



DAVID HERASIMTSCHUK

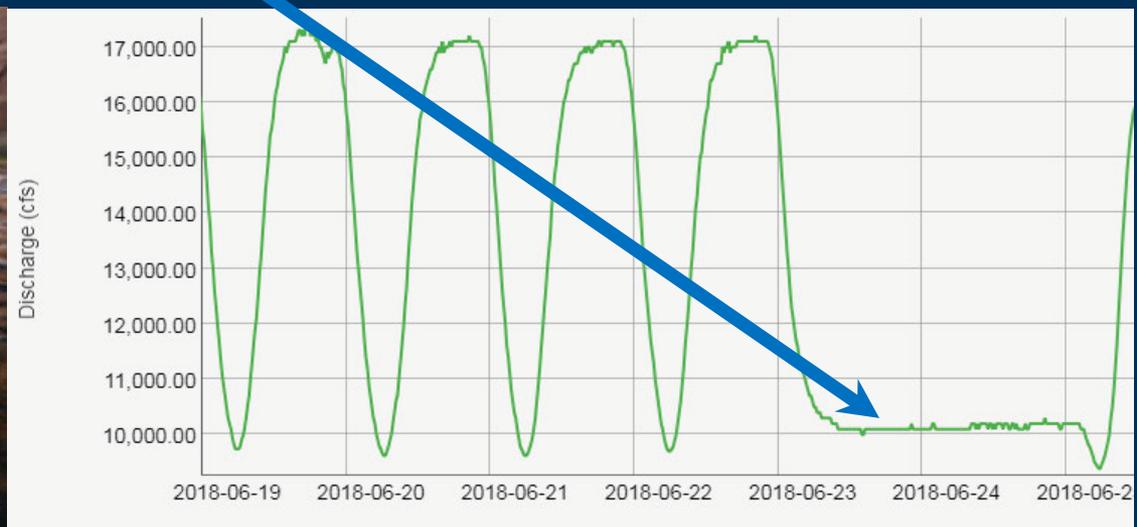
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Bug Flows Monitoring Results

Ted Kennedy

Design of Bug Flows

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



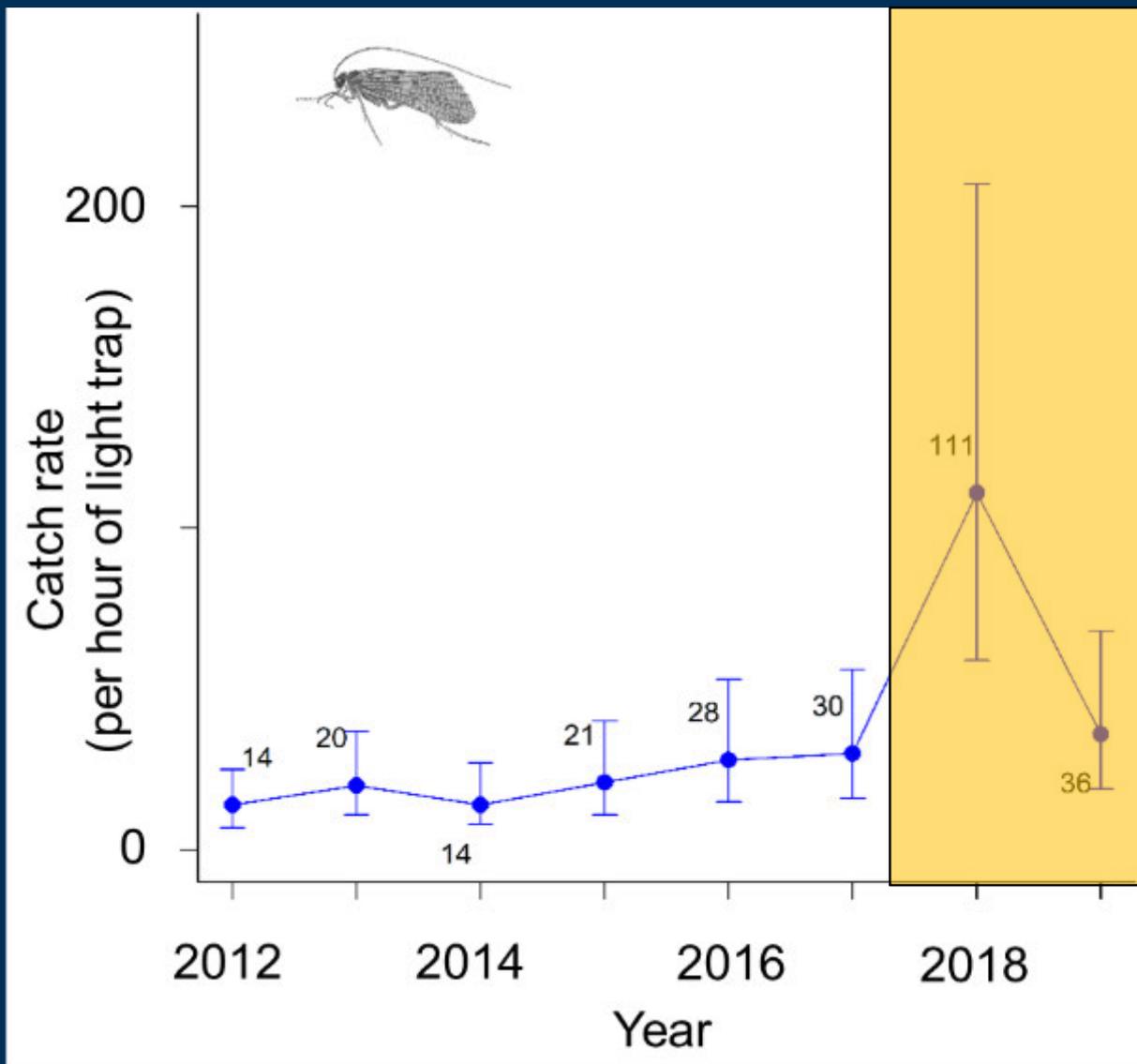
https://www.gcmrc.gov/discharge_qw_sediment/station/GCDAMP/09380000



