Fish Conservation, Working Rivers, and Quality Collaborations

Outline

Fish Biology

- Water Quality

Collaborations

- Scientific
- Government
- NGO
- Citizen

Water Quality

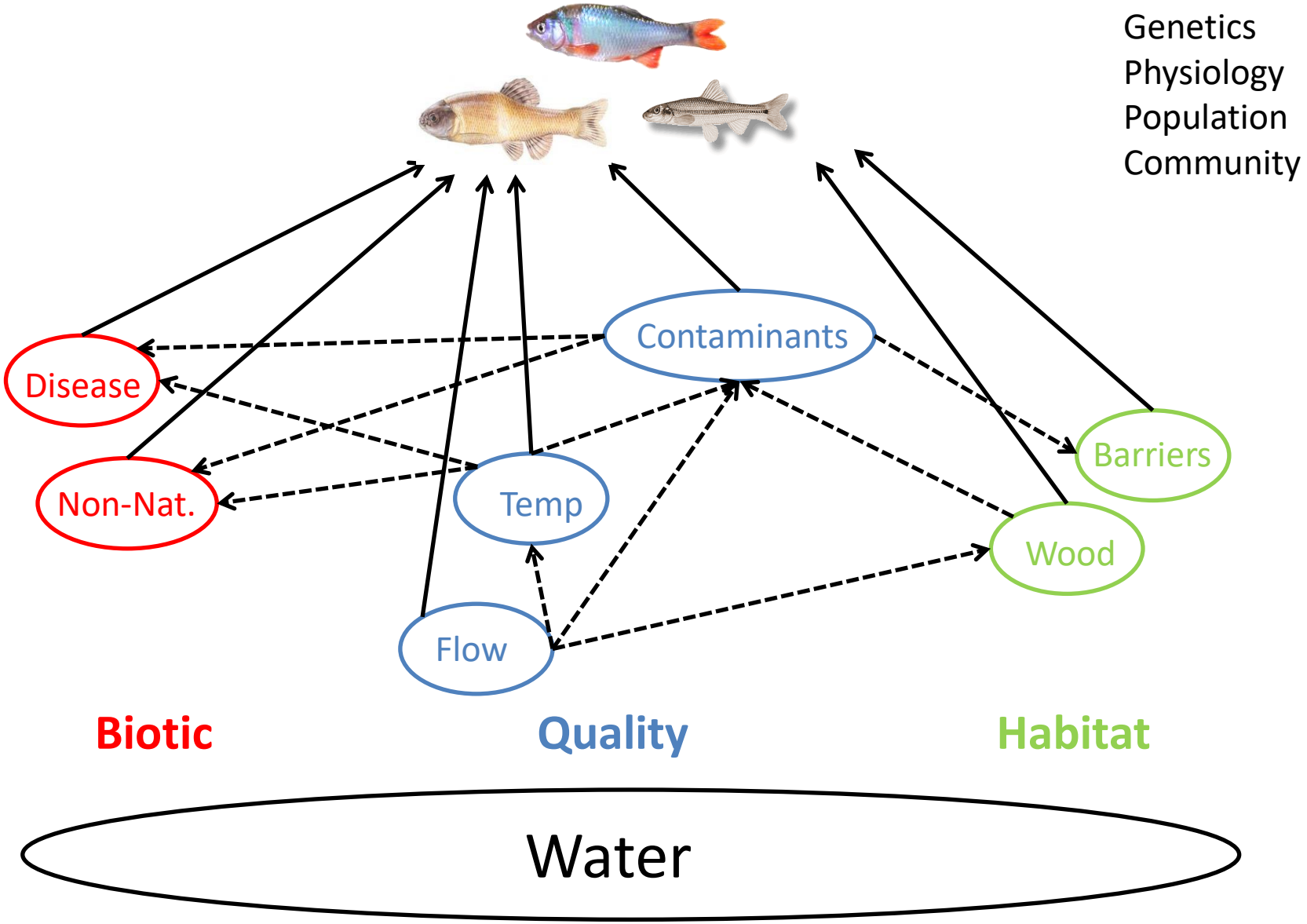
Physical Characteristics

- Discharge or Flow
- Temperature

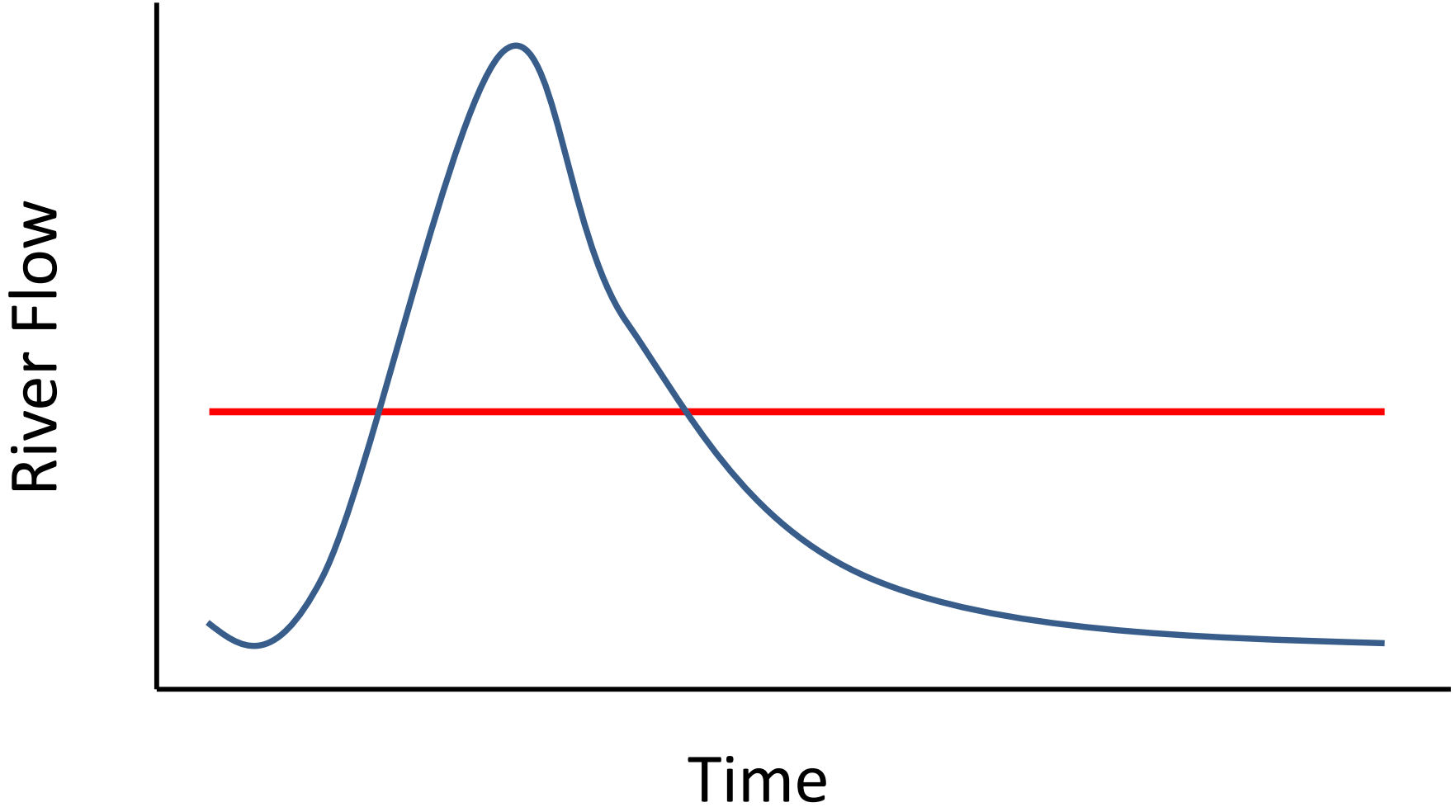
Chemical Characteristics

- Hardness, Ph, Dissolved Oxygen
