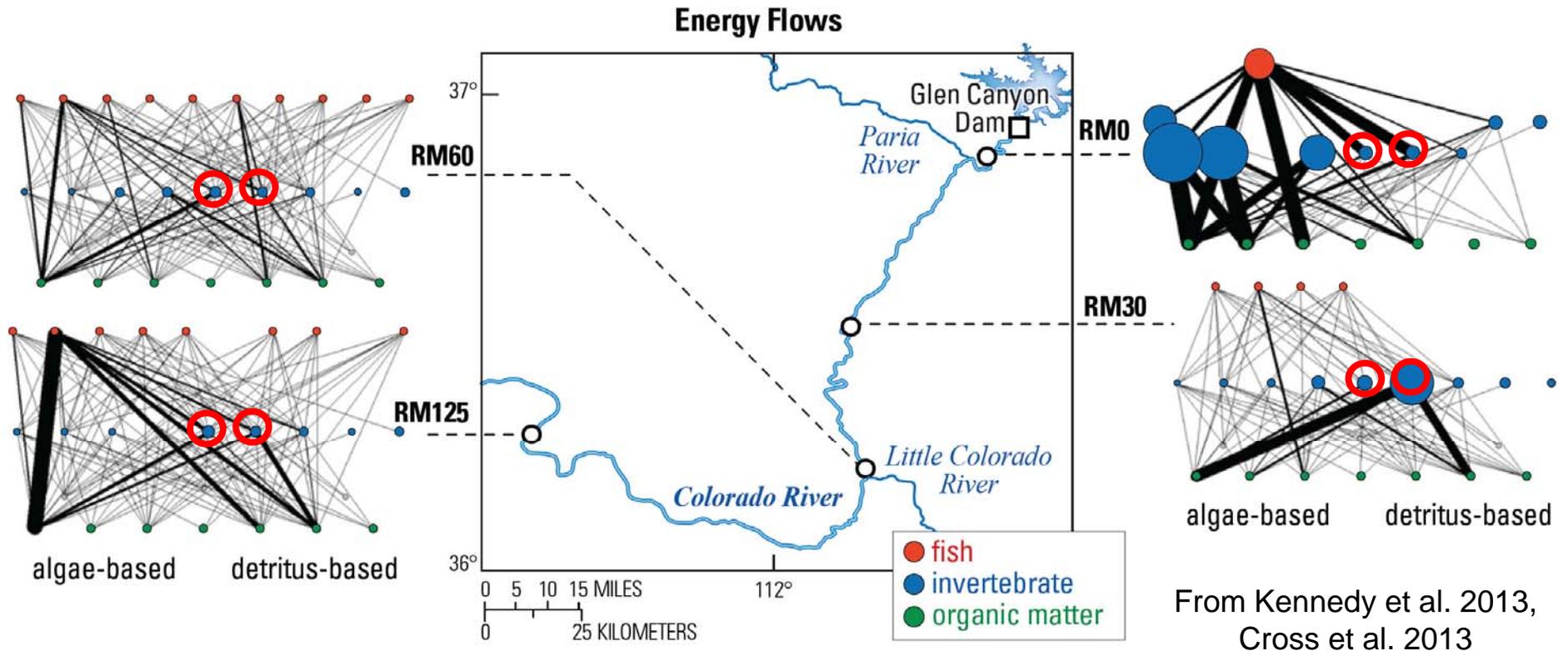


Previous Findings:



- Fish populations are food limited.
- Food web in Glen Canyon is simple and unstable.
- Midges and blackflies key prey items everywhere.
- Midges and blackflies are the only aquatic insects.

But is having only two types of insects unusual for a tailwater?

- %EPT (mayflies, stoneflies, & caddisflies): Nationally accepted metric for assessing stream health
 - *DIRECT* measure of the ability of a stream to support aquatic life



Ephemeroptera (mayflies)



Plecoptera (stoneflies)



Trichoptera (caddisflies)

