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2020 GCDAMP Annual Reporting Meeting Overview – Part 1

Adaptive Management Work Group Meeting
Feb 12-13, 2020

Scott VanderKooi
Southwest Biological Science Center
Grand Canyon Monitoring and Research Center

U.S. Department of the Interior
U.S. Geological Survey

Outline

- Part 1
  - Humpback Chub
  - Native and Nonnative Fishes
  - Bug Flows
- Part 2
  - Nutrients and Temperature as Ecosystem Drivers and Lake Powell
  - Riparian Vegetation
  - Warm-Water Invasive Fishes
  - Trout
- Part 3
  - Sediment
  - Archaeological Site Monitoring
  - Socioeconomics and Hydropower

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(*Feb 12, 2020*)

Humpback Chub – Project G

(*Feb 12, 2020*)

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(*Feb 12, 2020*)

Annual spring abundances of HBC ≥150 mm and ≥200 mm in lower 13.6 km of LCR

2019 spring abundance estimates for sub-adults and adults increased in 2019. Adult abundance upward trend since 2015 continued.

(*Feb 12, 2020*)

Provisional data. Do not cite.

Annual spring abundances of HBC 150-199 mm in lower 13.6 km of LCR

2019 spring abundance estimate for sub-adult humpback chub (150-199 mm) in the Little Colorado River. 3-year average is 2,509 fish, exceeds 2016 BiOp tier-1 trigger level of 1,250.

(*Feb 12, 2020*)

Provisional data. Do not cite.

Fall abundances of adult humpback chub in the LCR aggregation (>199mm TL)

Adult abundance as estimated in multi-state model is stable and exceeds 2016 BiOp tier-1 trigger level of 9,000.

(*Feb 12, 2020*)

Provisional data. Do not cite.

July Abundance of Age-0 Humpback Chub: Little Colorado River

Although adult abundance is stable, little age-0 production seen in the LCR in 2016-2018. Increase in abundance observed in 2019 reverses this trend, but may see a decrease in adult abundance in the next 3-5 years.

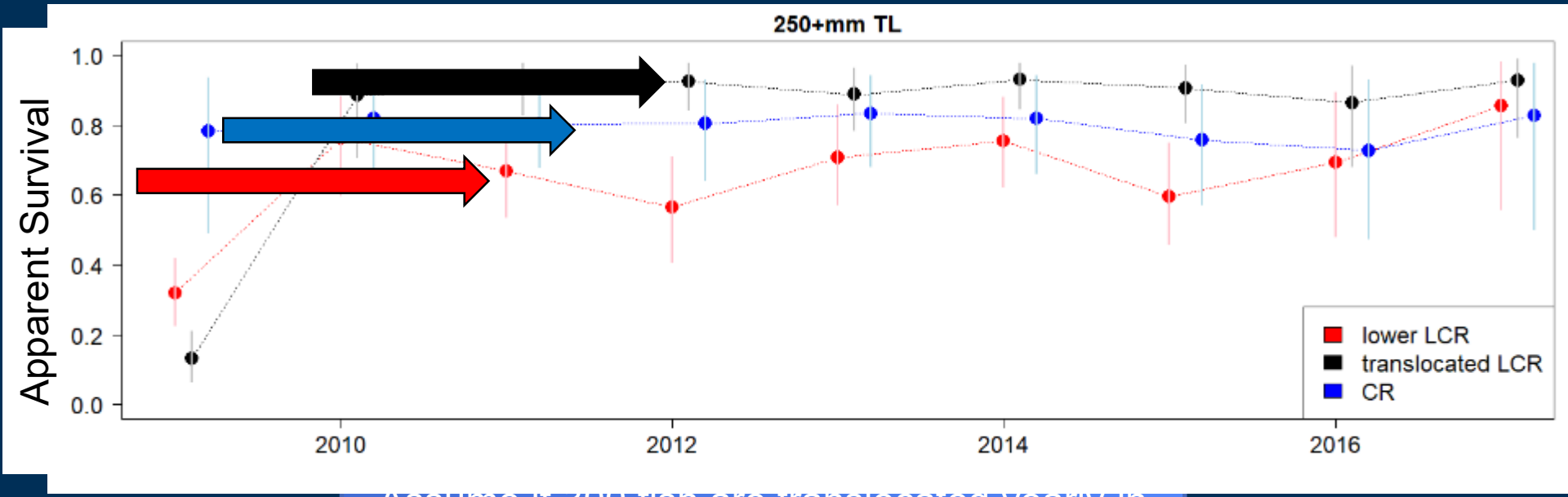
(*Feb 12, 2020*)

Provisional data. Do not cite.

Translocations and Chute Falls Monitoring

(*Feb 12, 2020*)

Apparent Survival Humpback Chub: Translocated vs Not Translocated



Assume if 300 fish are translocated yearly in perpetuity, adult abundance would be 350 adults higher vs. if no translocations occurred.

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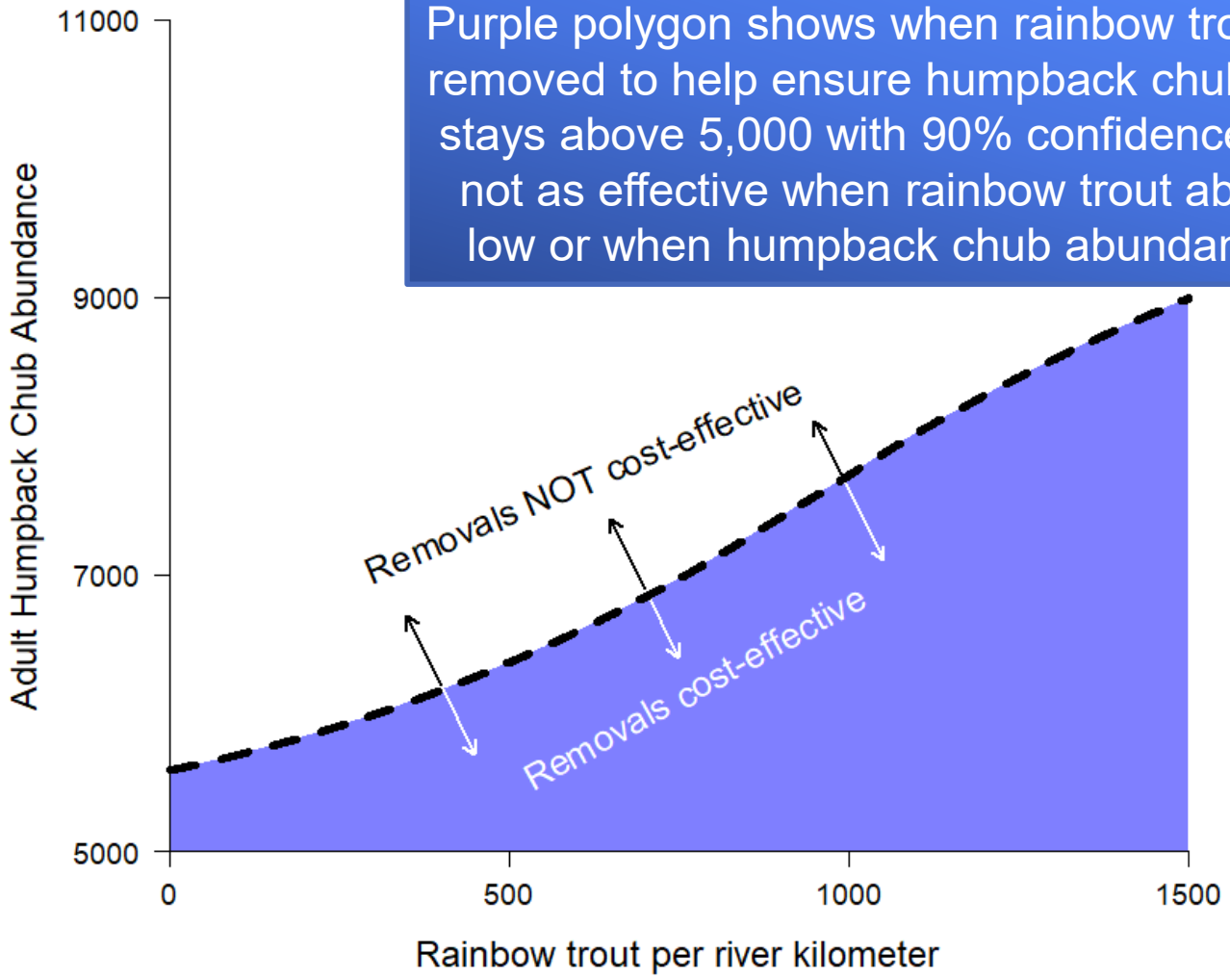
(*Feb 12, 2020*)

