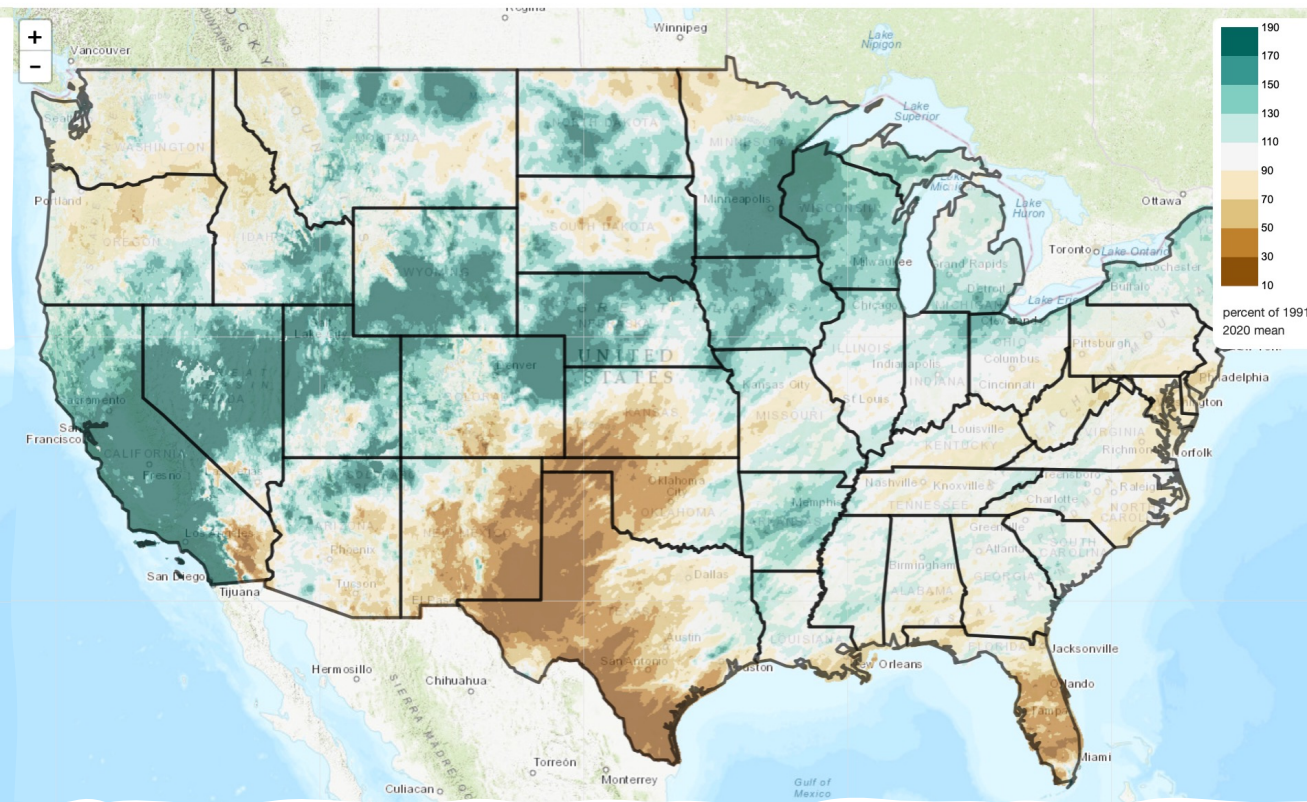
Mean Daily Temperature Anomaly, Last 90 Days

2022/12/16 - 2023/03/15



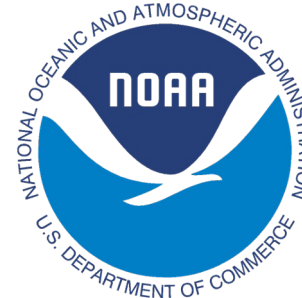
Total Precipitation Anomaly, Last 90 Days

2022/12/16 - 2023/03/15



The Story of Extremes in real time -
2023 Winter temps and precipitation patterns

