



Existing and Planned Monitoring of Non-Native Aquatic Species in Lake Powell and Below Glen Canyon Dam

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“Managing fisheries is hard: it’s like managing a forest, in which the trees are invisible and keep moving around” (J. Shepherd, from an unpublished lecture at Princeton University, ca 1978)

Outline

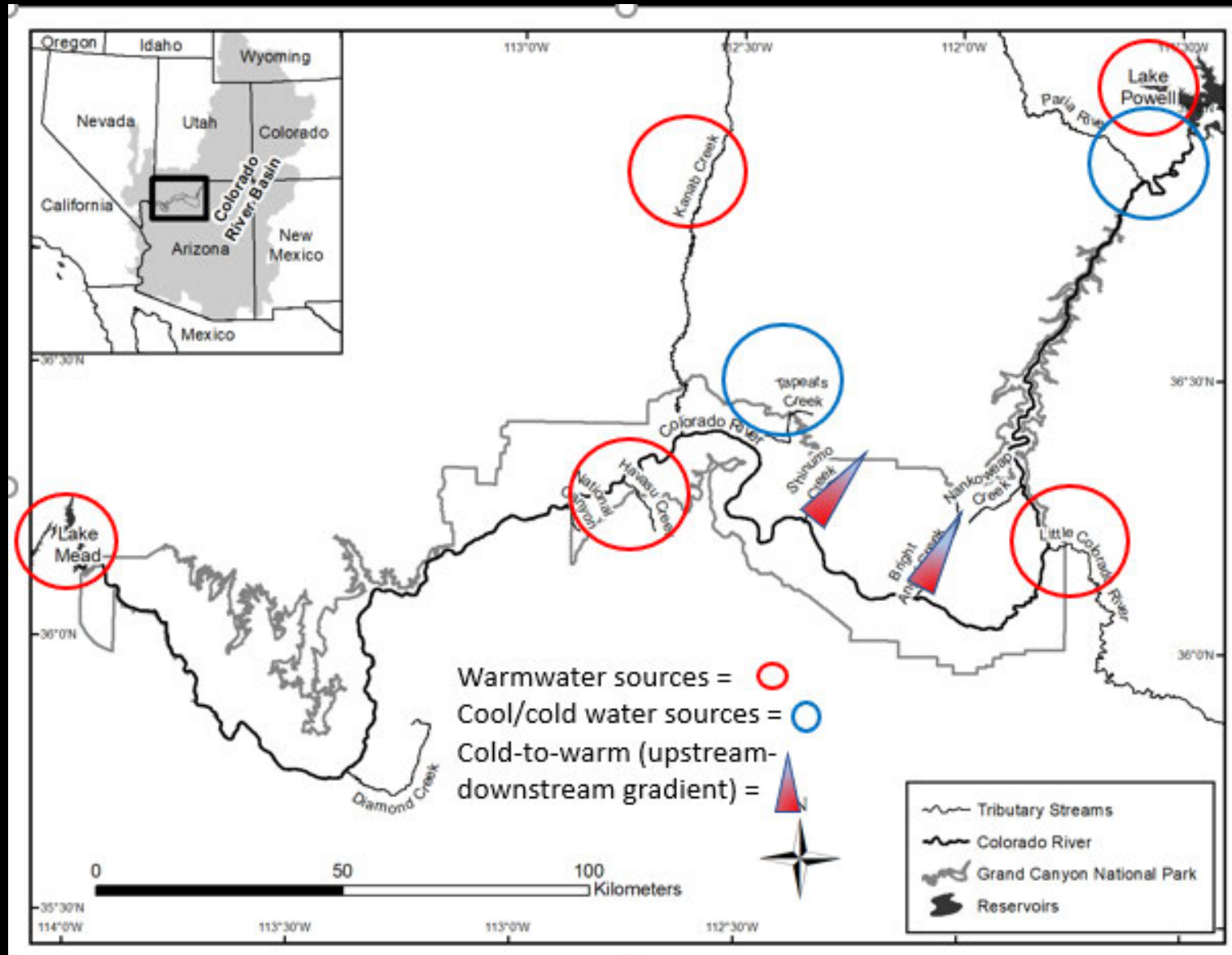
- Fish monitoring techniques
- Identify source areas
- Description of planned monitoring:
 - Objective
 - Gear type
 - Locations
 - Time of year
- Limitations & monitoring gaps

