



Headwater Streams & Wetlands are Critical for Sustaining Fish, Fisheries, & Ecosystem Services

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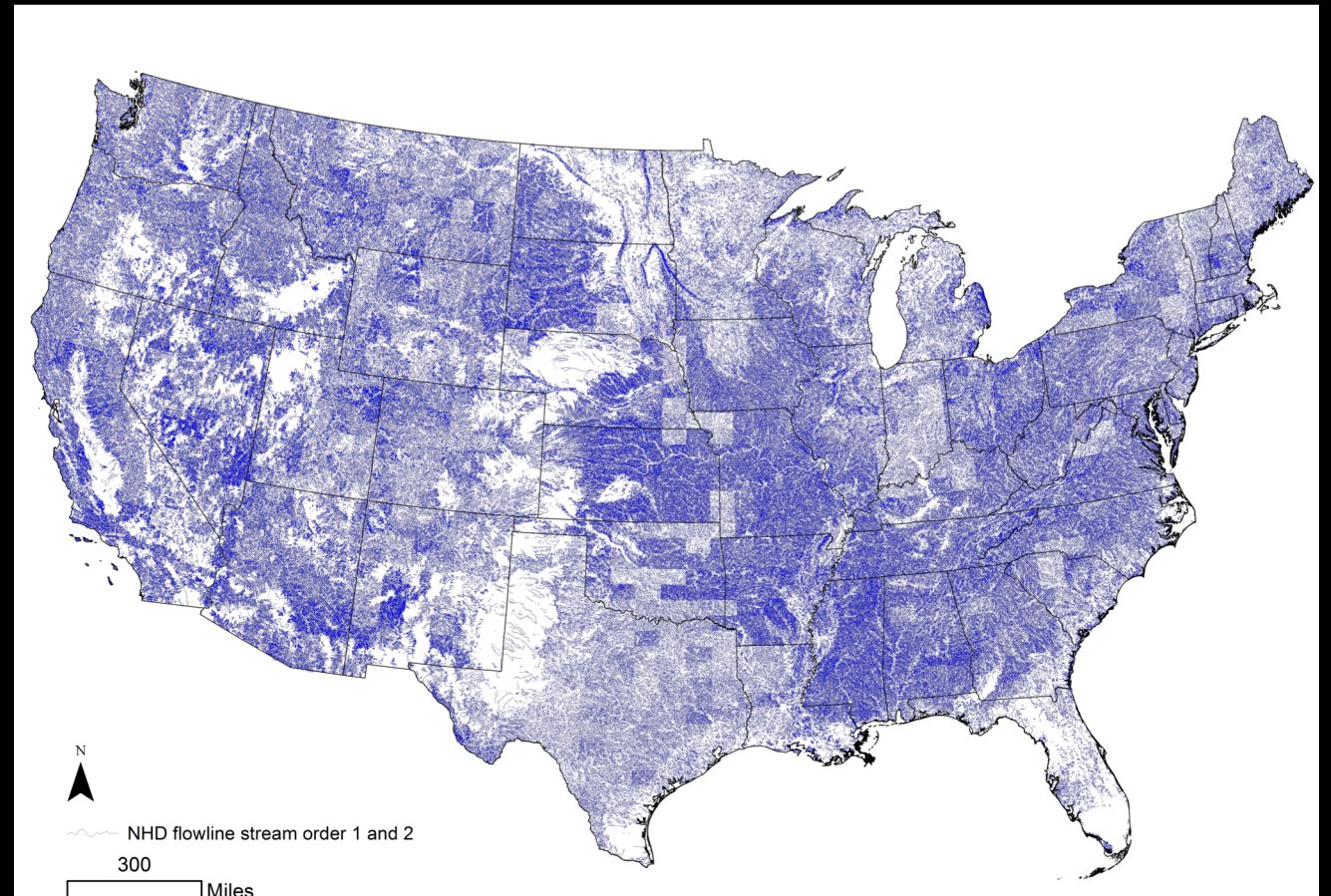
Importance of Headwater Streams



- *Headwater streams & wetlands - integral components of watersheds & surrounding systems*
- *Critical for biodiversity, fisheries, ecosystem functions, natural resource-based economies, & human society & culture*

