Update on the Bug Flows Experiment

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Theory Behind Bug Flows

- Daily hydropower flows create “tides”
- Insects lay eggs at water line at dusk
- When tide drops, eggs dry, die

Kennedy et al. 2016 BioScience
Goals of Bug flows

- Improve egg-laying conditions for bugs!

  Thus:

  - Increase abundance of midges
  - Increase abundance/diversity of EPT
    - (mayflies, stoneflies, caddisflies)
  - Improve fish condition
Design of Bug Flows

- Give bugs the “weekends off”
- Stable, low flows on weekends, May-August
- Eggs laid on weekends won’t dry/die

“Bug Flows” tested at Glen Canyon Dam May-August of 2018, 2019, 2020
In the past we’ve shown you:

- Midge spatial pattern
- Midge, caddisfly abundance
- Midge, caddisfly phenology
- Lees Ferry midges monthly

These are based on:

- Citizen science light traps (~1000 yearly)
- Lees Ferry sticky traps (~60 monthly)
With COVID-19 in 2020:

- Midge spatial pattern
- Midge, caddisfly abundance
- Midge, caddisfly phenology
- Lees Ferry midges monthly

These are based on:

- Citizen science light traps (~1000 yearly)
- Lees Ferry sticky traps (~60 monthly)

~450 (~250 done)
Lees Ferry monthly patterns

- **2018 and 2019:** Extreme May emergence
- **2020:** Normal?
- **But May 2020 hydrograph was unusual**

Unpublished data, subject to change, do not cite.
2020 as a rubber match?

2018
- Dry/warm early, normal later
- High-normal bugs, and early
- Bug sine wave breaks?

2019
- Wet/cold early, dry/warm later
- Normal-high bugs, but late
- Bug sine wave returns?

Due to COVID-19, 2020 will NOT fully settle this!

Consider continuing in 2021…
Why not do Bug Flows in 2021?

**Known outcomes**
1. Better fishing
2. High wknd emerg.
3. High May emerg.
   - Wet wknd eggs
   - High wknd algae
   - Hydropower cost

**Less certain outcomes**
A. Spatial sine wave
B. Midge increase
C. Caddisfly increase

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What about the FLAHG flow?

- Complementary? Yes
  - Bug Flows: Egg stage
  - FLAHG flow: Larval stage
- Complicating? Yes
  - Will make data analysis harder
- Confounding? No
  - Effects can be disentangled

**Bug Flows**
- Sine wave pattern
- Grand Canyon focus

**FLAHG flow**
- Insect, NZ mudsnail count
- Lees Ferry focus

*No (scientific) issues with FLAHG flow + Bug Flows in 2021*