Conceptualizations of Ecological Drought in Montana

Sale Rhodes, Fall 2023

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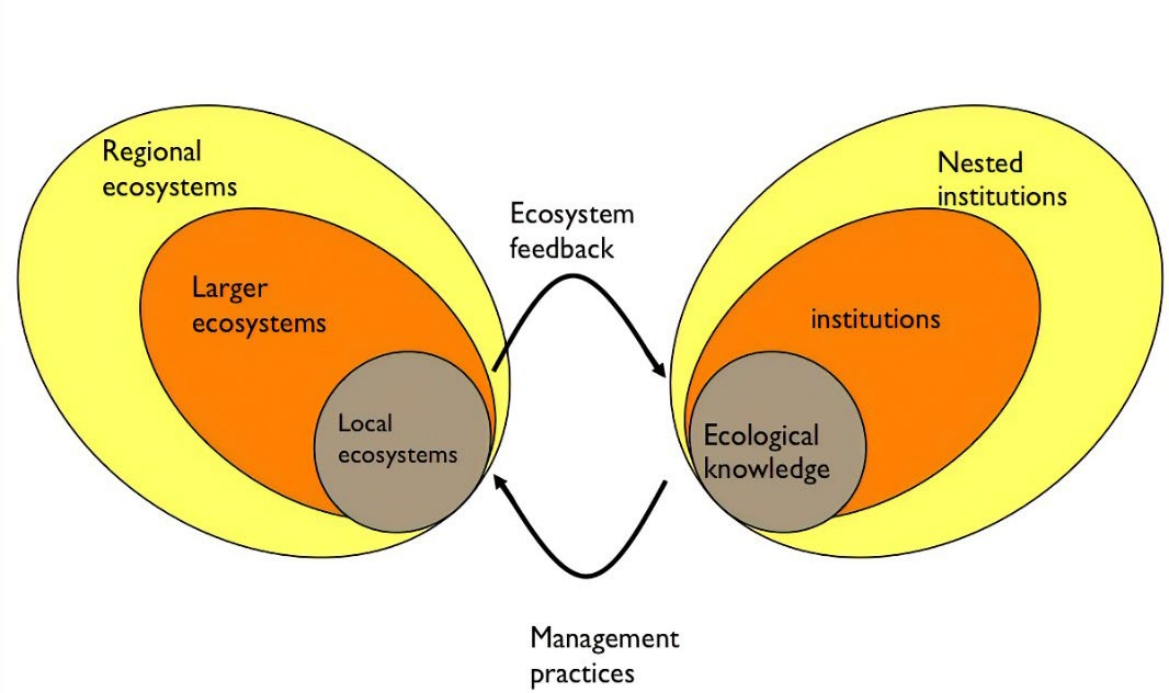
NOAA NIDIS Coping with Ecological Drought: Connecting Ecological Drought Monitoring Tools with Natural Resource Stakeholders in Montana

Ecological Drought

1)Moderately dry Valley County seeing more grasshoppers than usual. 2) Severely dry Glacier County is losing connectivity between ponds. **Photos from MT Drought Dashboard (MT DNRC & MT State Library)**

"An episodic deficit in water availability that drives ecosystems beyond thresholds of vulnerability, impacts ecosystem services, and triggers feedbacks in natural and human systems"
(Crausbay et al. 2017)