(USGS and USFWS Preliminary Data, 2019. Do Not Cite.)

Humpback Chub Translocations – Quantifying Effectiveness

Purple polygon shows when rainbow trout should be removed to help ensure humpback chub abundance stays above 5,000 with 90% confidence. Removals not as effective when rainbow trout abundance is low or when humpback chub abundance is high.

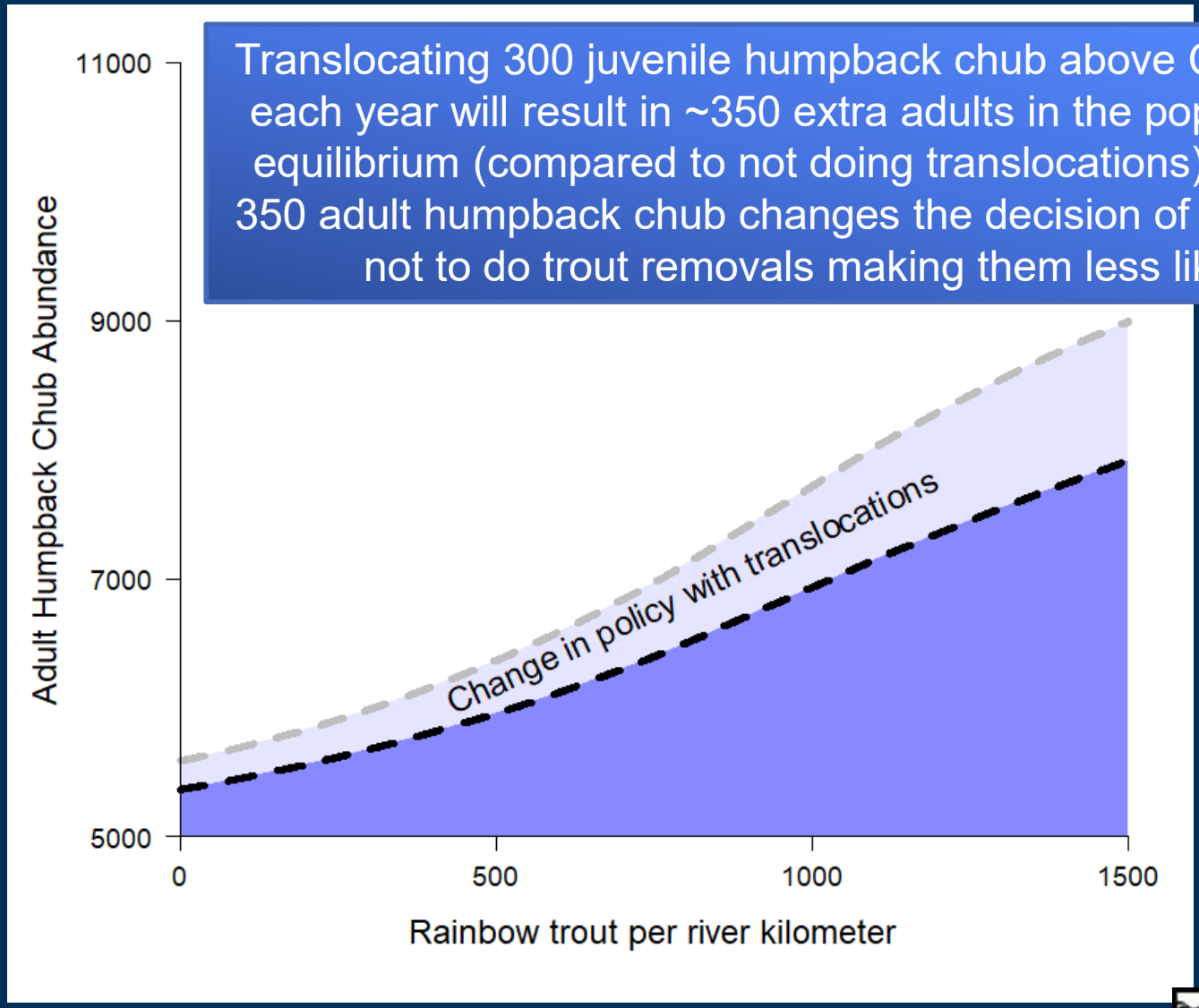


(*Feb 12, 2020*)

Provisional data. Do not cite.

Humpback Chub Translocations – Quantifying Effectiveness, cont.

Translocating 300 juvenile humpback chub above Chute Falls each year will result in ~350 extra adults in the population at equilibrium (compared to not doing translocations). An extra 350 adult humpback chub changes the decision of whether or not to do trout removals making them less likely.