***“Bug Flows” tested at Glen Canyon Dam
May-August of 2018 & 2019!!***

Insect Response Equivocal

2018-Huge Increase!
2019-Back to earth

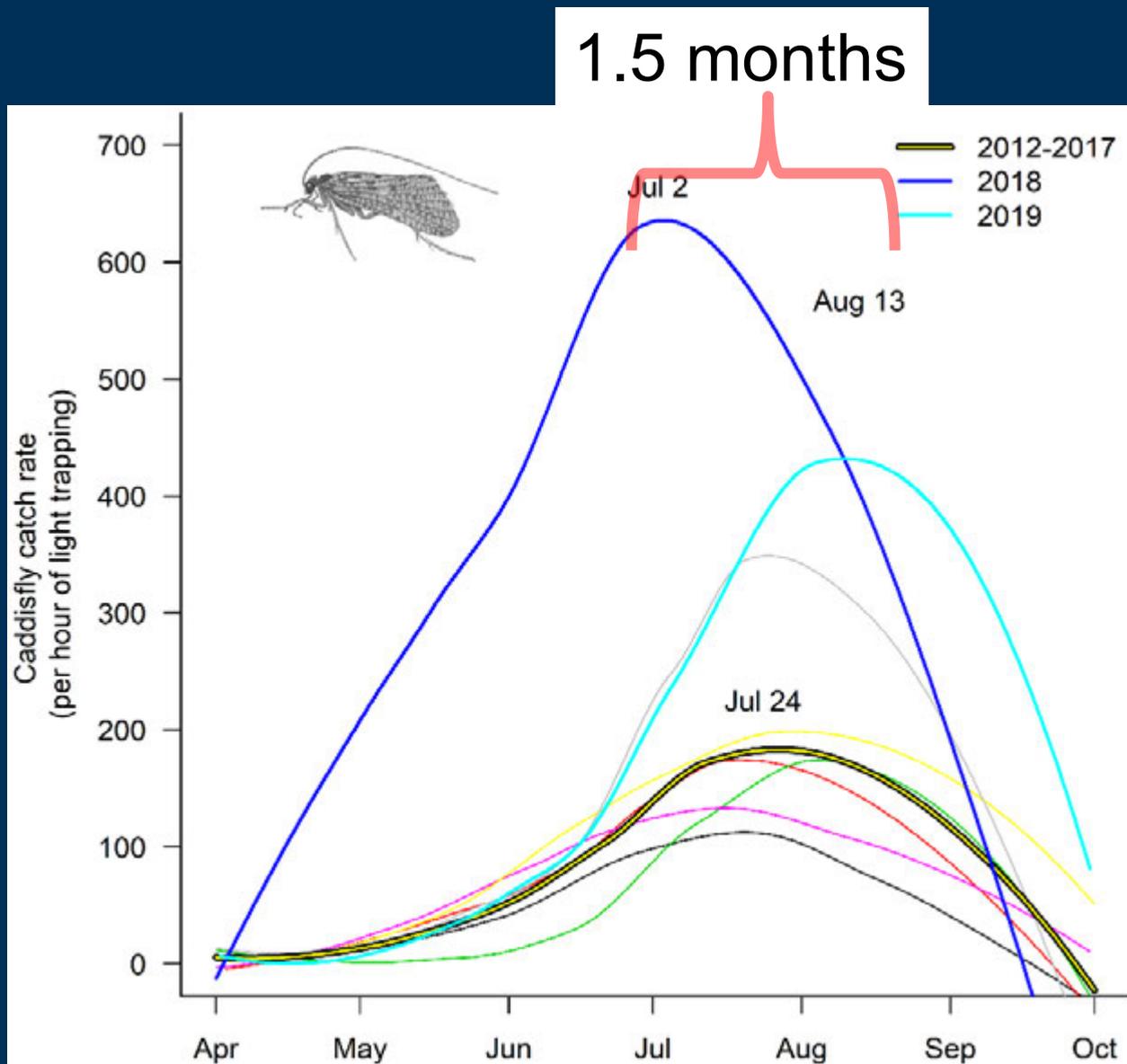


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But Caddisflies Emerged Later?

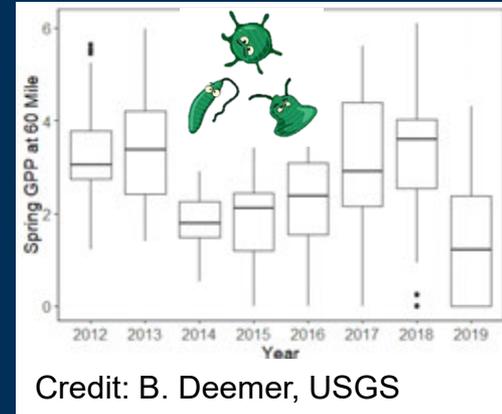
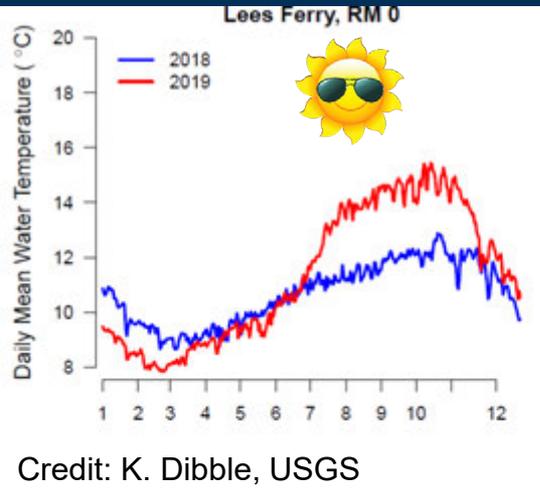
- 2018: early
- 2019: late

Midges 3.5 months later in 2019!