Drought Monitoring & Indicators Dashboard



Operational drought models

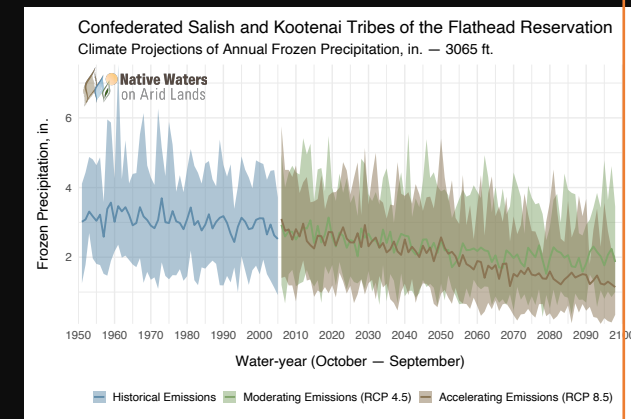
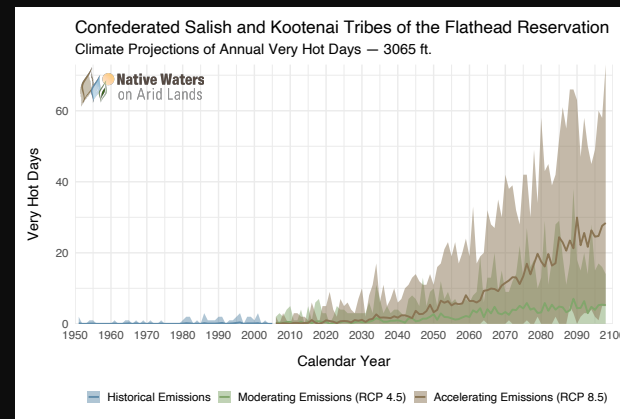
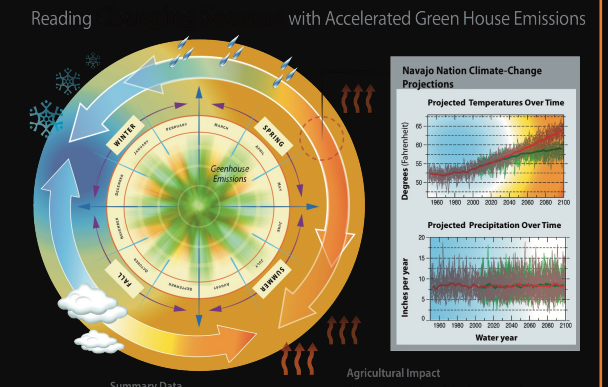
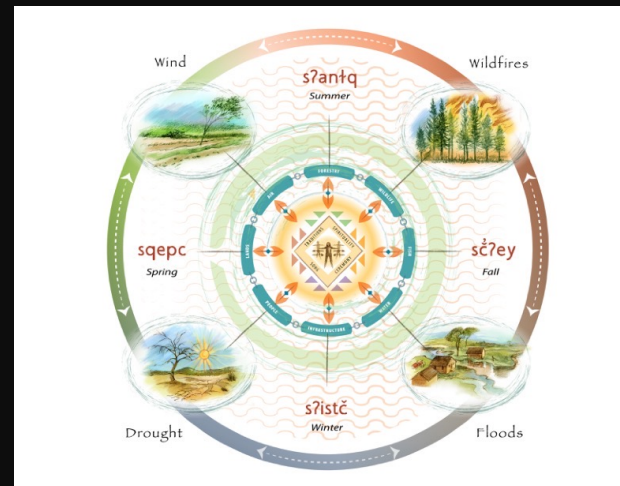
- Interactive
- Daily to weekly
- 30m – 1km resolution
- Local validation via MT Mesonet

These data form the basis for objective assessment by the monitoring committee and making our case to the USDM

<https://drought.climate.umt.edu>

Climate projections and resilience

- Native and Indigenous communities have long history of climate resilience
- Elder stories tell of climate drivers
- Context matters – the climate is always changing...what's new?
- Met monitoring on tribal lands scarce
- Agricultural projections tell a story
- Downscaled projections at reservation-scale matters
- Climate storytelling essential



Learning from Tribes...advice for the rest of us

- **Decolonize your mindset**
- Respect tribal sovereignty
- Recognize relationships with the land are from time immemorial
- See the future for seven generations
- Listen, listen, listen, listen...then talk then listen again. Storytelling matters.
- Climate data provides context. It do not “confirm” or “deny” traditional knowledge.