- Contaminants

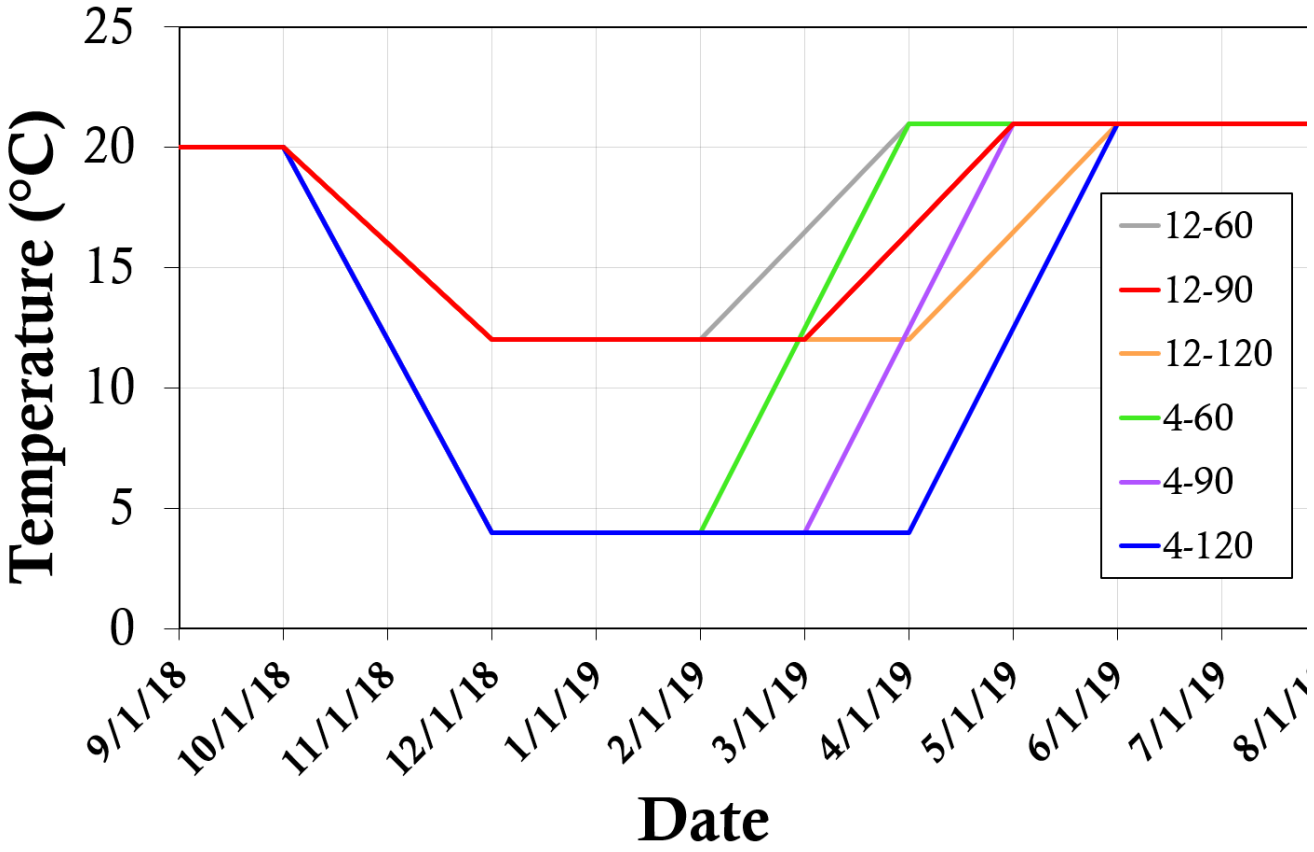
Motivation


Genetics
Physiology
Population
Community
Contaminants
Disease
Non-Nat.
Temp
Flow
Barriers
Wood
Biotic
Quality
Habitat
Water

River Discharge



Water Temperature



Contaminants

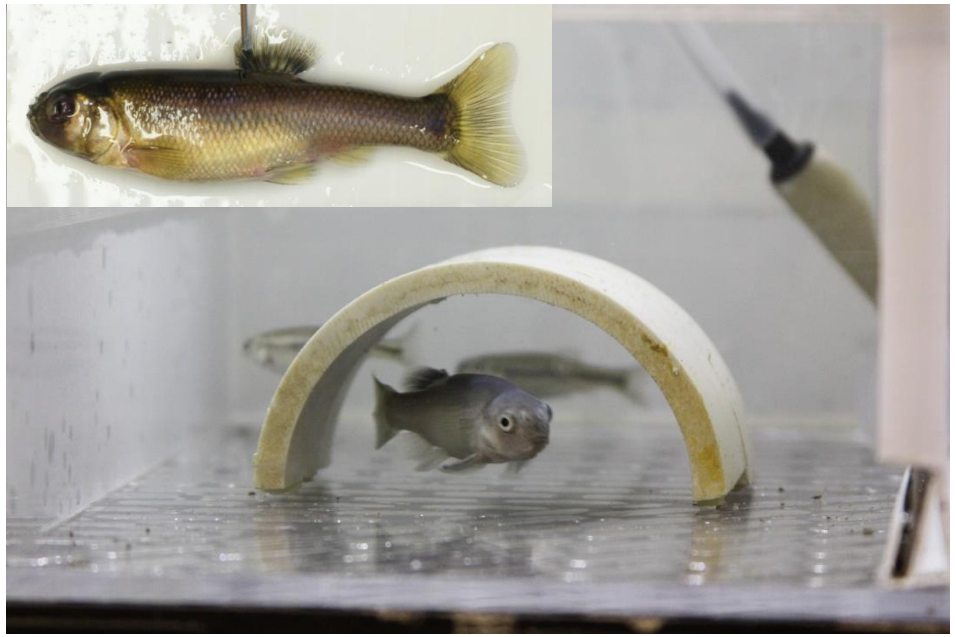
- Pharmaceuticals and Personal Care Products
  - Estrogens

Pranathi Perati, MSc

Test Organisms

Red Shiner (*Cyprinella lutrensis*)

Fathead minnow (*Pimephales promelas*)



1. Native to Eastern Plains Drainages
2. Small minnows
3. Well Studied Physiological Responses
4. Sexually dimorphic
    - Study male responses

Physiological Endpoints (Secondary Sexual Characteristics)

Exposure to 17β estradiol (40 ng/L)