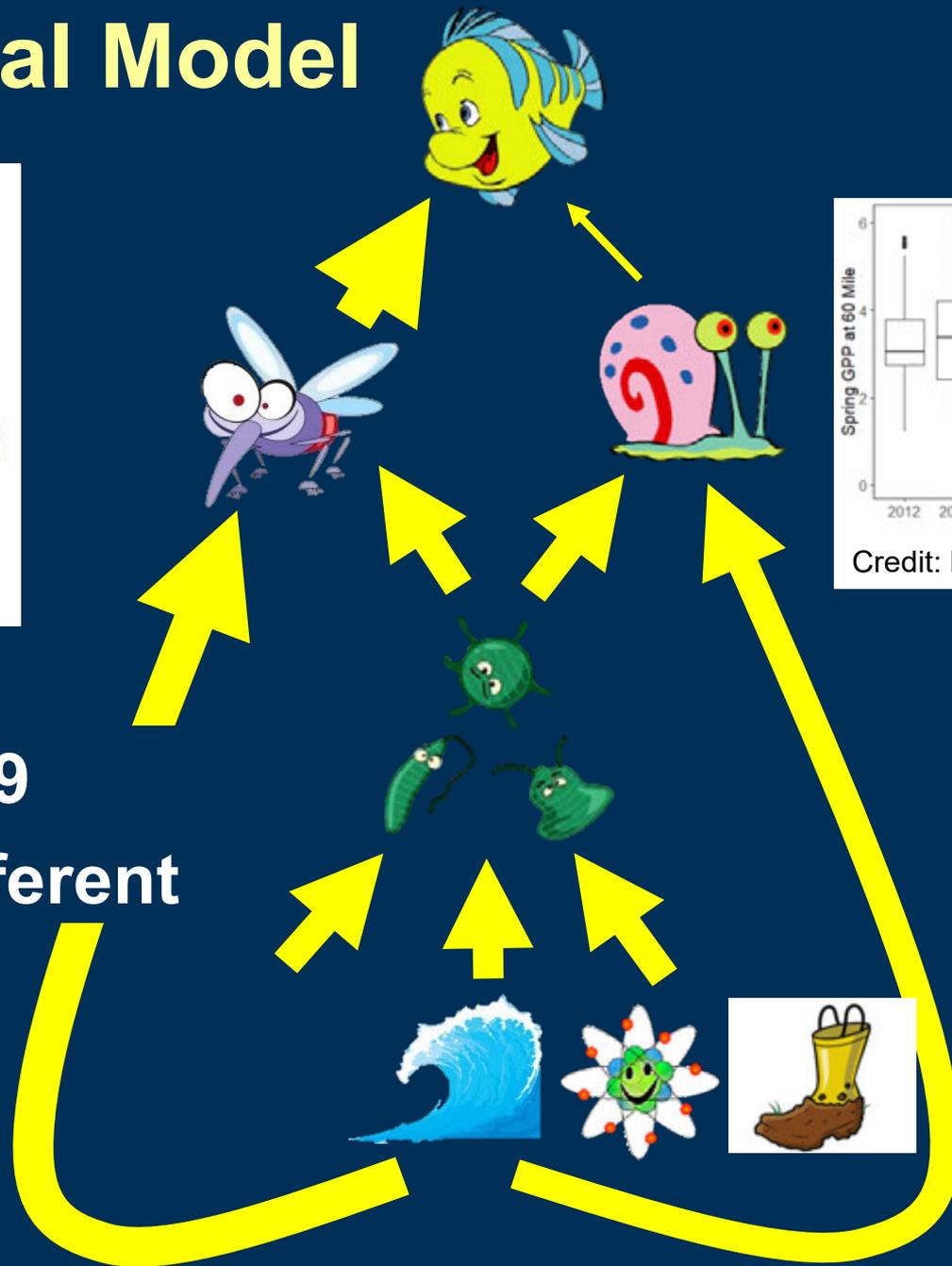


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Conceptual Model



2018 and 2019
were very different



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Growing conditions → phenology