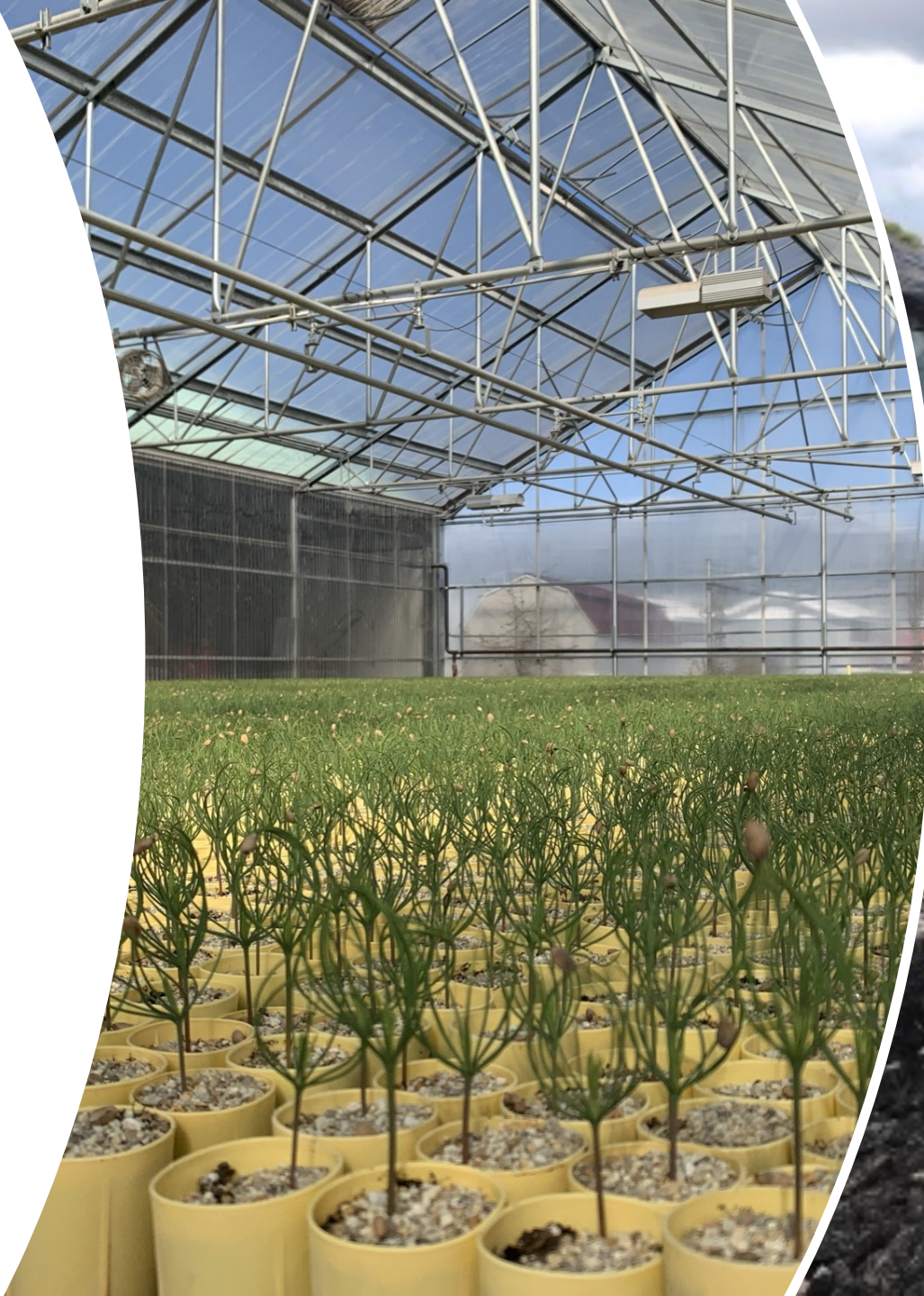


**A few examples of how
weaving works in
practice**

CSKT Biocultural restoration of Whitebark Pine

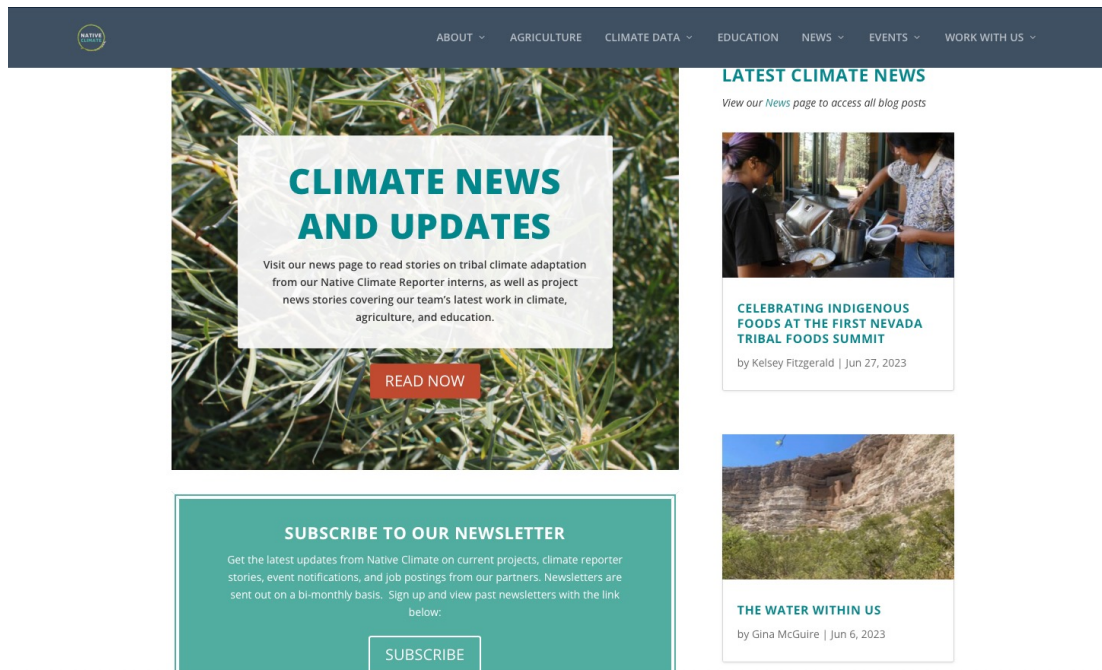
“Biocultural restoration is the science and practice of restoring not only ecosystems but also human and cultural relationships to place, so that cultures are strengthened and revitalized along with the lands to which they are inextricably linked”

- Robin Wall Kimmerer



Native Climate Fellows linking science and traditional knowledges

Join us at Native Climate:
<https://native-climate.com>



- **Native Climate Agriculture Fellow** – climate needs of Native American farmers and ranchers (*Vicki Hebb, UNR-Ext working with Staci Emm*)
- **Native Climate Data Fellow** – climate monitoring and data services on tribal lands (*Paige Johnson, UM/MCO working with Kyle Bocinsky*)
- **Native Climate Teaching Fellow** – place-based climate modules for Native teachers (*Crystal Miller, DRI/UA working with I Leah Kirchoff*)

Native Climate Reporters – stories of impacts and resilience

Gina McGuire (U. Hawaii), Robin Smuda (UNR), Sarah Sandoval (SKC)