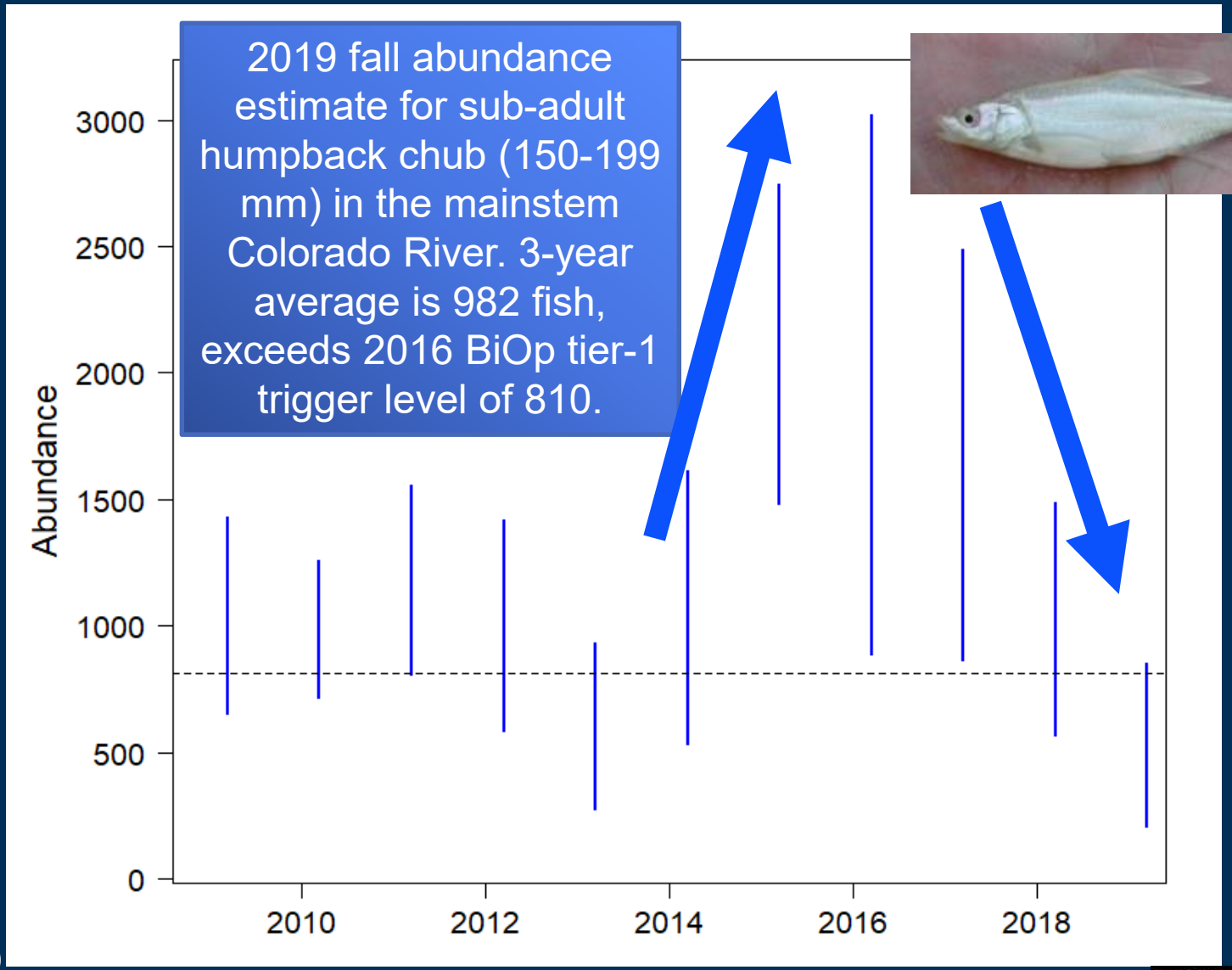


(*Feb 12, 2020*)

Provisional data. Do not cite.

(*Feb 12, 2020*)

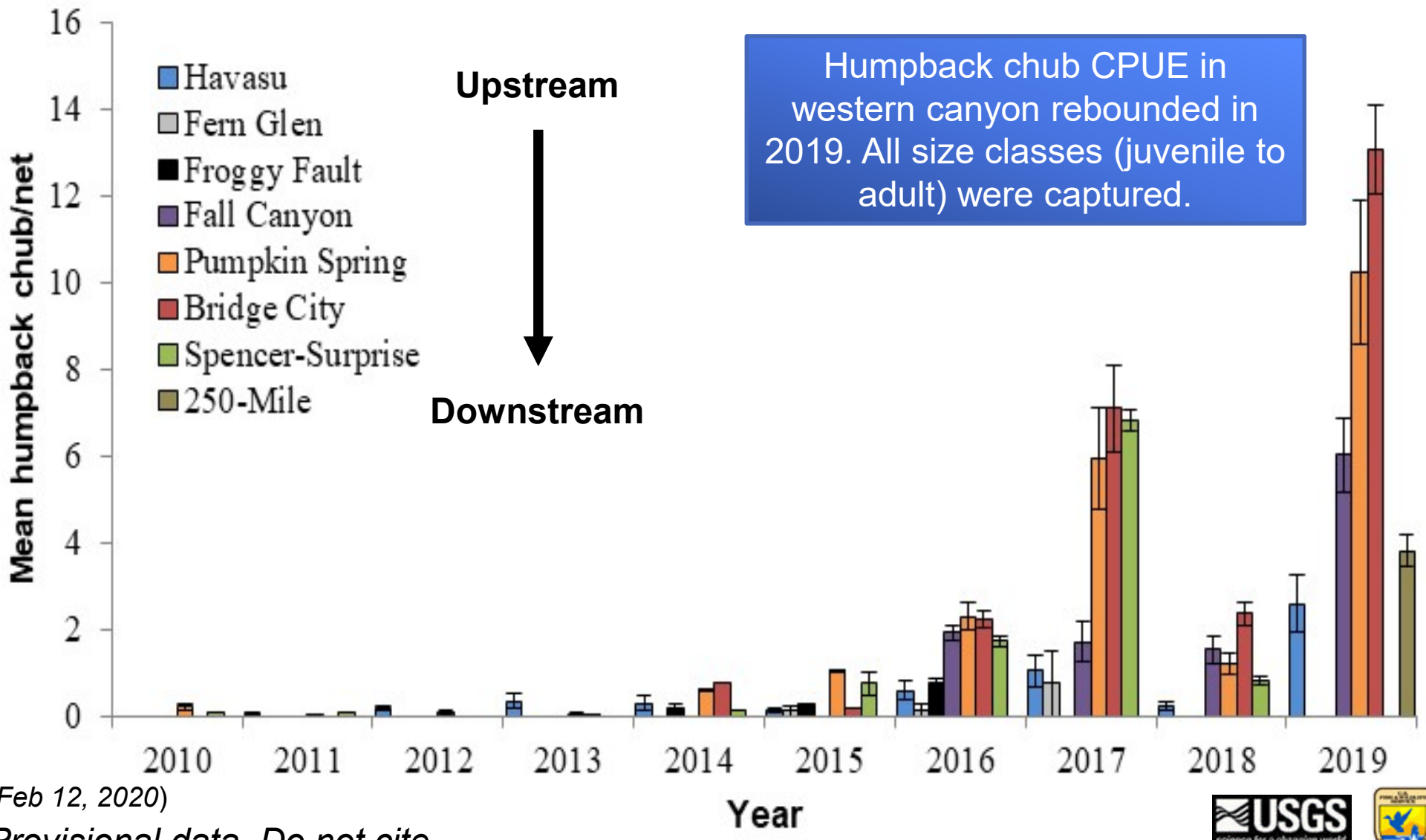
Fall abundances of large subadult humpback chub in the JCM reach (150-199mm TL)



(*Feb 12, 2020*)

Provisional data. Do not cite.