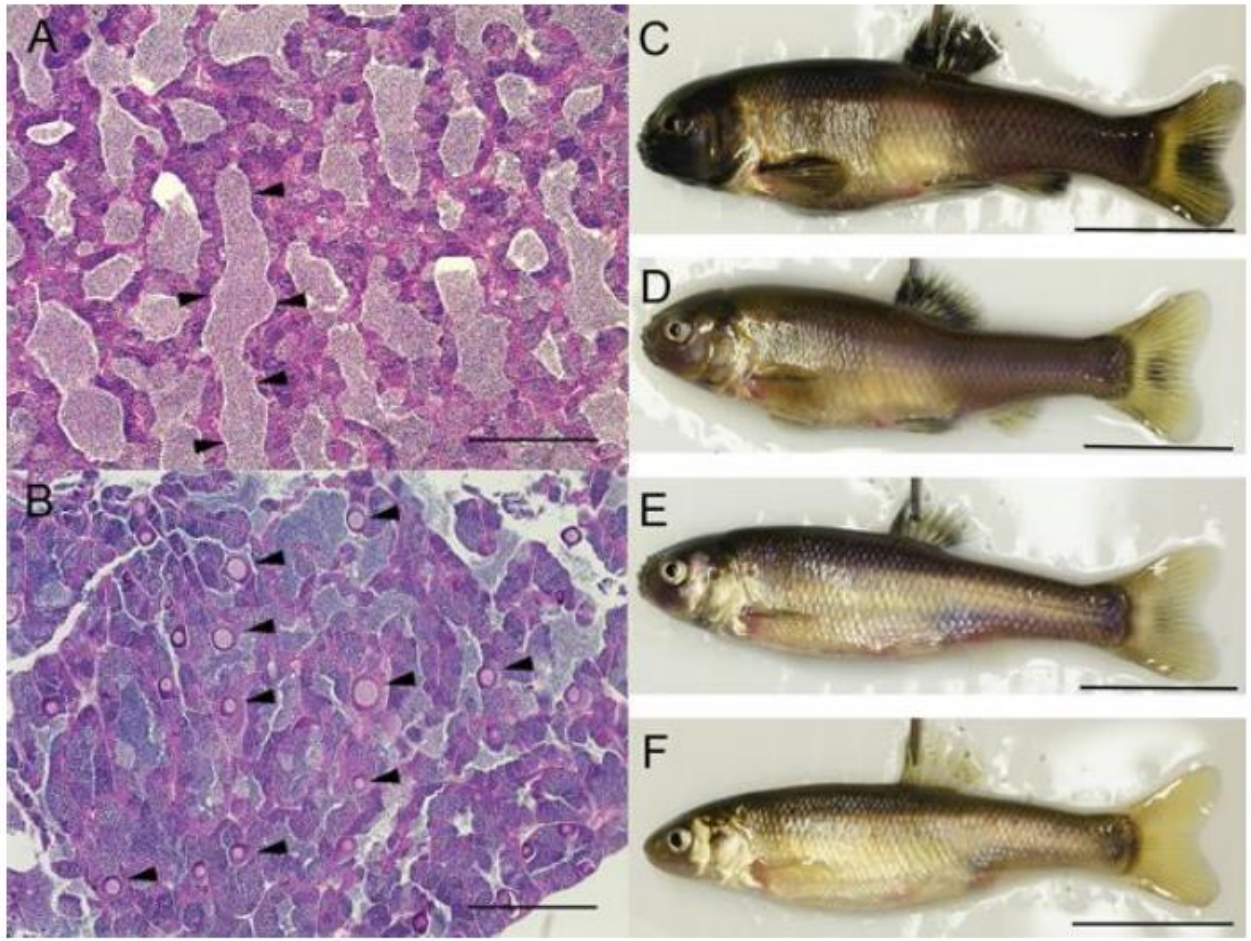
McGree et al. 2010. Reproductive failure of the red shiner (*Cyprinella lutrensis*) after exposure to an exogenous estrogen. CJFAS 67:1730-1743

Physiological Endpoints (Intersex/SSC)