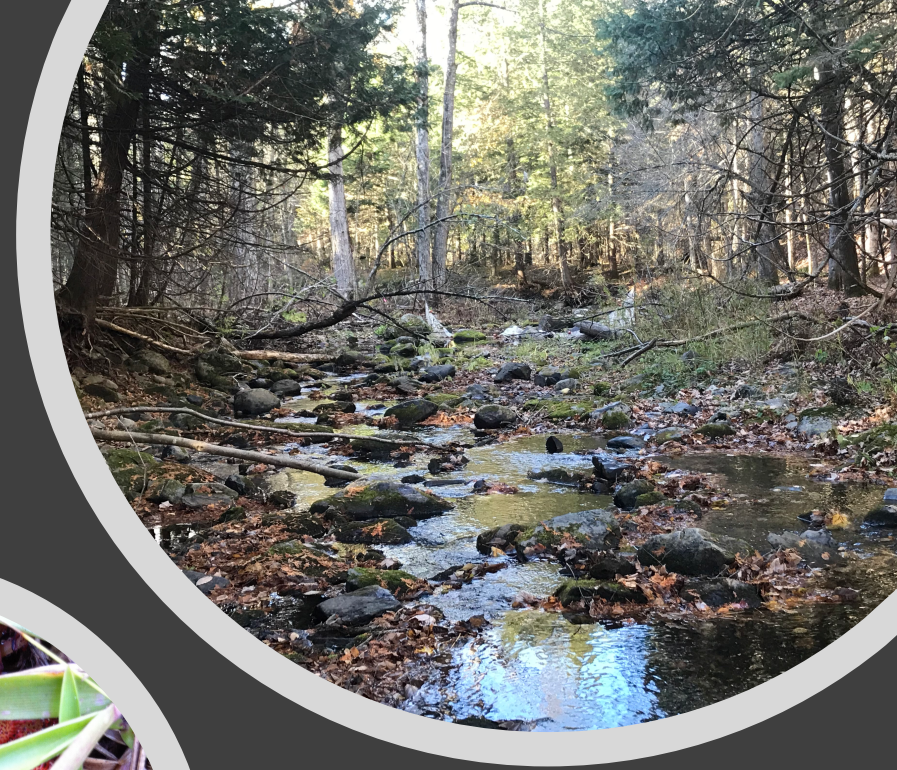
Headwaters

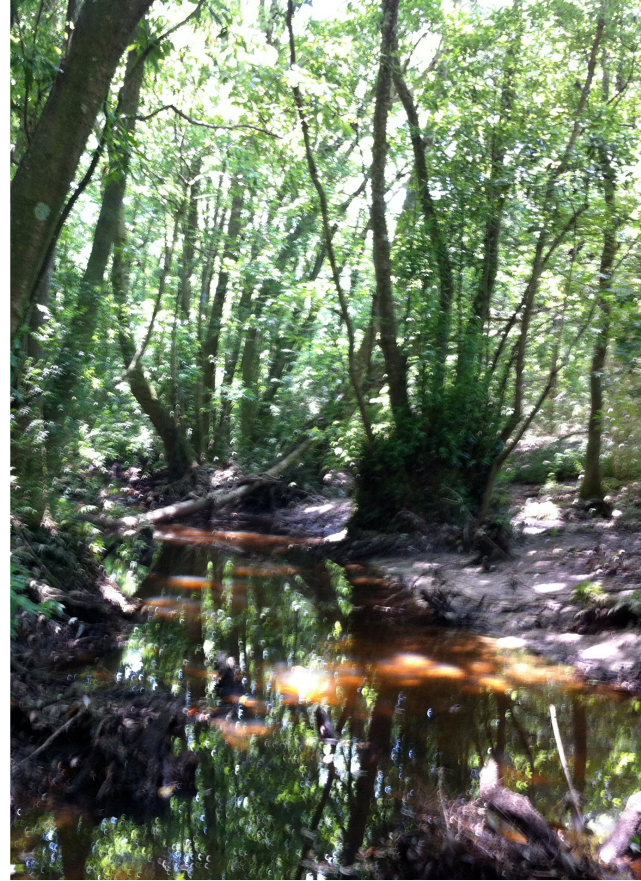
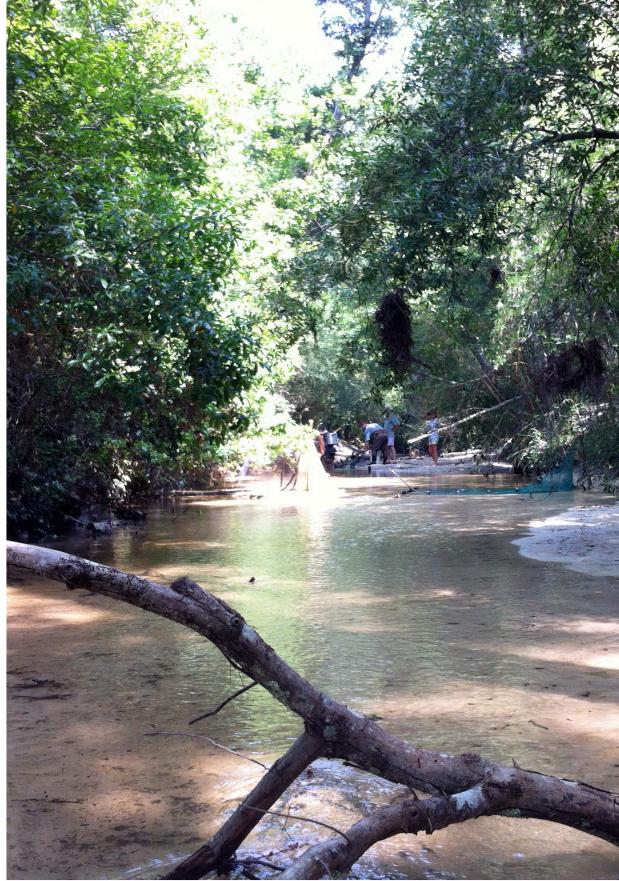
- Majority of global river networks (Datry et al. 2014)
- In US comprise 79% of river length & drain >70% of land area (Colvin et al. 2019)
- *Length likely underestimated*
- *Uneven efforts in mapping & permanence uncertainty & loss (see Colvin et al. 2019)*
- Supply clean water for 1/3 of US population (US EPA 2009)