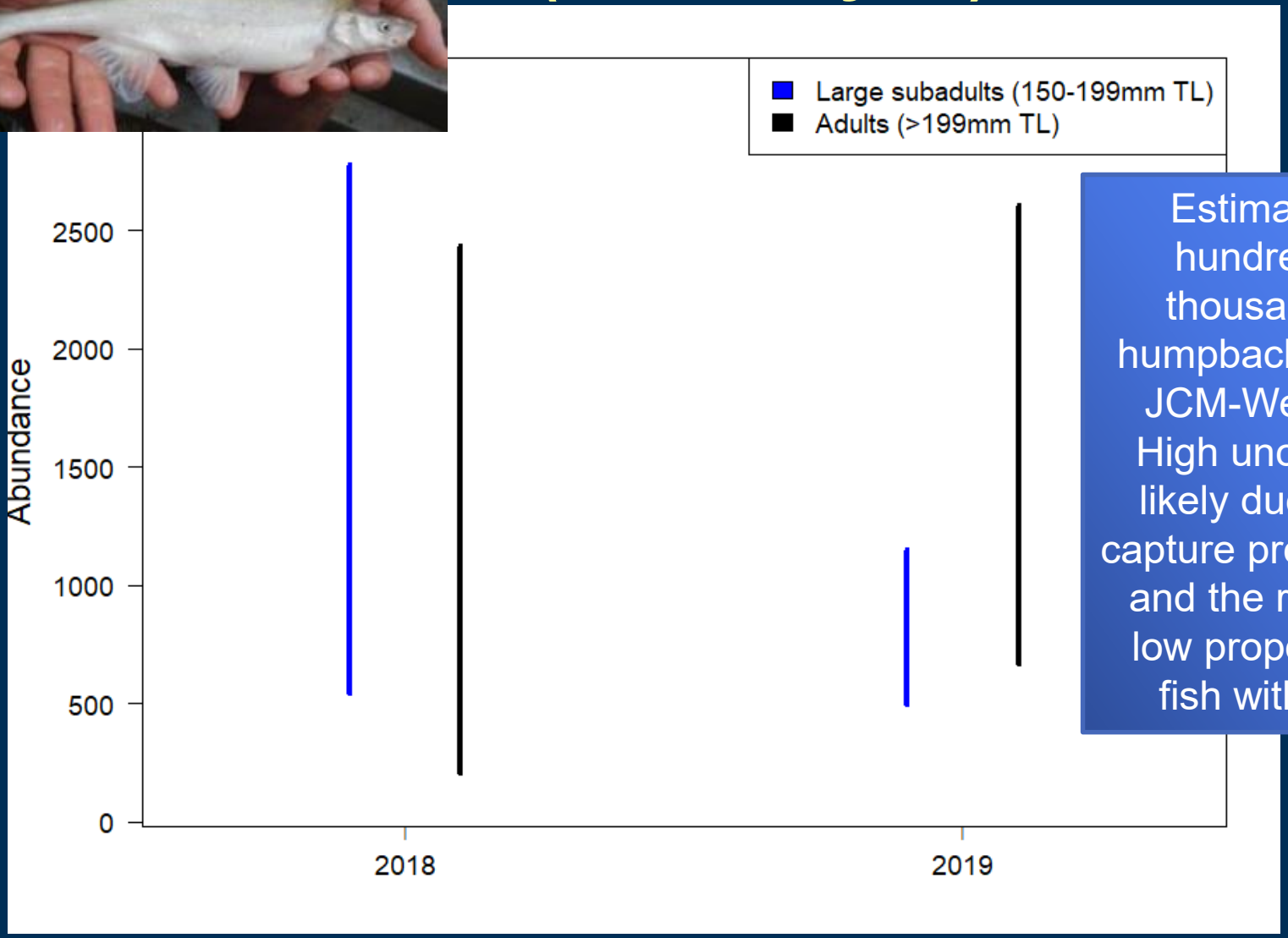
CPUE (fish/net) of adult HBC at sampling sites in western Grand Canyon (downstream of 156 mile)



Feb 12, 2020)

Provisional data. Do not cite.

Fall Abundance Estimates in JCM-West (Fall Canyon)



Estimates of hundreds to thousands of humpback chub in JCM-West site. High uncertainty likely due to low capture probabilities and the relatively low proportion of fish with tags.

(*Feb 12, 2020*)

Provisional data. Do not cite.