Exposure to 17$^{\alpha}$ ethinyl estradiol

0 ng/L

5.3 ng/L



0 ng/L

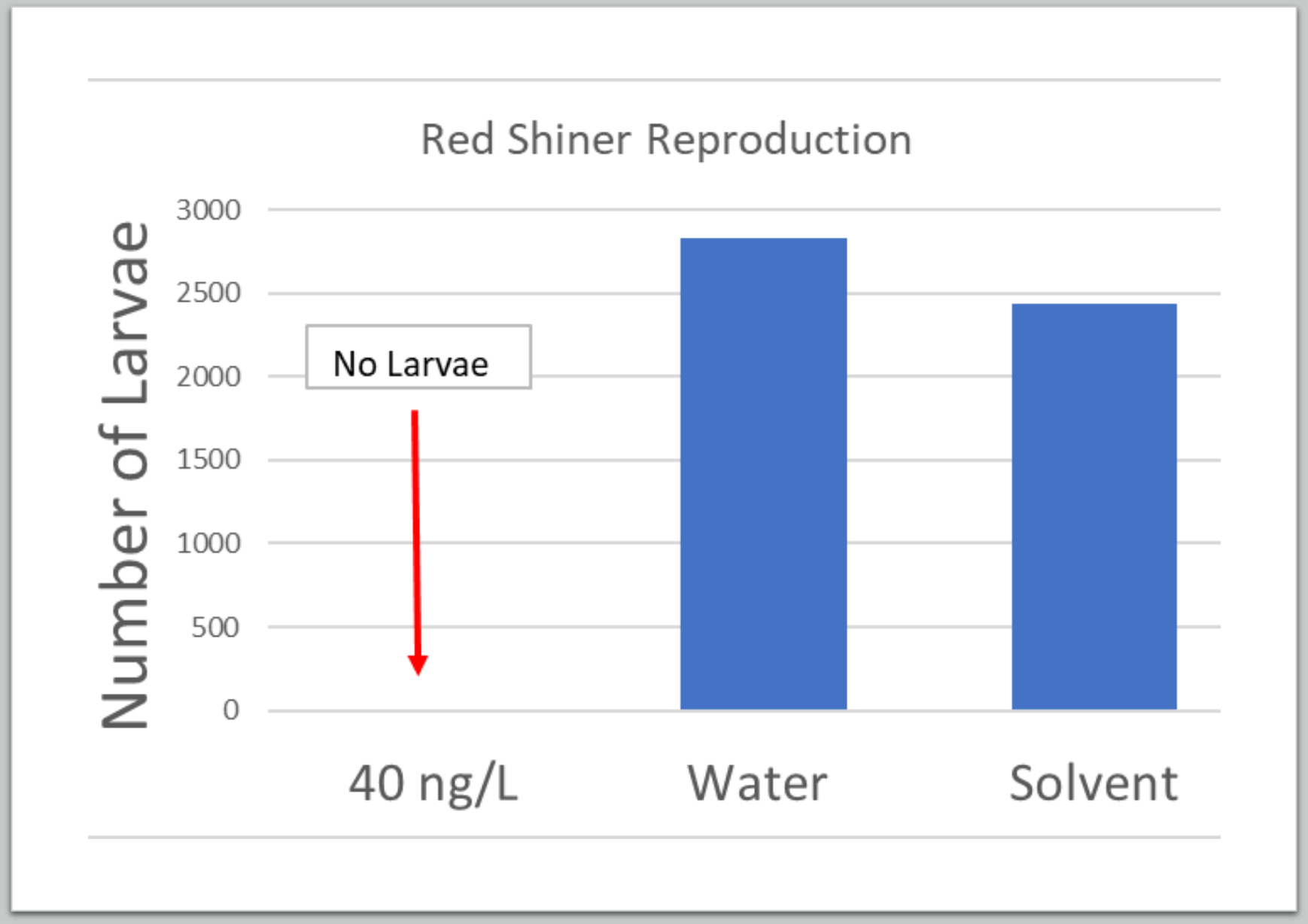
3.2 ng/L

5.3 ng/L

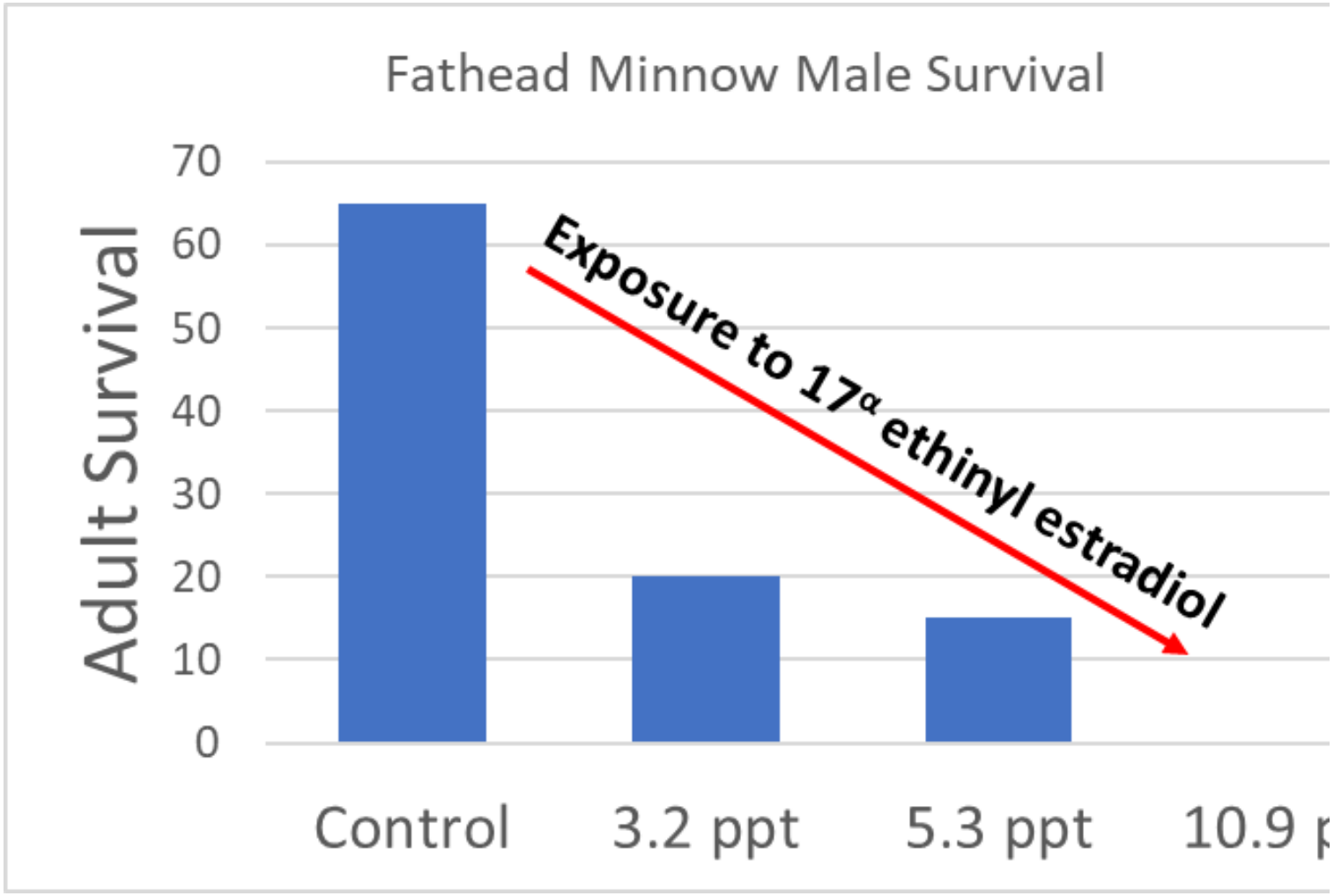
0 ng/L Female

Schwindt et al. 2014. An environmental oestrogen disrupts fish population dynamics through direct and transgenerational effects on survival and fecundity. JAE 51:582-591