Climate stories, poetry, and fiction help remember the past, understand the present, envision a better future



ESTOM YUMEKA MAIDU STUDENT TEACHES DIY AIR FILTRATION TECHNIQUES TO HELP RESERVATION COMMUNITIES DURING WILDFIRE SEASON

by Robin Smuda | Jan 17, 2023 | Resilience Stories | 0 | ★★★★★

Piercen Nguyen, member of Enterprise Rancheria, Estom Yumeka Maidu Tribe, has been teaching Native American community members in NV and CA how to protect air quality in their homes during wildfire season.



THE WATER WITHIN US

by Gina McGuire | Jun 6, 2023 | Project News, Resilience Stories | 0 | ★★★★★

A poem by Gina McGuire looks back to ancestral knowledges of groundwater and lifeways to inform the future.



SEEK ME, YOU TWO, AND FIND ME

by Gina McGuire | Mar 15, 2023 | Resilience Stories | 0 | ★★★★★

A short story by Gina McGuire explores the intersection of Hawaiian culture with climate and disease ecology.



HOW MUCH MORE? A POEM ON SEA LEVEL RISE IN HAWAI'I

by Gina McGuire | Feb 1, 2023 | Resilience Stories | 0 | ★★★★★

By Gina McGuire. How Much More? I wonder, will the sea push, the slow crawl inland into freshwater lens...