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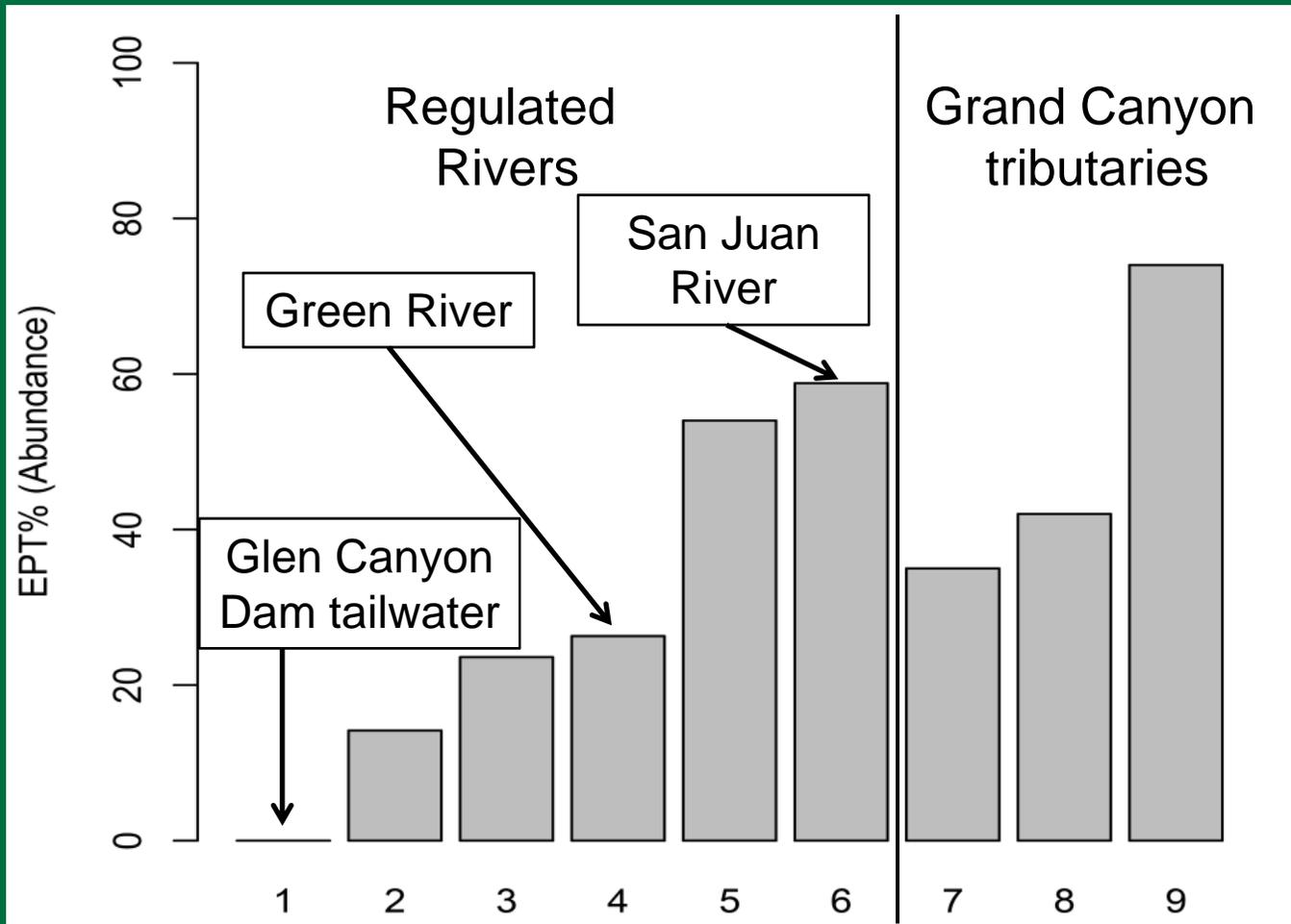
Trichoptera (caddisflies)

$$\text{EPT} = \frac{\# \text{ of } E,P,T}{\text{total \# of invertebrates}}$$

OR

Proportion of mayflies,
stoneflies and
caddisflies

Having only two types of insects (and no mayflies, stoneflies or caddisflies) is unusual



By this metric, Glen Canyon invertebrate assemblage is **IMPAIRED**

Key: 1) Colorado River, 2) Kootenai River, 3) Flathead River, 4) Green River, 5) Madison River, 6) San Juan River, 7) Bright Angel Creek, 8) Shinumo Creek, 9) Havasu Creek. Grand Canyon tributary data courtesy of Brian Healy, NPS. Regulated rivers data courtesy of Kim Dibble, USGS.

- All proposed actions have potential to improve the fishery and some have potential to improve the prey base and move assemblage to include mayflies, caddisflies and stoneflies.
- Habitat enhancements might create more favorable foraging arenas for fish and new habitat for bugs, but seems unlikely enhancements alone will allow for colonization of mayflies, caddisflies and stoneflies.

- May gain additional insights about roles temperature vs. flow and relation to lack of mayflies, caddisflies and stoneflies.
- Planning to model EPT (mayflies, caddisflies and stoneflies) among tailwaters as a function of temperature and hydrologic metrics. May inform whether flow or temperature are main factors responsible for current condition.

- After analyses complete, propose convening expert elicitation panel to evaluate likely causes of zero EPT (no mayflies, caddisflies or stoneflies).
- Could include temperature alteration, flow alteration, past extirpation and present recruitment limitation, and habitat, and likely interactions. Given the complexity, expert elicitation and modeling of data from other tailwaters most appropriate approach.

- Very interested in developing a new project focused on resolving uncertainties related to enhancing the foodbase.
- Approaches outlined by FFF are logical next steps from science, learning and resource enhancement perspectives
- Must work closely with NPS to help design such a project to maximize learning.