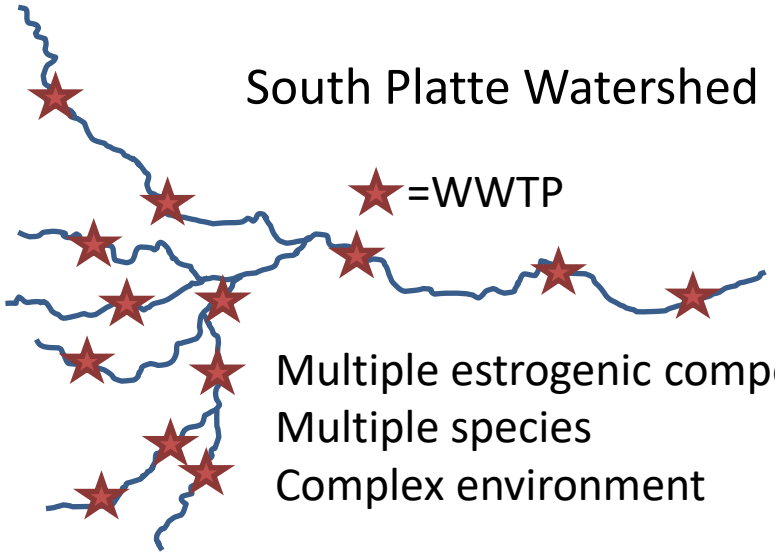
Effects on Reproduction



Effects on Survival



Scaling Up



Multiple estrogenic compounds
Multiple species
Complex environment

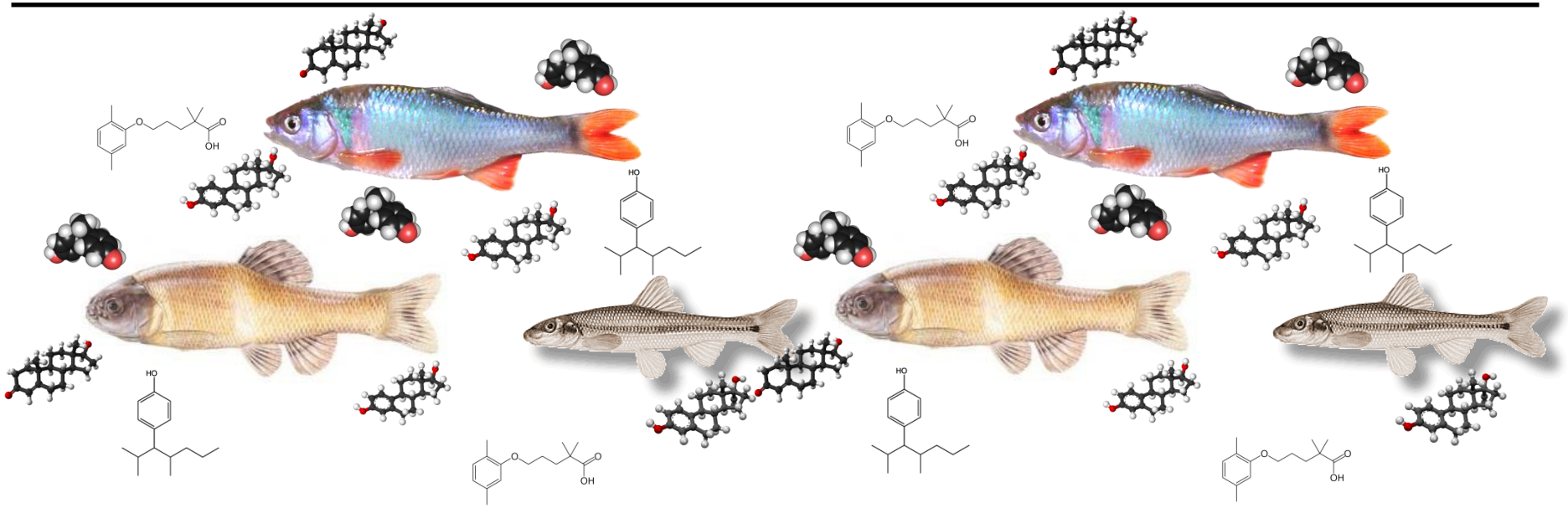
17α-ethinylestradiol
Single species

17β-estradiol
Single species

Complexity

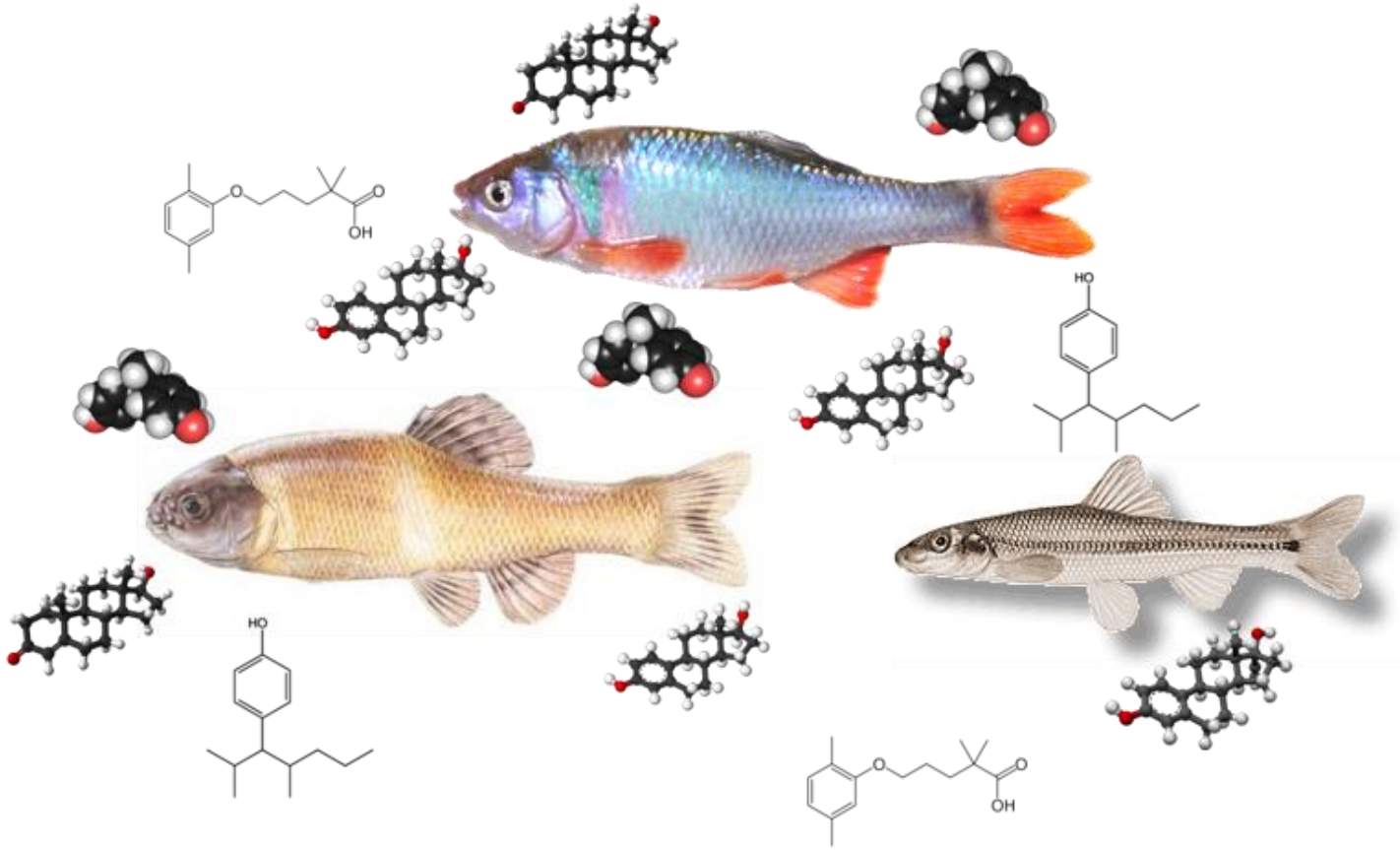
Scale

Implications of Exposure



- Caging experiments suggest that:
  - **Wild populations are being exposed to exogenous estrogen**
  - **Exposure varies across the riverscape**
- The issues are:
  - **Populations?**
  - **Exposed to what else?**

Why tell this story???



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Quality Collaborations

What do we want from collaborations?

- Scientific
- Government
- Private
- NGO

Scientific Collaborations

Students

- Michelle McGree, Adam Schwindt, and Jordan Anderson

State

- Colorado Parks and Wildlife: Ryan Fitzpatrick, Pete Cadmus, Melynda May
- Colorado Department of Public Health and Environment: Patrick Bachmann, Blake Beyea