Berkes, Folke, Colding. 2003 Navigating social-ecological systems

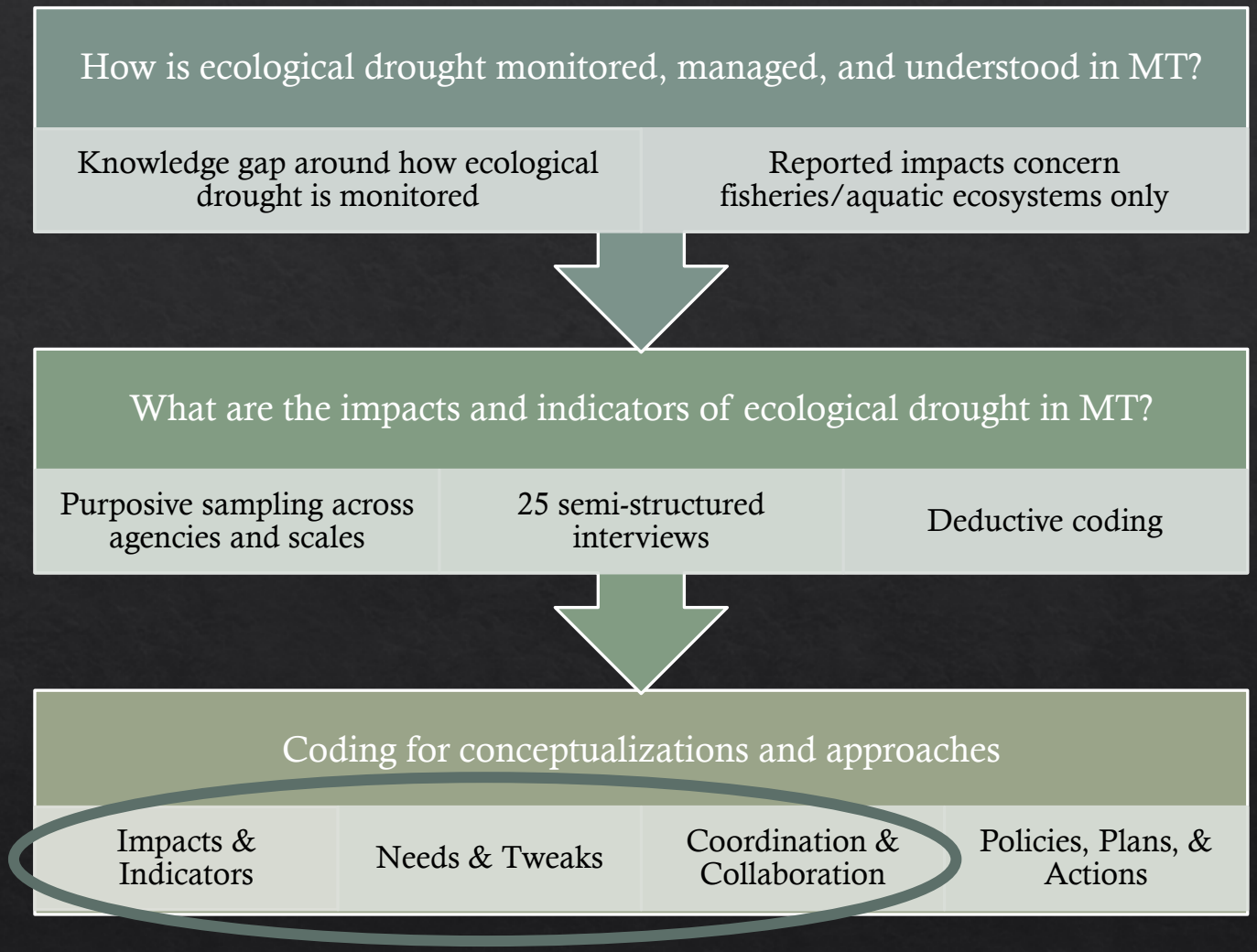
Ecological drought as a social-ecological system

Research Questions

Connecting Ecological Drought to Monitoring Tools

- **What indicators are used to monitor and address ecological drought impacts?**
- Understand how new drought monitoring tools can support ecological drought monitoring, planning, and mitigation activities in Montana (30m ET)

Methods


How is ecological drought monitored, managed, and understood in MT?
Knowledge gap around how ecological drought is monitored
Reported impacts concern fisheries/aquatic ecosystems only
What are the impacts and indicators of ecological drought in MT?
Purposive sampling across agencies and scales
25 semi-structured interviews
Deductive coding
Coding for conceptualizations and approaches
Impacts & Indicators
Needs & Tweaks
Coordination & Collaboration
Policies, Plans, & Actions

Results: Impacts

- Wildlife (21)
- Surface water (17)
- Aquatic ecosystems (16)
- Alpine ecosystems (3)
- Disease (2)
- Groundwater (1)

Primary management concern

Climate adaptation

Fire and Forestry

Freshwater Ecosystems

Science Communication

State Drought Planning

Wildlife Conservation

Results: Indicators

SURFACE WATER (22)

TEMPERATURE (19)

PRECIPITATION (18)

VEGETATION (16)

GROUNDWATER (2)

SNOWPACK AND SOIL MOISTURE (10)