Monitoring Techniques

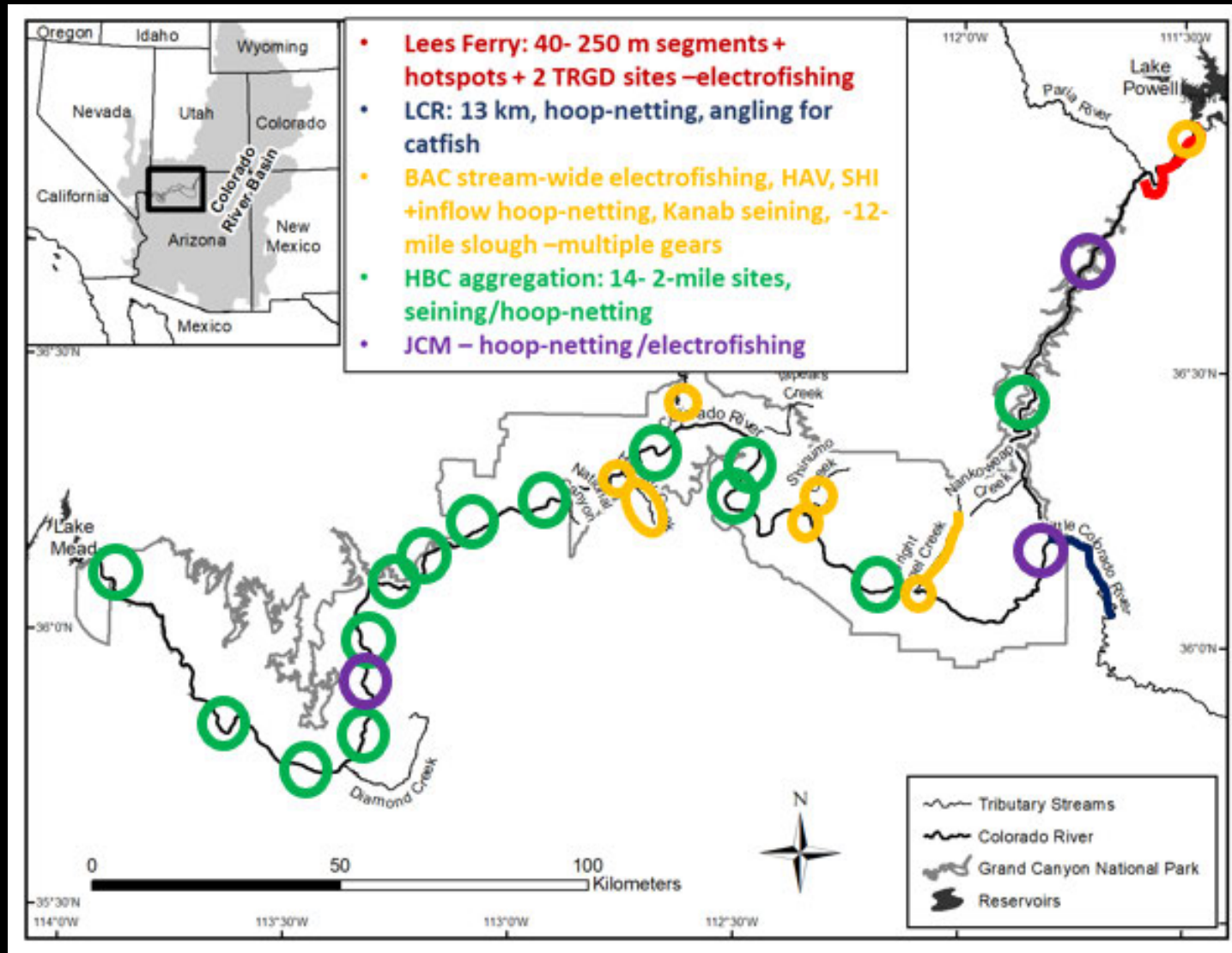
- Electrofishing
- Seining –
 - Larval
 - Small-bodied
- Trap netting –
 - Hoop netting
 - Minnow traps
- Angling - catfish
- eDNA