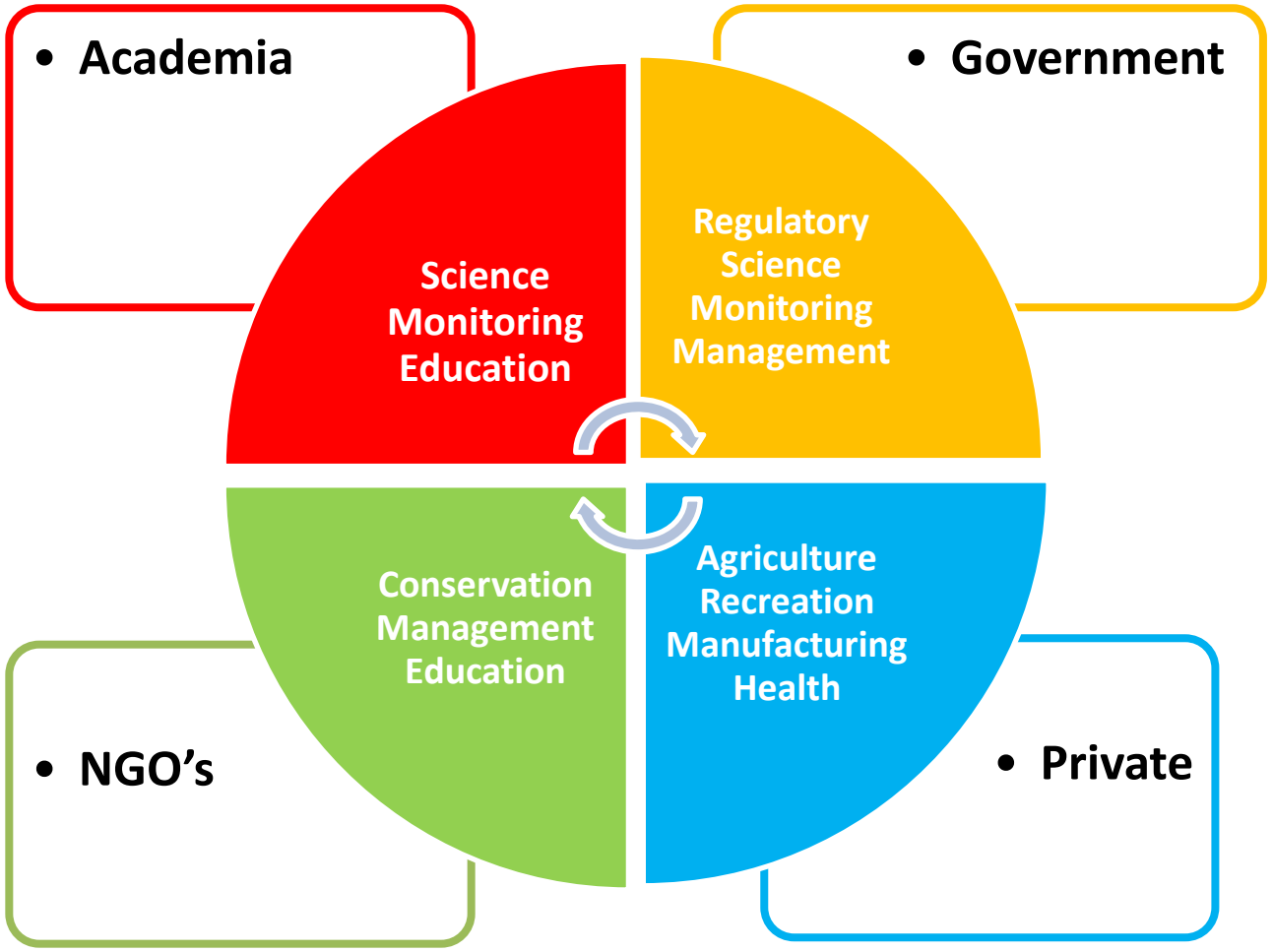
Federal

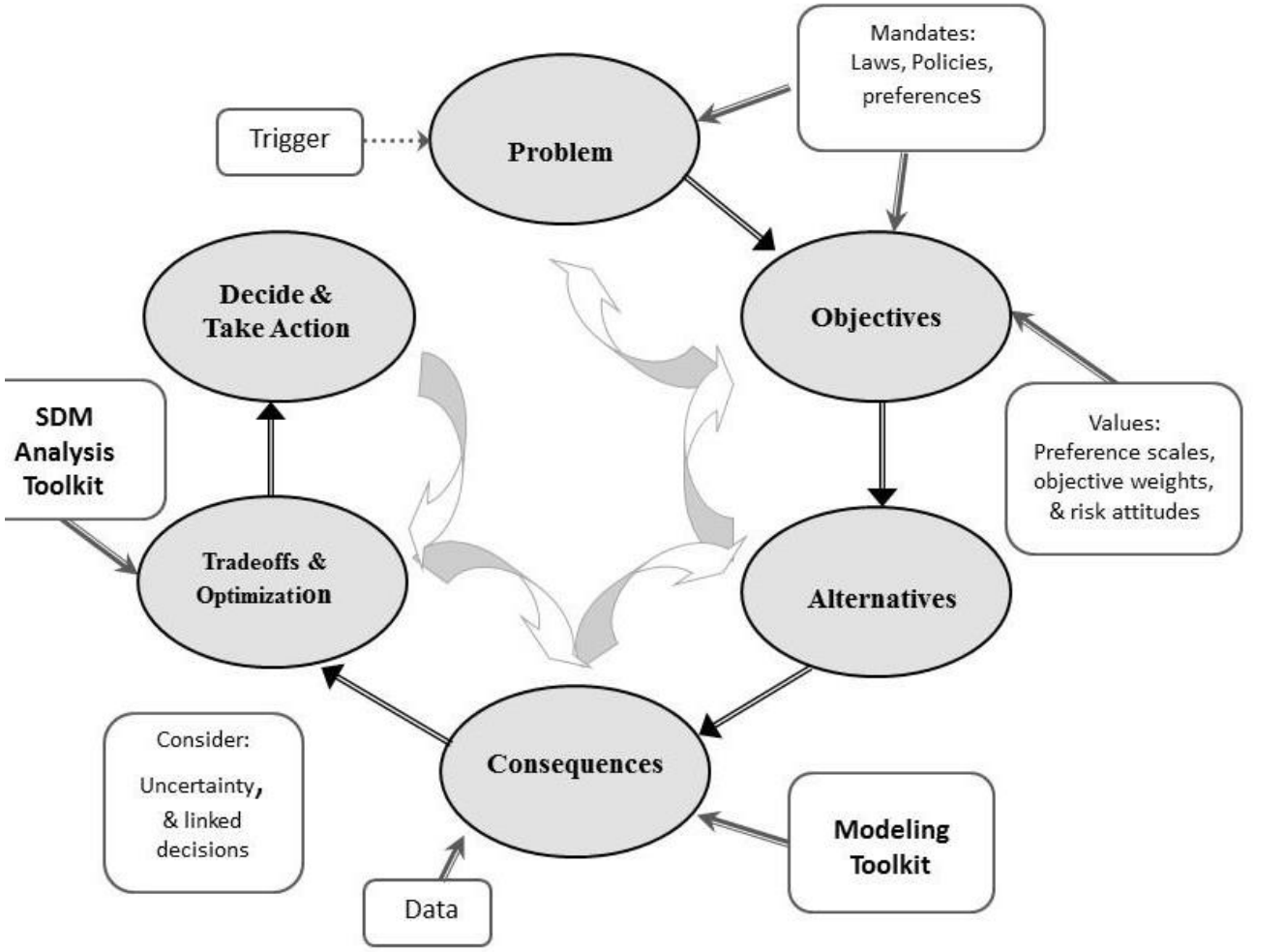
- Environmental Protection Agency: Kristen Keteles, Aaron Jastrow, Dan Villenueve, and Drew Eckman
- USGS: Larry Barber

Academic

- Alan Vajda

Decision Collaborations





Source: Jean Fitts Cochran

Quality Collaborations Quantified

- Structured Decision Making
  - Quantifiable Actions
  - Brings all interested stake holders into the process at the beginning

Working Rivers

- Management and Conservation of working rivers is a complex challenge and will require Quality Collaboration across a wide variety of disciplines and people.