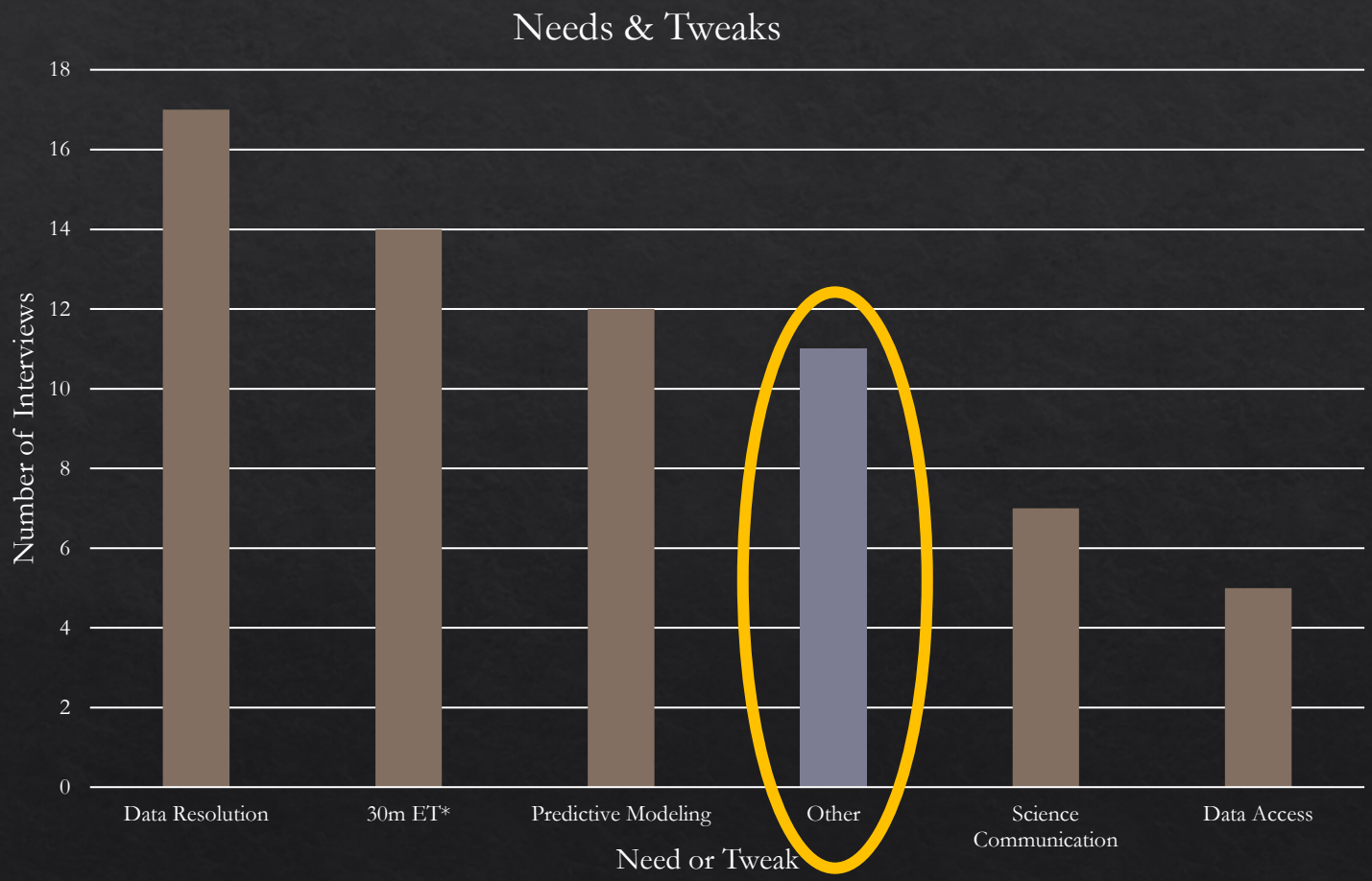
Novel Indicators

- Communication with neighbors, scientists, and land managers
- Presence of bees
- Bird habitat

- Value in specialization

"As soon as you say indicator, all I want to say is with birds. **They're a great indicator of everything, where they go, what they do, how they're doing indicates how the habitat is doing**."

Results: Needs and Tweaks



Other needs and tweaks

- **Education to incorporate stakeholders in monitoring**
- **Converting tools for other ecosystems**
- **Lag times between events and impacts**

- Decoupling climate shifts from evaluations of management
- Biodiversity (in)migration
- Ephemeral wet areas
- Floodplain restoration priorities
- Targeted releases for aquatic species
- Professional-grade tools from research
- Leverage existing collaborations for ecological drought

"…**citizen science where you can take pictures of dry stream channels** and that all gets collated"

"And if you look at Grasscast … **products like that could be adjusted for a wider ecology**…"

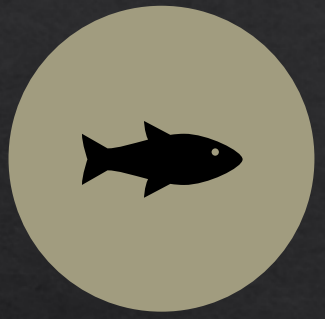
Results: Collaboration

"**A lot of the information sharing happens in formalized coordination groups**…the Western Regional Panel on Aquatic Nuisance Species brings together all the state coordinators with all the federal coordinators with all the tribal coordinators to do a big information dump.
The goal is to coordinate the coordinators."

"**The Forest Service, BLM, and Park Service coordinate their activities and have subcommittees for hydrology fisheries, charismatic wildlife, bears, whitebark pine, and climate adaptation**."

- Who indicated collaboration?
  - 19 formal, 14 informal
- Collaboration and coordination ***within*** primary management concern
  - Or watershed
- Collaboration and coordination *NOT* focused on (ecological) drought
  - Aquatic species
  - Grazing allotments
  - Fire planning

Generalized Understanding, Siloed Management



Common impacts and indicators center aquatic ecosystems regardless of management concern

Novel monitoring relates to specific management concern

Needs and tweaks suggest more science communication () and community engagement () is needed

Collaboration occurs within watersheds and management areas, not between

Discussion

- How can we address ecological drought as a holistic/SES challenge?
  - Close gaps between management siloes? At what scale?

Larry Mayer, Billings Gazette, 2021

How to save on pricey pumpkins as drought, inflation impacts farmers ahead of Halloween

Buying locally will cut down on transportation costs.

By Kelly McCarthy and Dominick Proto GMA
September 27, 2022, 8:28 AM

How summer drought, inflation could cause pumpkin prices to rise
The cost of the fall staple is up due to inflation and drought conditions just ahead of Halloween.

Acknowledgements

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