Location - sources

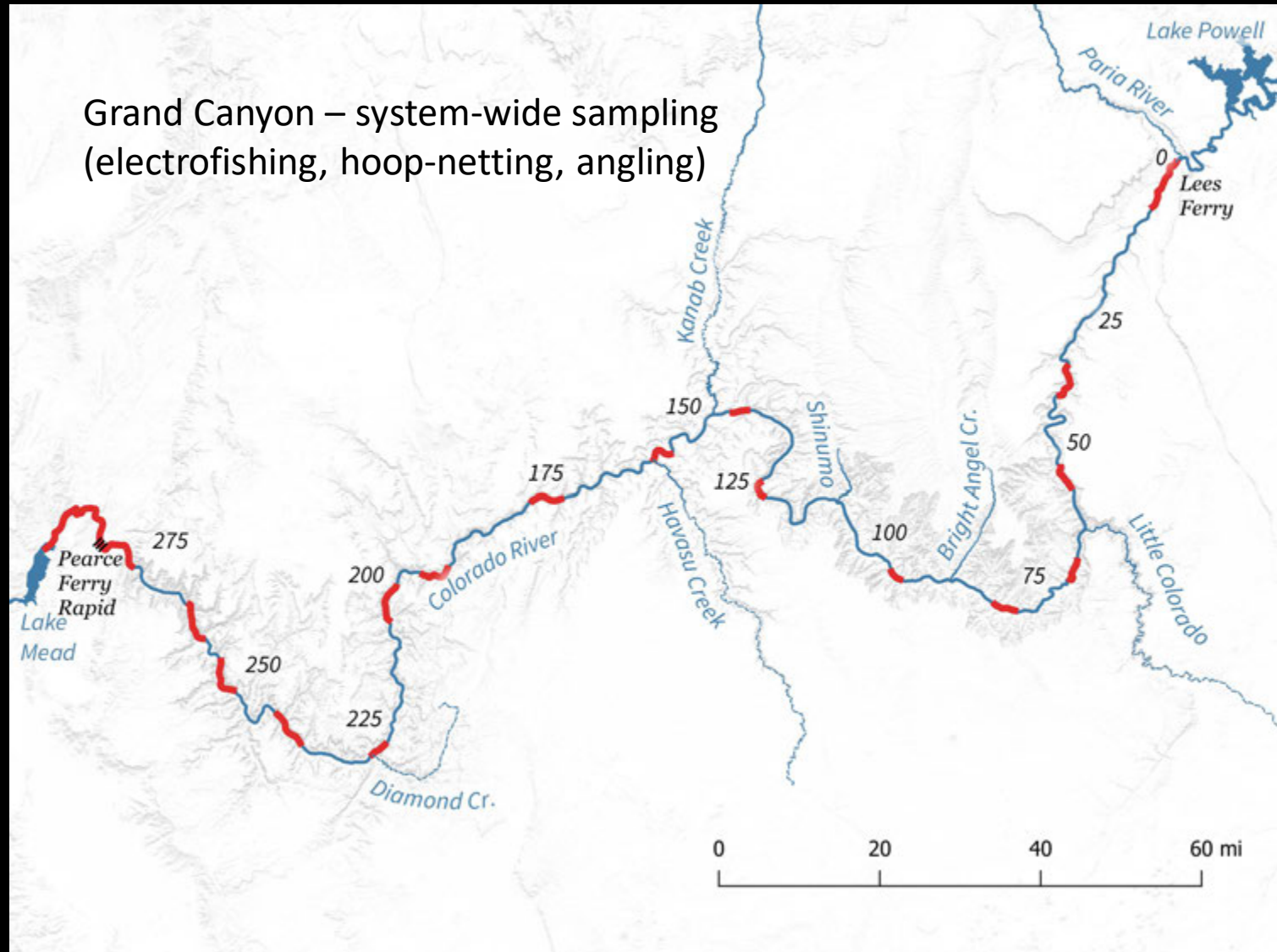


Location - sampling

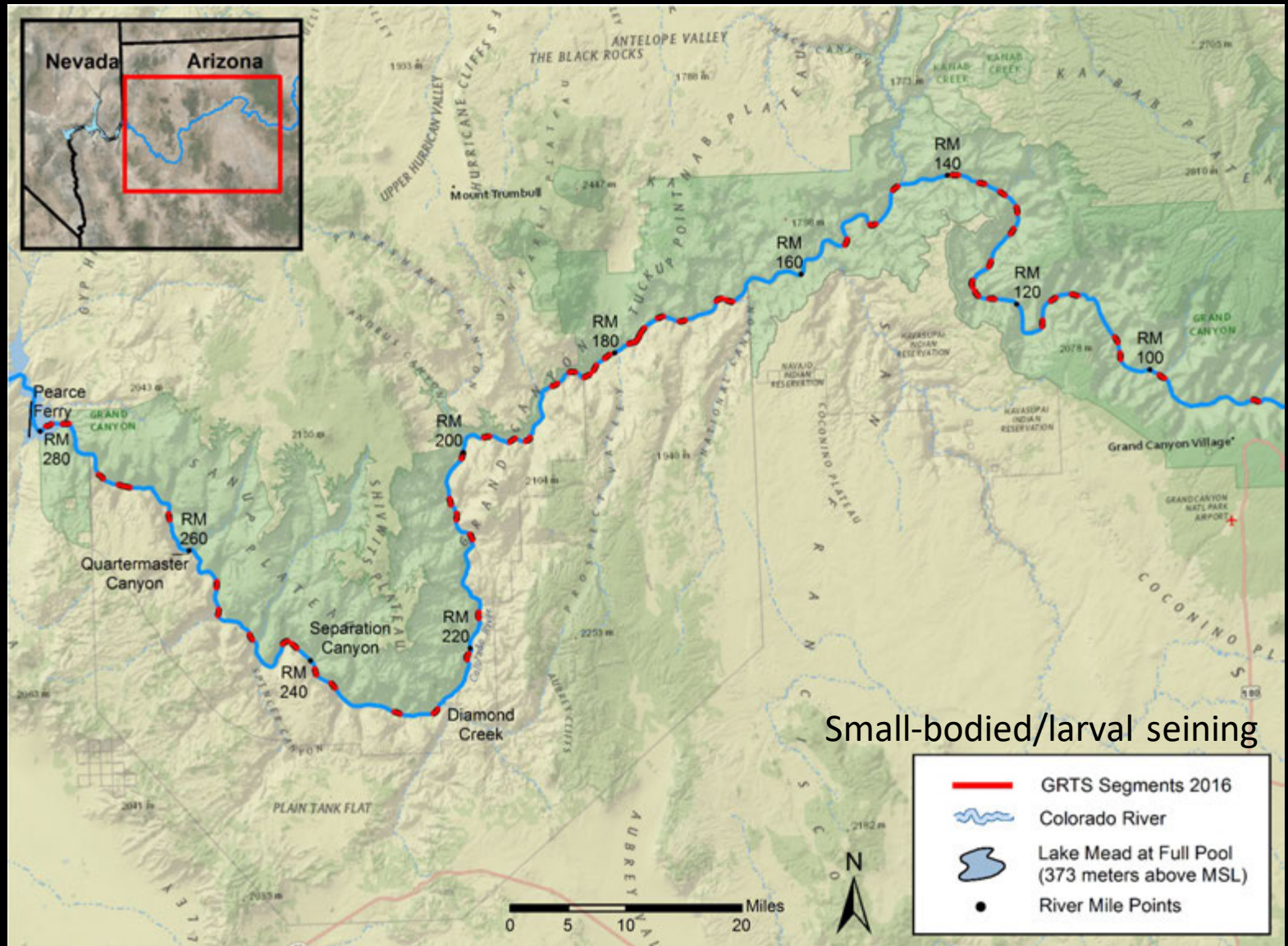


Sampling Locations

Grand Canyon – system-wide sampling
(electrofishing, hoop-netting, angling)



Location – sampling (seining)



Small-bodied/larval seining

Environmental DNA Project





Objective: *Detection of rare native and nonnative species by filtering DNA from water sample*