Headwaters

- Headwater streams & wetlands outside of floodplains collectively “headwaters”
- Inherent complexity of natural systems – regionally diverse
- Provide habitat unique to (& necessary for!) larger downstream systems
- Wetlands outside of floodplains occupy 6.59 million hectares (Lane and D’Amico 2016)
- Wetland loss – up to 85% in Midwest (Dahl 1990)





Headwater Diversity – Coastal Plains

Upper Midwest - Prairie Potholes



Figure 2. Aerial view of glacially formed, depressional wetlands of the Prairie Pothole Region.
Credit: J. Ringleman, Ducks Unlimited, OCPO7-Fig37 PPR, www.usgcrp.gov



Photo Credit Jim Ringelman

Headwaters Support Ecosystems

- Perform ecological functions: biological, geochemical, physical
- Provide habitat & resources for endemic & downstream fishes & aquatic organisms
- Fuel surrounding food webs
- Contribute to nutrient cycling
- Deliver water, sediments, organic material such as woody debris to downstream systems
- Enhance flood protection
- *Provide \$15.7 Trillion USD in ecosystem services for conterminous US & Hawaii (Creed 2017)*



Arid Regions

- Ephemeral streams may make up 96% of stream systems (Meyer et al. 2003)
- Critical for maintaining these aquatic systems
- Death Valley Pupfish spawn during spring flows in Death Valley National Park, CA
- Salt Creek ceases to flow during remainder of year & Pupfish take refuge in headwater pools

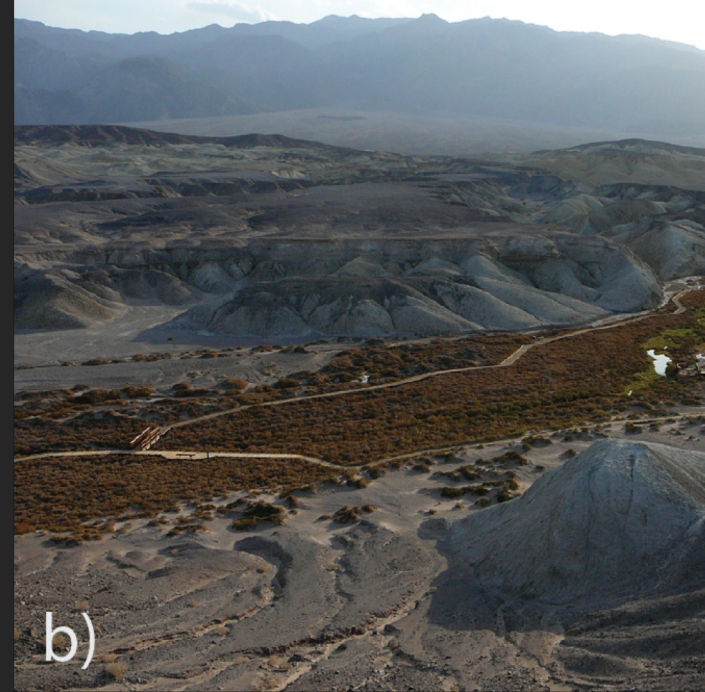


Photo Credit: A–C, National Park Service; D, Jessica Wilson, Creative Commons.

Headwaters Support Imperiled Species

- Habitat loss & pollution primary causes of aquatic biota extinction (see Colvin et al. 2019)
- Endangered Alabama Cavefish & Threatened Ozark Cavefish occupy caves supplied by intermittent streams as well as seeps & sinkholes (Graening et al. 2010, USFWS 2017)
- Federally listed Coho & Chinook Salmon juveniles occupy headwater tributaries & seasonal floodplain wetlands during winter (see Colvin et al. 2019)