RESTORING OUR RELATIONSHIP WITH HÍMU (WILLOW) REQUIRES HUMAN INTERACTION RATHER THAN PROTECTION

by Robin Smuda | Sep 12, 2022 | Resilience Stories | 0 | ★★★★★

dá·bal (dah-ball; big sage), tá·gim (tdah-goom; pinion pine), and hímu (him-oo; willow) are why...

Education modules for teachers and the next generation of climate warriors



ELEMENTARY SCHOOL

Curricula for grades pre-K to 5. Click on the toggle boxes below for more information about each course.

TRADITIONAL ECOLOGICAL KNOWLEDGE

SEASONAL STORYLINE

SALISH SEA PLAYING CARDS



MIDDLE SCHOOL

Curricula for grades 6-8. Click on the toggle boxes below for more information about each course.

PUEBLO FARMING PROJECT

TRADITIONAL ECOLOGICAL KNOWLEDGE, SCIENCE AND MANAGEMENT

SALISH SEA PLAYING CARDS

WITH WATER WE THRIVE STEAM CURRICULUM



HIGH SCHOOL

Curricula for grades 9-12. Click on the toggle boxes below for more information about each course.

WATER RESOURCES IN A WARMING WORLD

TERRA PRIME BLUEPRINT DECK

AIR QUALITY AND HEALTH

WITH WATER WE THRIVE STEAM CURRICULUM



Seeing with both eyes

“In the Western tradition there is a recognized hierarchy of beings, with, of course, the human being on top—the pinnacle of evolution, the darling of Creation—and the plants at the bottom. But in Native ways of knowing, human people are often referred to as “the younger brothers of Creation.” We say that humans have the least experience with how to live and thus the most to learn—we must look to our teachers among the other species for guidance. Their wisdom is apparent in the way that they live. They teach us by example. They’ve been on the earth far longer than we have been and have had time to figure things out.”

— Robin Wall Kimmerer, [Braiding Sweetgrass](#)



Lemlmtš for
listening...and
don't forget
there is still
magic in the
world...if we
listen...and
take care of
our world
around us...

Strengthening the Role of the Climate Hubs in Indian Country

Native Climate Project

Kyle Bocinsky, Maureen McCarthy, Meghan Collins, Ilea Kirchoff, Staci Emm, Kelsey Fitzgerald, Vicki Hebb, Kelsey Jencso, Trent Teegerstrom, Dannele Peck, Caiti Steele



Traditional Ecological Knowledges

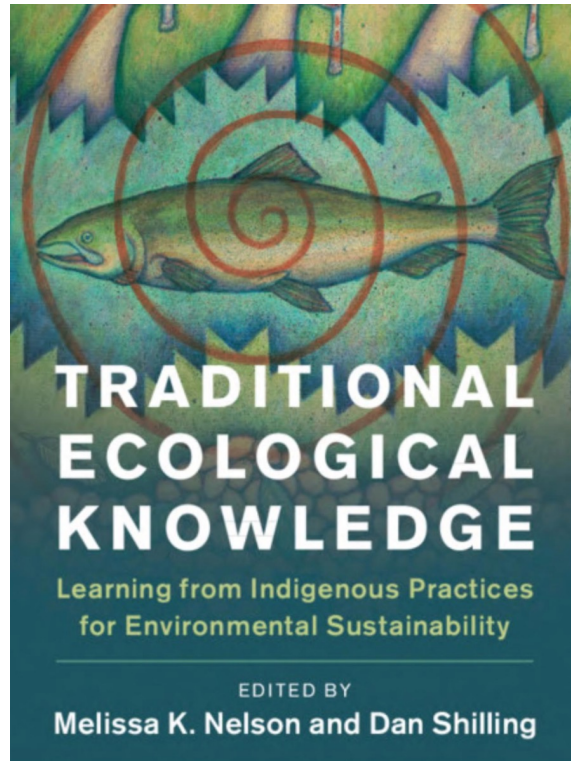
A hymn of love to the world.
—ELIZABETH GILBERT

BRAIDING SWEETGRASS



Indigenous Wisdom, Scientific Knowledge,
and the Teachings of Plants

ROBIN WALL KIMMERER



“Know the ways of the ones who take care of you, so that you may take care of them. Introduce yourself. Be accountable as the one who comes asking for life. Ask permission before taking. Abide by the answer.

Never take the first. Never take the last.