If growing conditions good

- Emergence early
- Body size large
- Lots of emergence

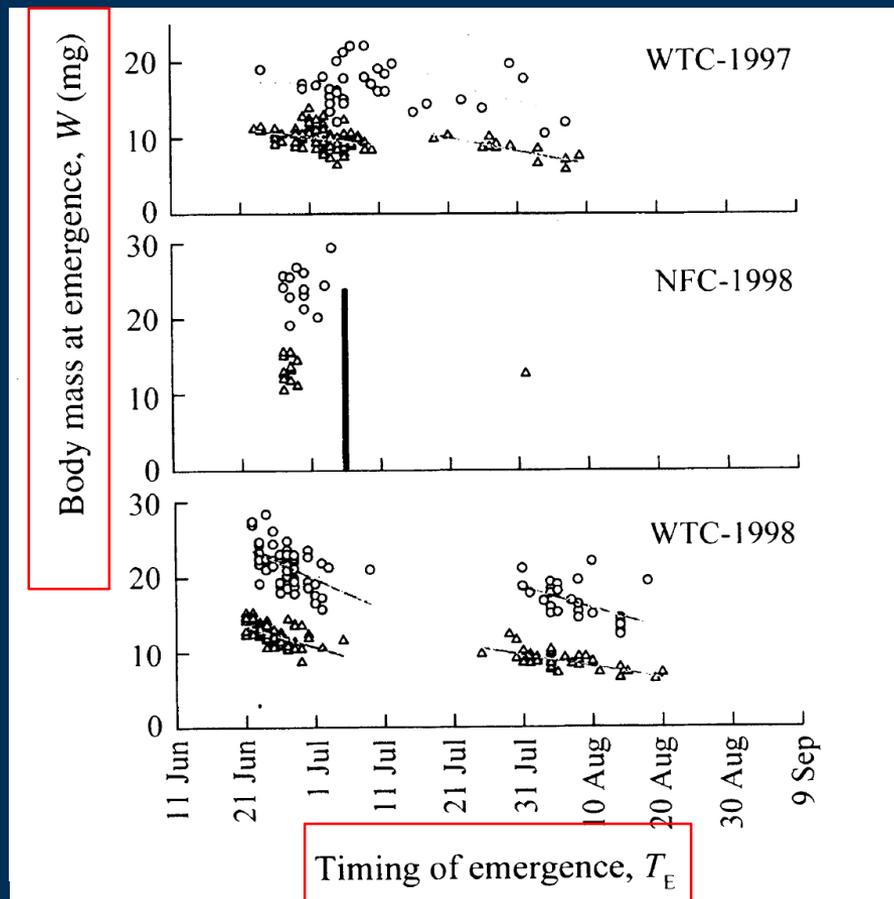
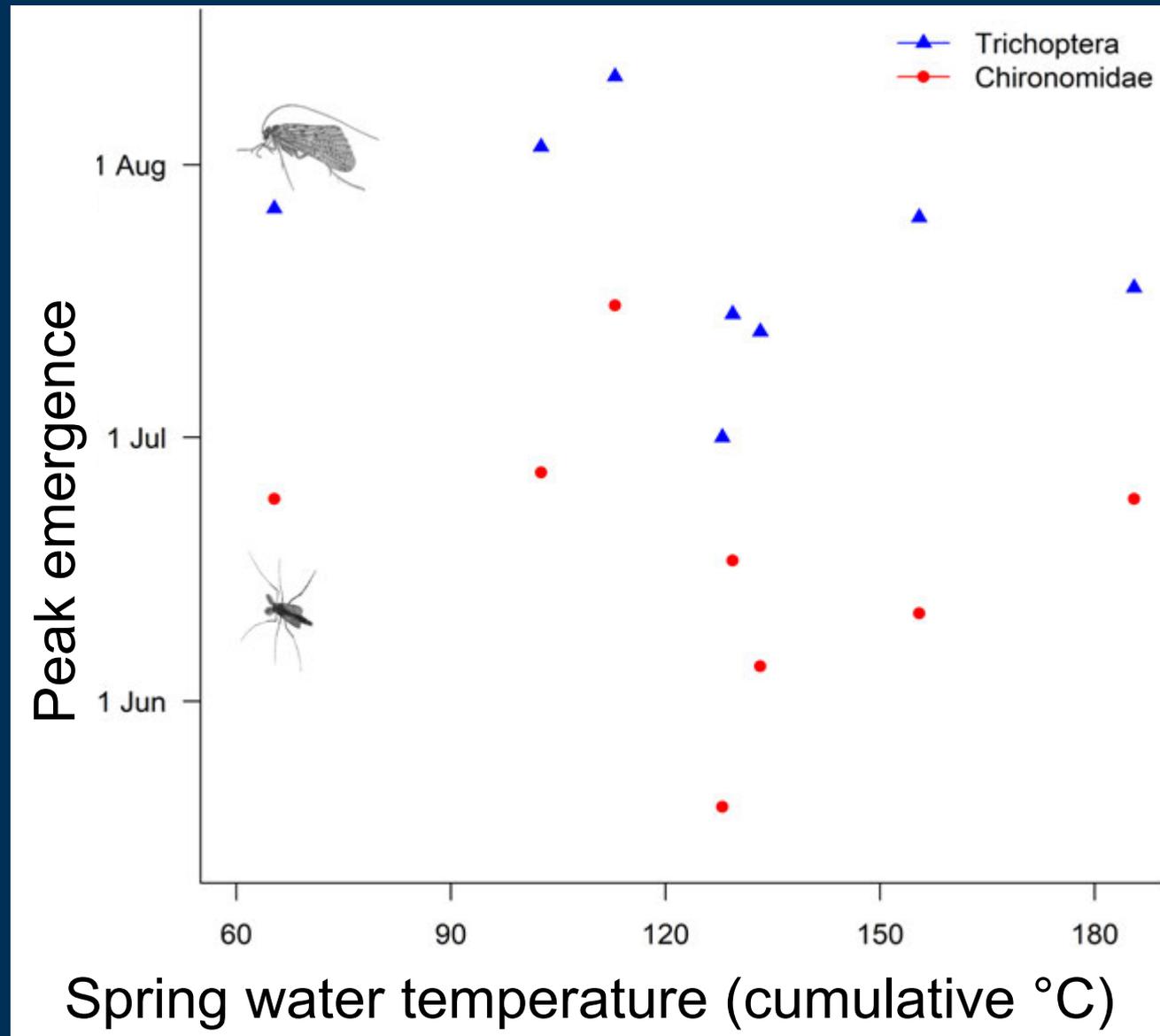


FIG. 4. Body mass at emergence as a function of timing of emergence at the five site-years. Solid bars denote occurrences of flash floods. Solid lines denote significantly negative regression slopes; dotted lines were nonsignificant. See Table 1 for regression-analysis details.