Fish community dynamics relative to current thermal regime

Cold-water non-native salmonids common to abundant in tailwaters

Warm-water non-native fish common to abundant in Upper Basin

Warm-water native fish rare or extirpated in basin

Humpback chub abundant in Grand Canyon despite cold water temperatures

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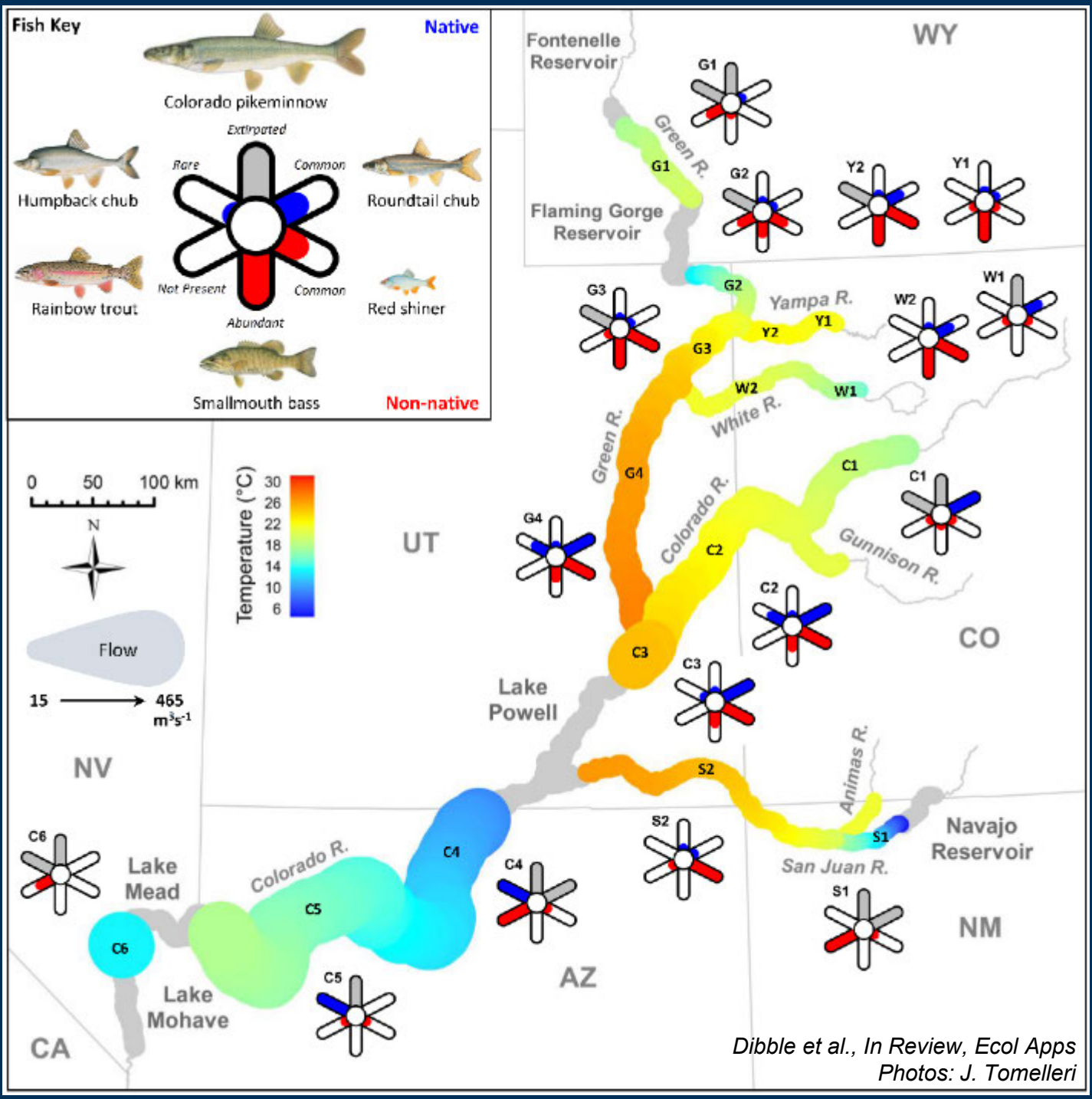
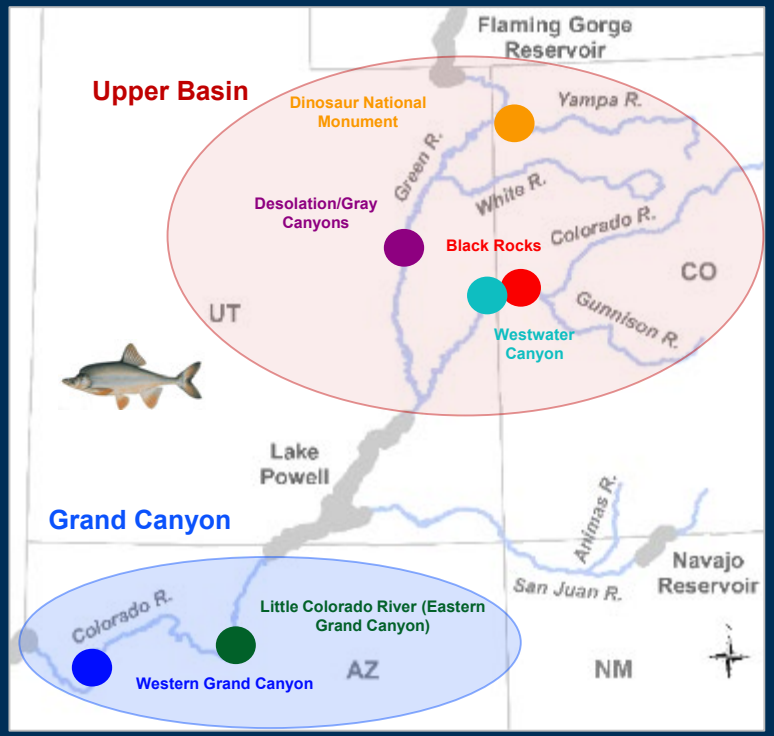
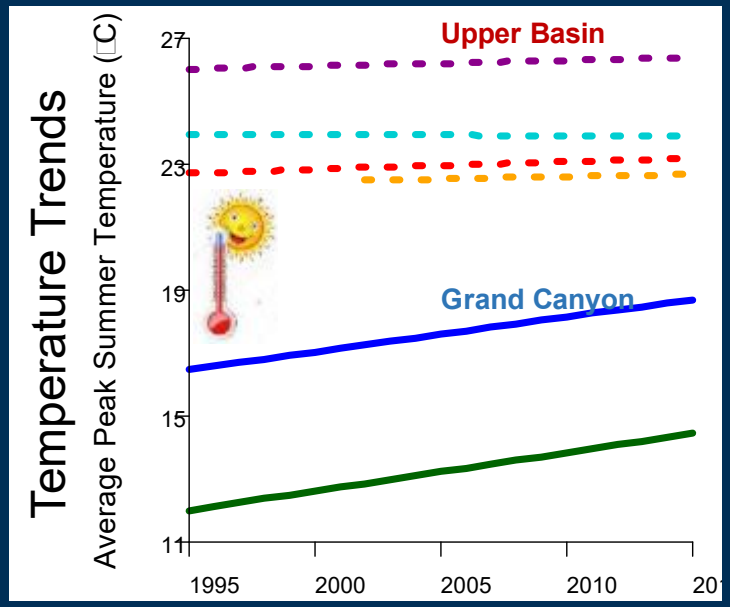
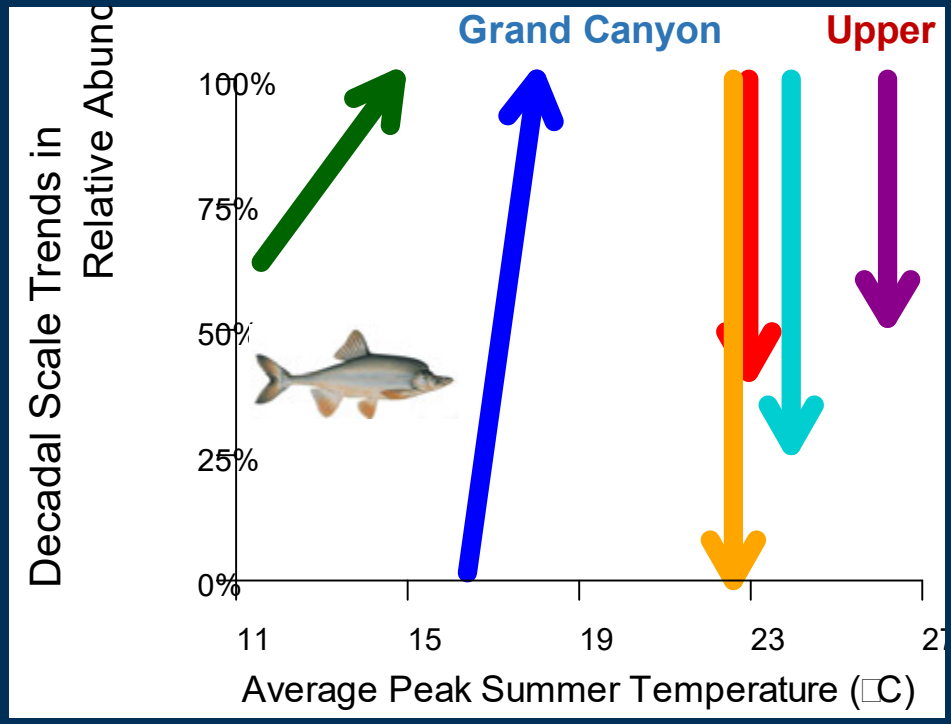