Take only what you need.

Take only that which is given.

Never take more than half. Leave some for others. Harvest in a way that minimizes harm.

Use it respectfully. Never waste what you have taken. Share.

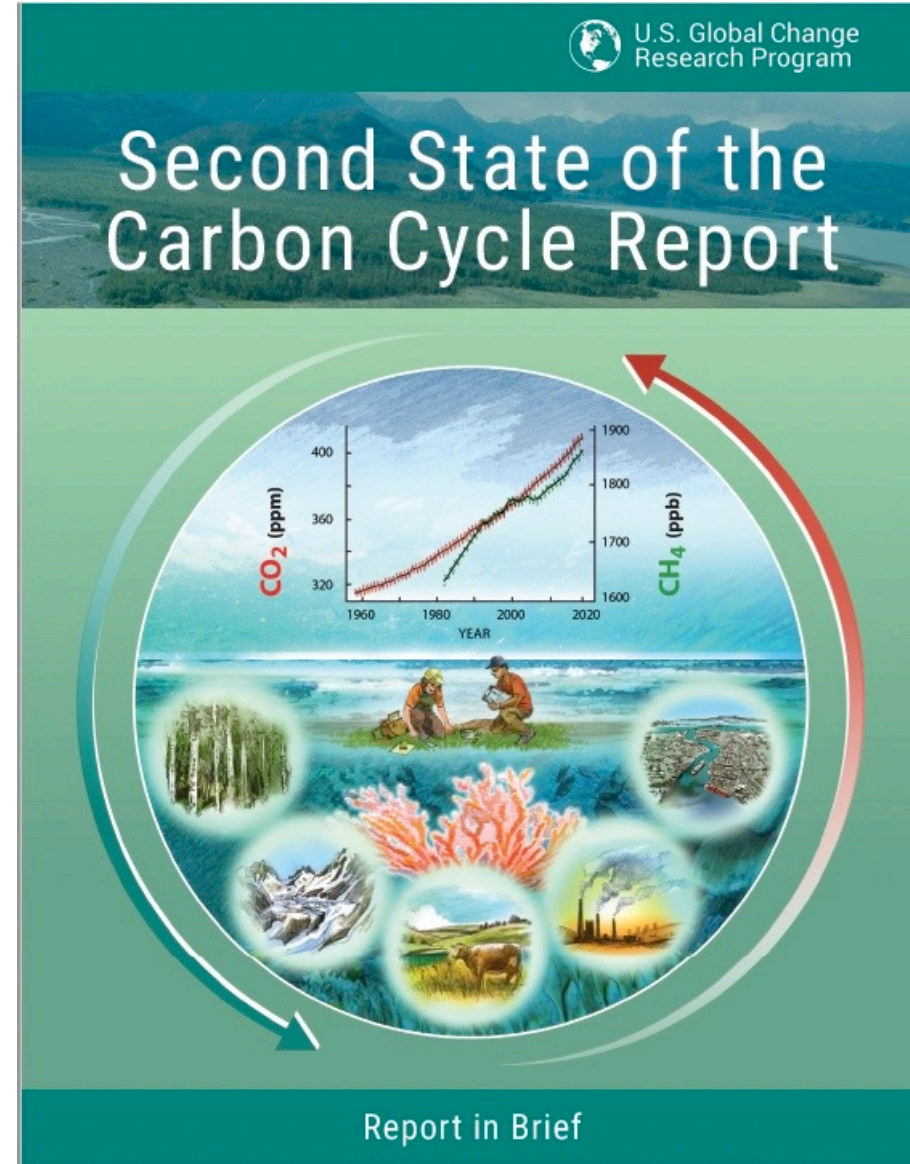
Give thanks for what you have been given.