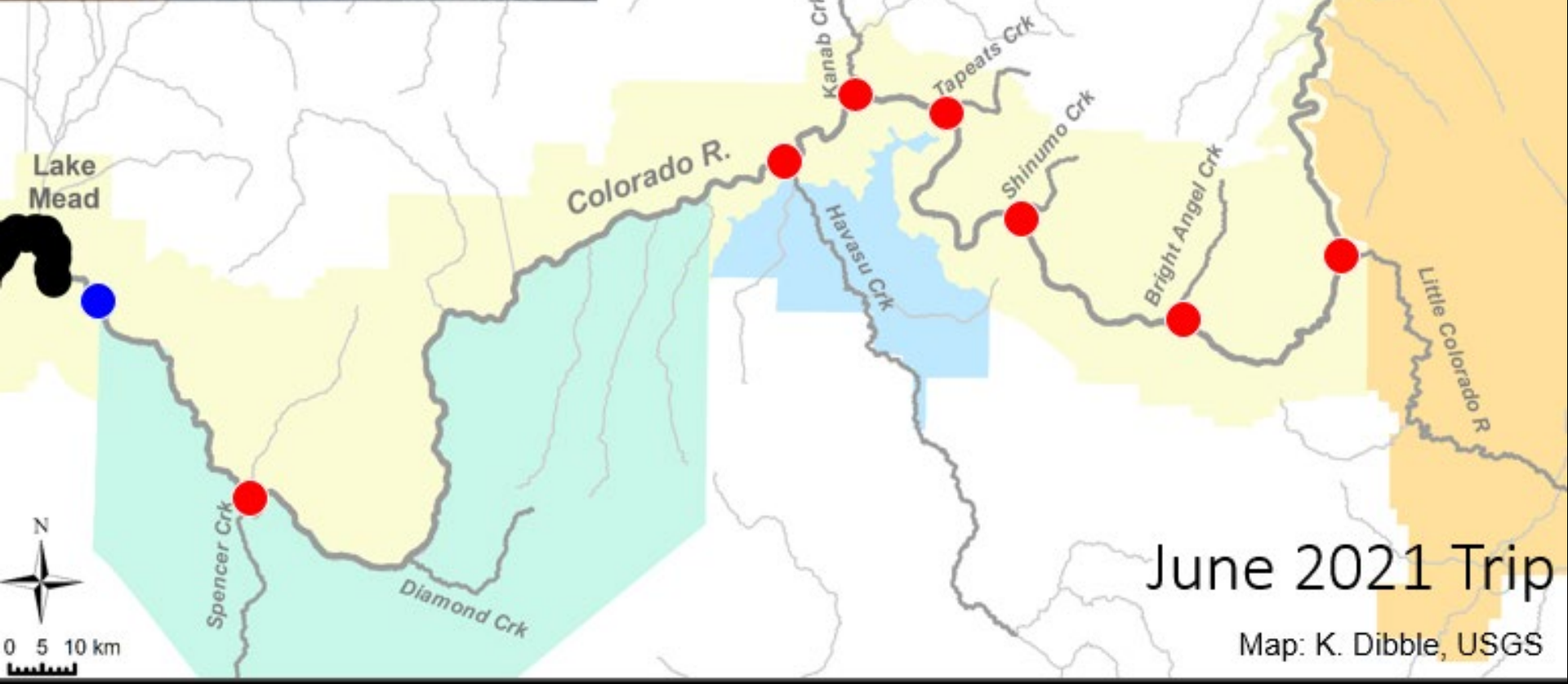
Approaches:

- Quantitative PCR
 - Species-specific
 - Relative abundance
- Metabarcoding
 - Community of fauna
 - Presence-absence





-  Havasupai Tribe
-  Hualapai Tribe
-  Navajo Nation
-  NPS Boundary



Monitoring Location and Funding Source

- System-wide: AMP
- Pearce Ferry, upstream & downstream: AMP/ BOR
- Lees Ferry catch-per-unit-effort: AMP/ BOR
- Lees Ferry TRGD project: AMP
- Little Colorado River HBC sampling: AMP
- Little Colorado River catfish sampling: AMP
- Tributary HBC Translocation & Trout Control: BOR/ NPS
- Hidden Slough GSF monitoring: BOR/ NPS
- HBC Aggregation Monitoring: AMP
- Juvenile HBC monitoring: AMP
- Larval fish monitoring: BOR
- Small-bodied fish monitoring: BOR
- eDNA sampling: FWS/ BOR/ AMP

Sampling Type & Timing

- **System-wide:** electrofishing, hoop netting, angling- April
- **Pearce Ferry, upstream and downstream:** electrofishing, hoop netting, angling- February, May, July, October
- **Lees Ferry catch-per-unit-effort:** electrofishing- March, July, September
- **Lees Ferry TRGD project:** electrofishing- January, May, October
- **Little Colorado River HBC sampling:** hoop netting- April, May, July, September, October
- **Little Colorado River catfish sampling:** angling- May, July
- **Tributary HBC Translocation & Trout Control:** electrofishing, hoop netting, minnow traps- January, February, May, June July, September, October, November, December
- **HBC Aggregation Monitoring:** hoop netting , seining- September
- **Hidden Slough GSF monitoring:** electrofishing, minnow traps- May, July, August
- **Juvenile HBC monitoring:** electrofishing, hoop netting- May, July, October
- **Larval fish monitoring:** seining- March, April, May, June, July, August
- **Small-bodied fish monitoring:** seining- April, May, June, July, August, September
- **eDNA sampling:** water collection- June

Limitations & monitoring gaps

- Gear limitations, e.g.,:
 - Size-specific
 - Temperature
 - Behavior/habitat use
 - Turbidity
 - eDNA presence/absence
- Infrequent trips targeting NNF:
 - Glen Canyon slough/hotspot
 - Tributary surveillance
 - Catfish angling
- LCR uncertainties:
 - Catfish abundance imprecision
 - Impacts on eggs/larval native fish?:
 - Plains killifish? Carp?