Dibble et al., In Review, Ecol Apps
Photos: J. Tomelleri

Humpback Chub *DECADAL* scale trends in abundance relative to temperature





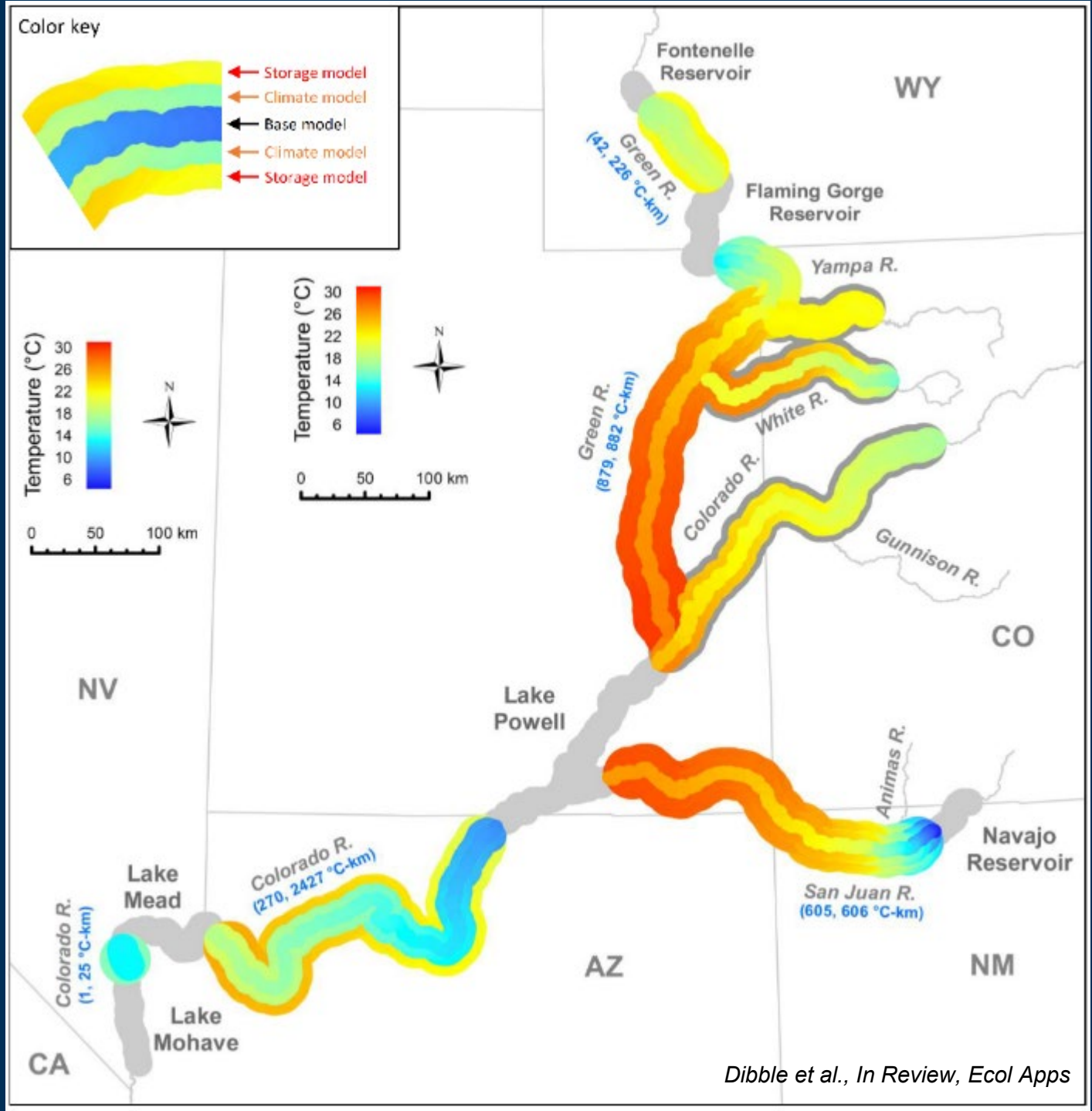


Dibble et al., In Review, Ecol Apps
Photos: J. Tomelleri

Preliminary Data – Do Not Cite

(Feb 12, 2020)

Future thermal regime



Preliminary Data – Do Not Cite

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(*Feb 12, 2020*)