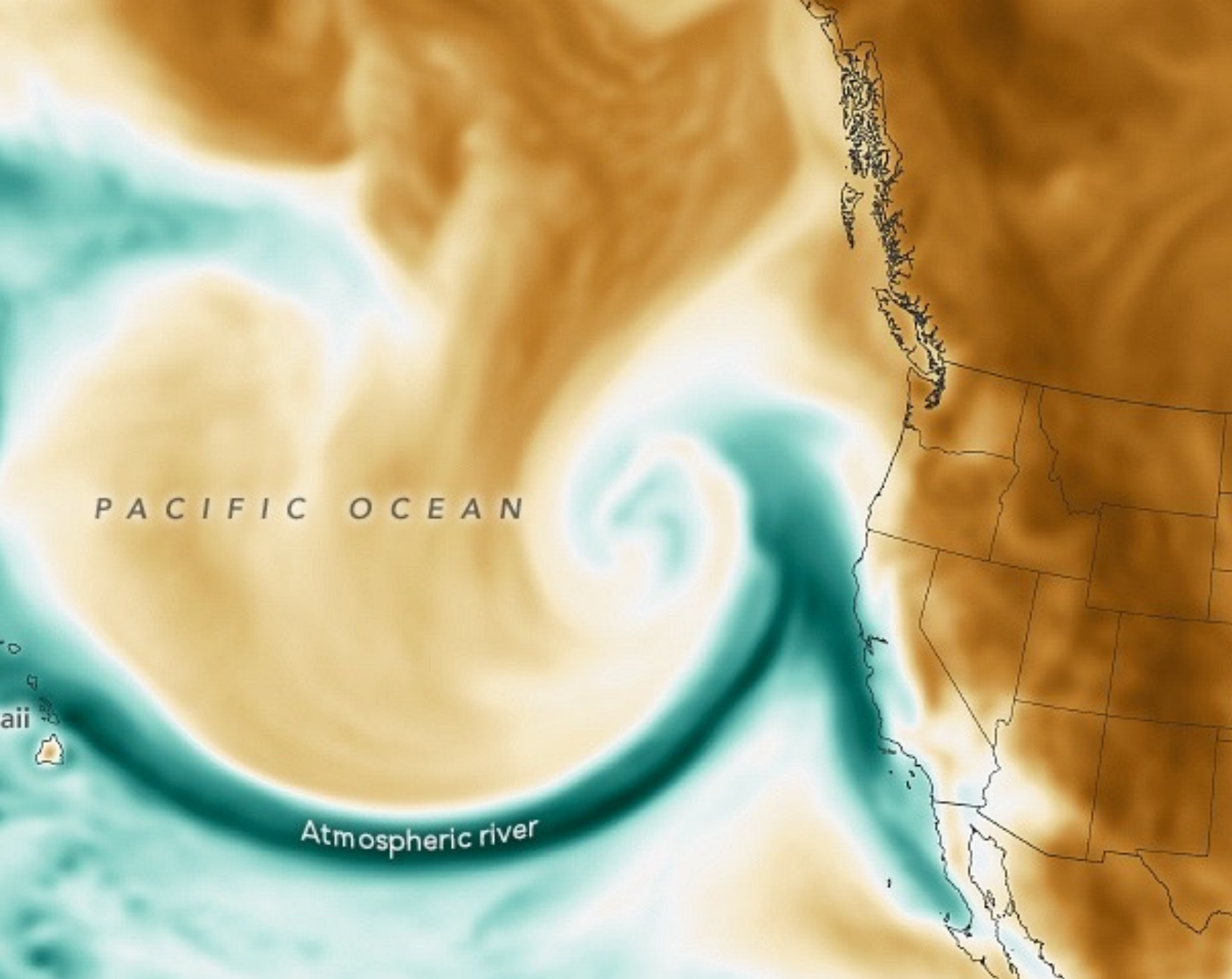
Give a gift, in reciprocity for what you have taken.

Sustain the ones who sustain you and the earth will last forever.”

— Robin Wall Kimmerer in **Braiding Sweetgrass**

Ecosystem and soil carbon stocks and fluxes driving climate change





ARkStorm 2.0

- Think winter of 2022-2023, only much, much worse!
- 31 AR events in CA-NV Oct22-Mar23
- All that snow had to go somewhere...
- Warming air and ocean temps are making these events more severe
- Are we really prepared?

Making extreme event data actionable for emergency managers, exercise planners

“ARkStorm 2.0” funded by USGS/SAFRR (CESU project)

Partners

- Christine Albano (DHS)
- USGS/SAFRR, Landslides
- TRFMA, NVDEM
- CA-DWR, CNRFC
- Daniel Swain (USSB), Xingying Huang (NCAR)
- DHS/CISA, NWS-Reno, USBR, Federal Water Master
- Builds on the original ARStorm@Tahoe project

The Trillion-Gallon Question

Extreme weather is threatening California's dams. What happens if they fail?