Temperature \neq phenology

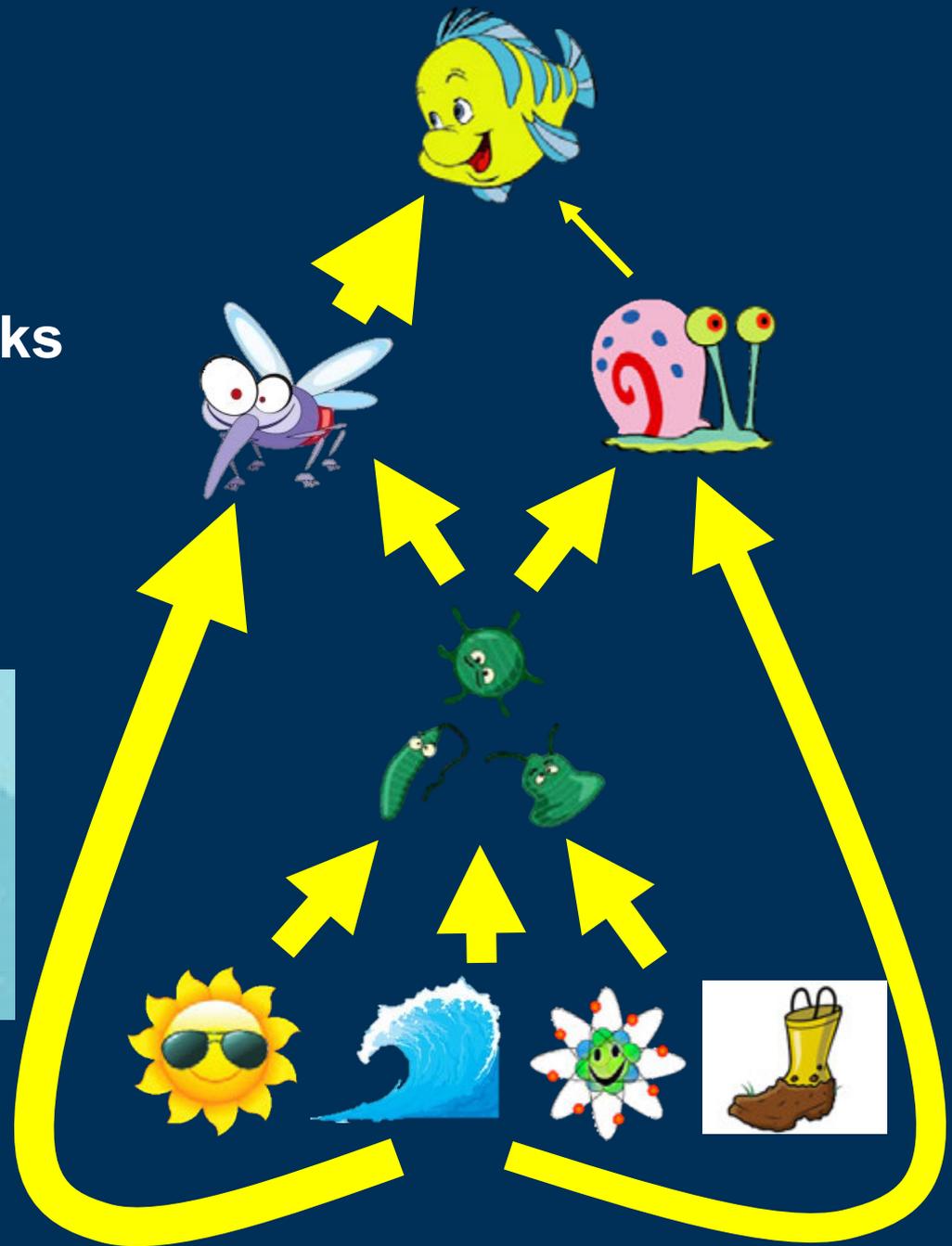
Water temp
poor
predictor of
insect growth



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Prediction

- Midge emergence peaks ...early June 2020
- Caddisfly emergence peaks ...mid July 2020



Don't forget to emerge!