Dibble et al., In Review, Ecol Apps

Potential ecological outcomes of a warmer CRe

Potential mainstem spawning and higher growth of native fish

Humpback Chub

Razorback Sucker

Potential boost in invertebrate taxa; better food base

Caddisflies

Midges

Potential nutrient decline (warmer, epilimnetic), implications for food base

P

Diatoms

Midges

Potential rainbow trout decline, replacement by piscivorous non-native fish

Smallmouth Bass

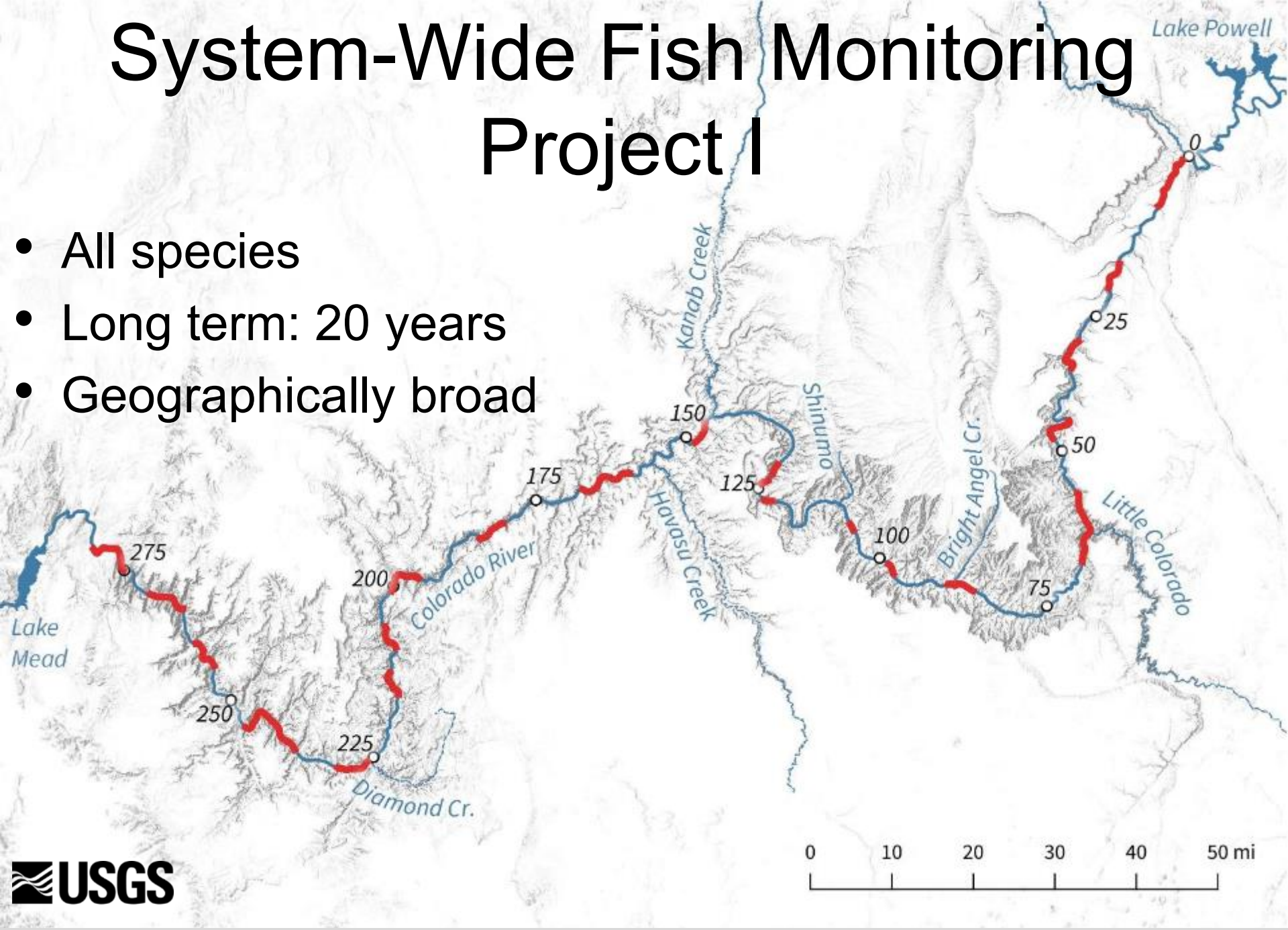
Northern Pike

Preliminary Data – Do Not Cite

(*Feb 12, 2020*)

System-Wide Fish Monitoring Project I

- All species
- Long term: 20 years
- Geographically broad



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AGFD – reaches sampled for system wide monitoring 2019 (*Feb 12, 2020*)

Electrofishing

Hoop Nets

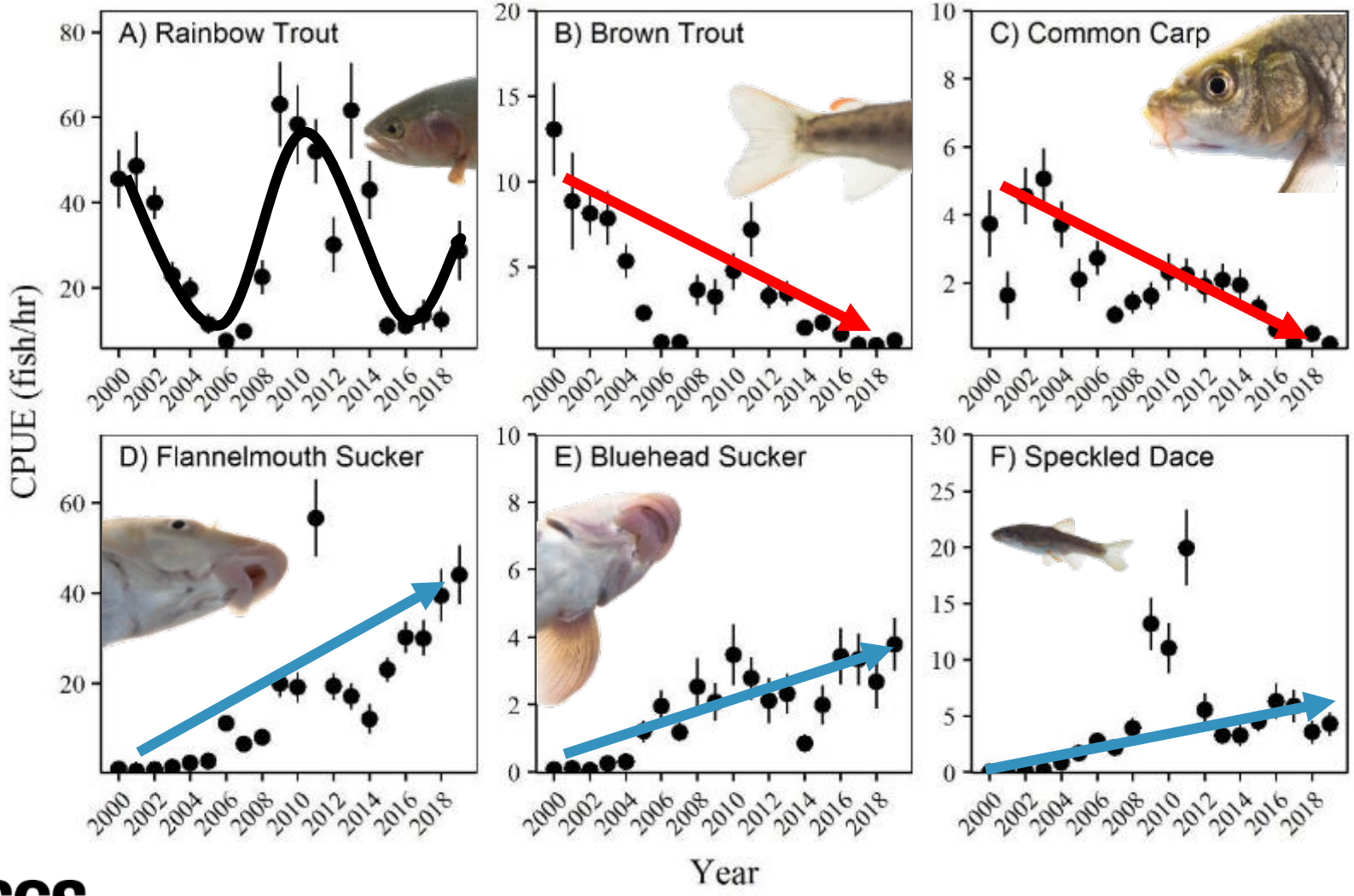
Angling

USGS

Photos © Susan Allen, Jan Boyer, Laura Lothrop

(*Feb 12, 2020*)