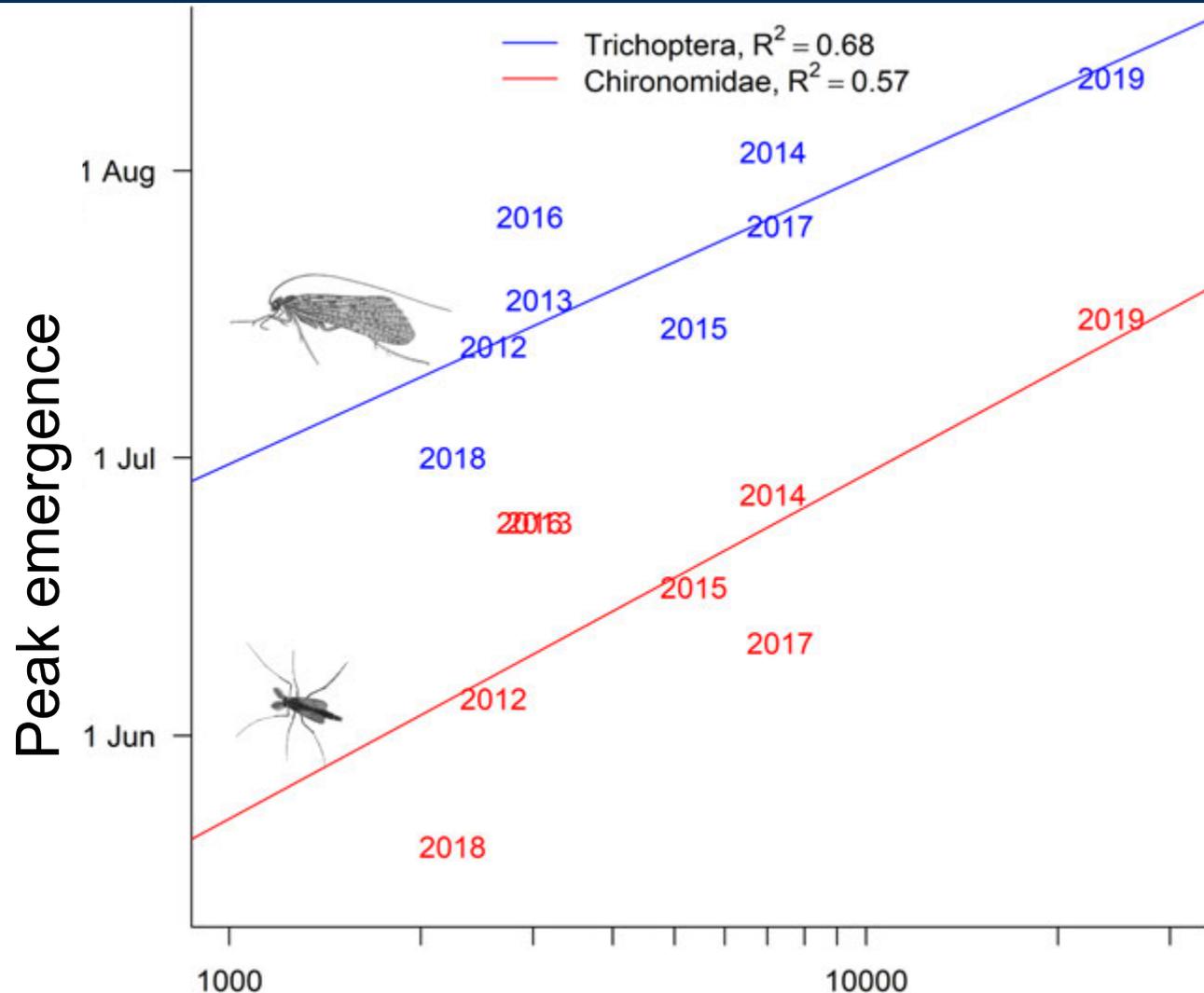
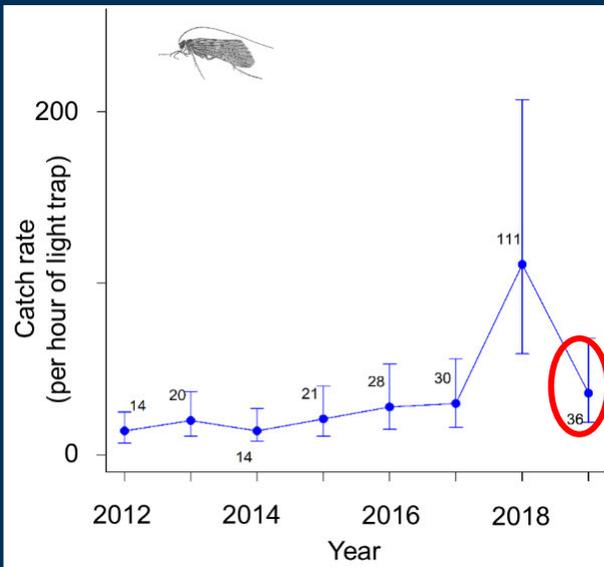


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Suspended sediment → Phenology

Growing conditions in 2019 were bad:

- 10X more mud than 2018



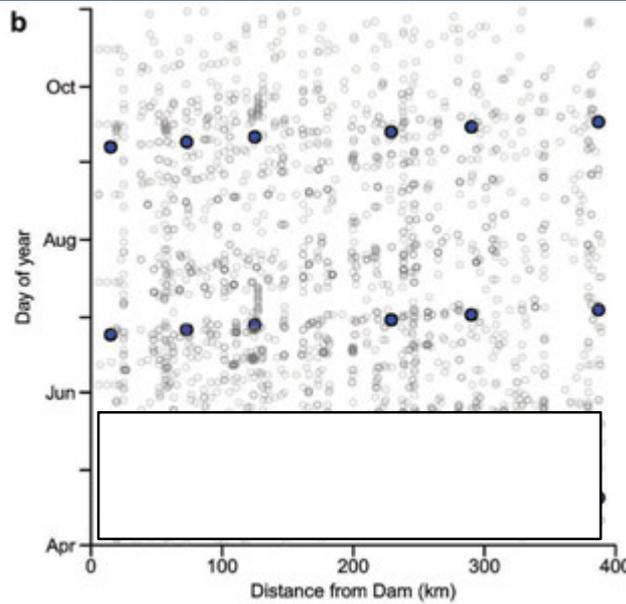
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Cumulative "Mud" in Spring (mg/L)
(Silt + Clay, March 1-May1, RM166 gage, National Canyon)

Monitoring 2020 Bug Flows

No river trips until May 22

- Statistical power still high w/ delayed start
- AND would still observe
 - early-June midge peak
 - mid-July caddisfly peak



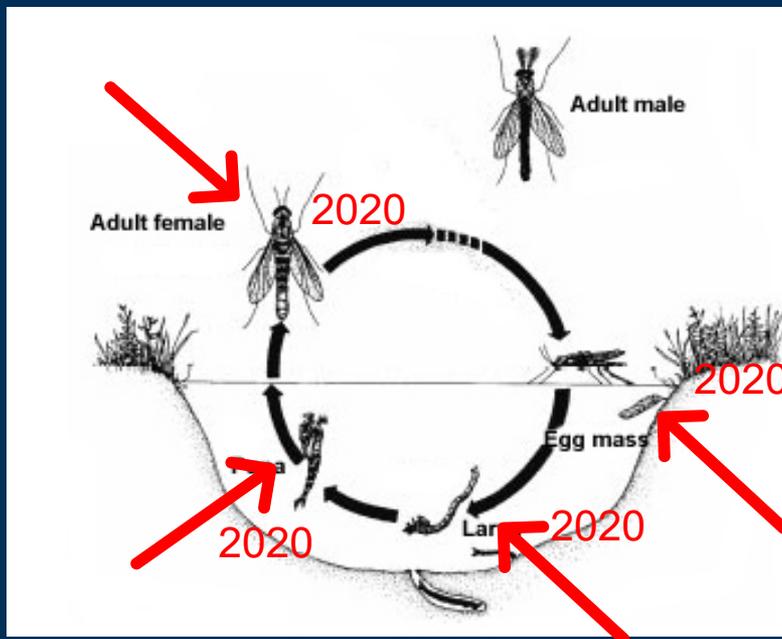
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***In discussion w/ NPS about new
sampling at Lees Ferry and Phantom***

But what if there is no monitoring in 2020?

- Unable to detect 'short-term' effects of 2020 Bug Flows
- Unable to detect 'long-term' effects of 2019 Bug Flows

Short-term (instantaneous)



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Long-term (whole life cycle)

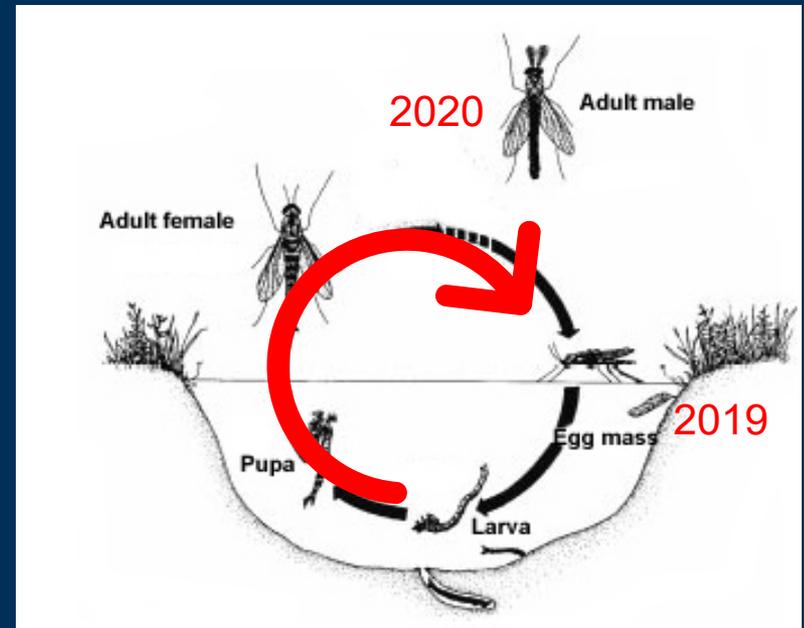


Image credit:
<http://www.ces.ncsu.edu/depts/ent/notes/Urban/images/midge-lc.jpg>

Questions?