Electrofishing Catch Rates



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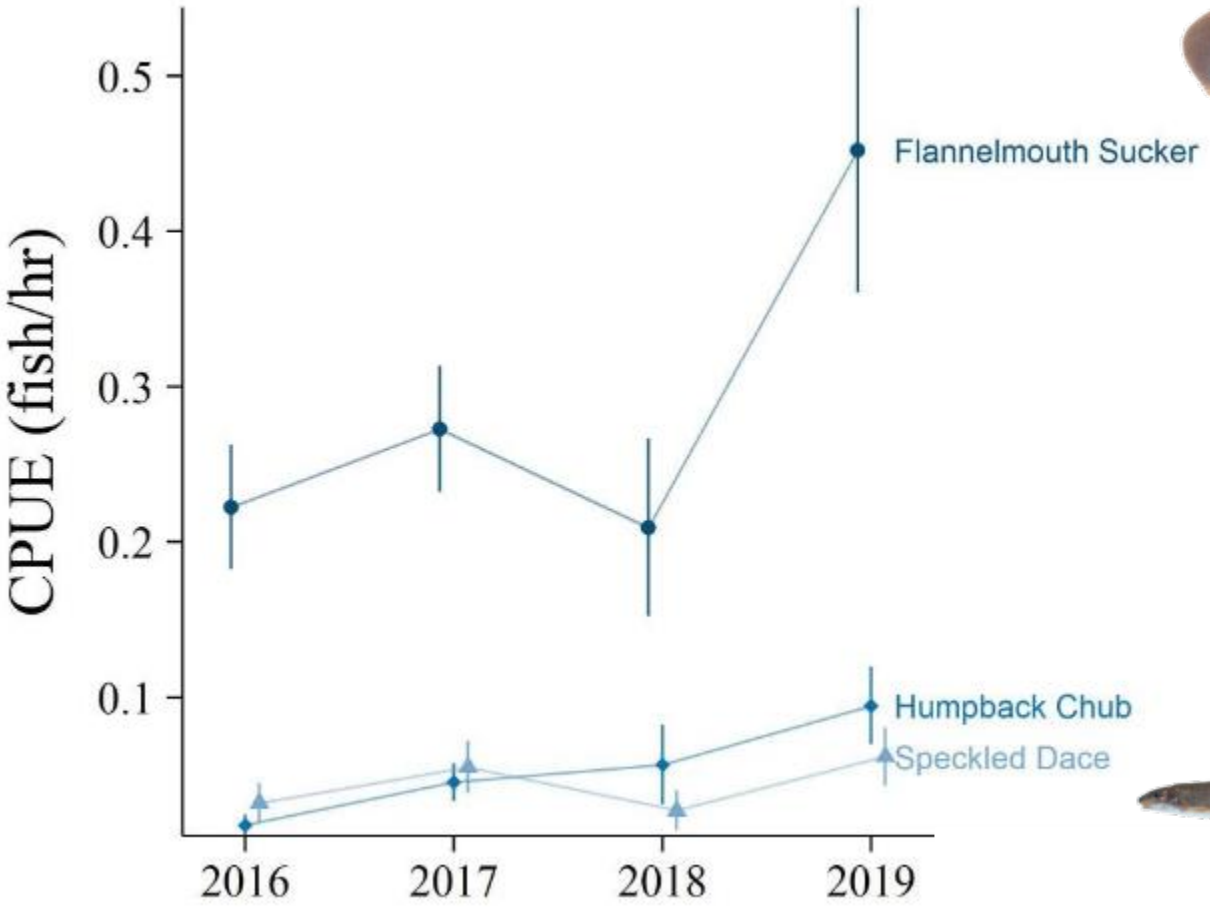
Hoop Net Catch Rates



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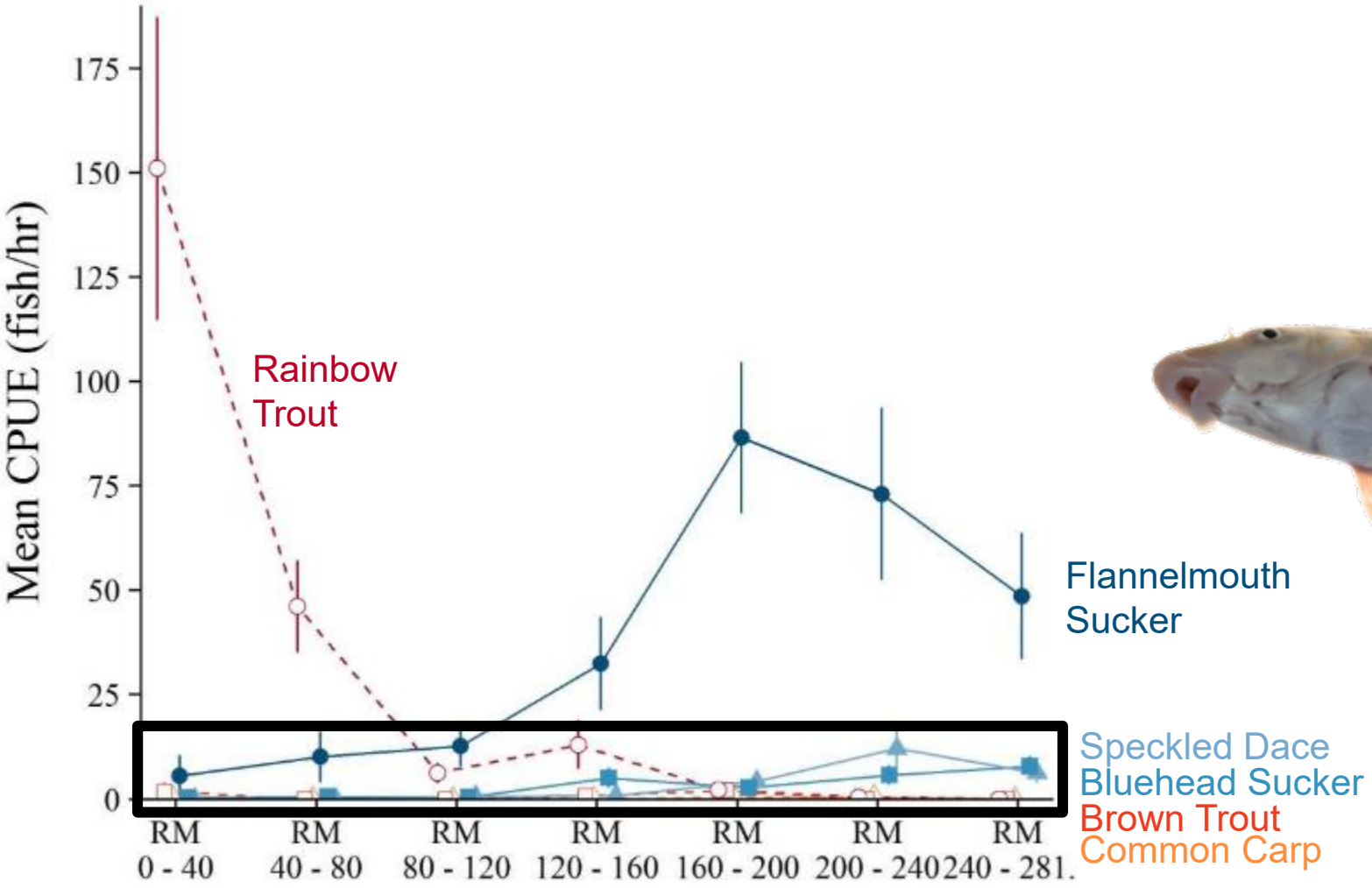
2019 CPUE - Electrofishing



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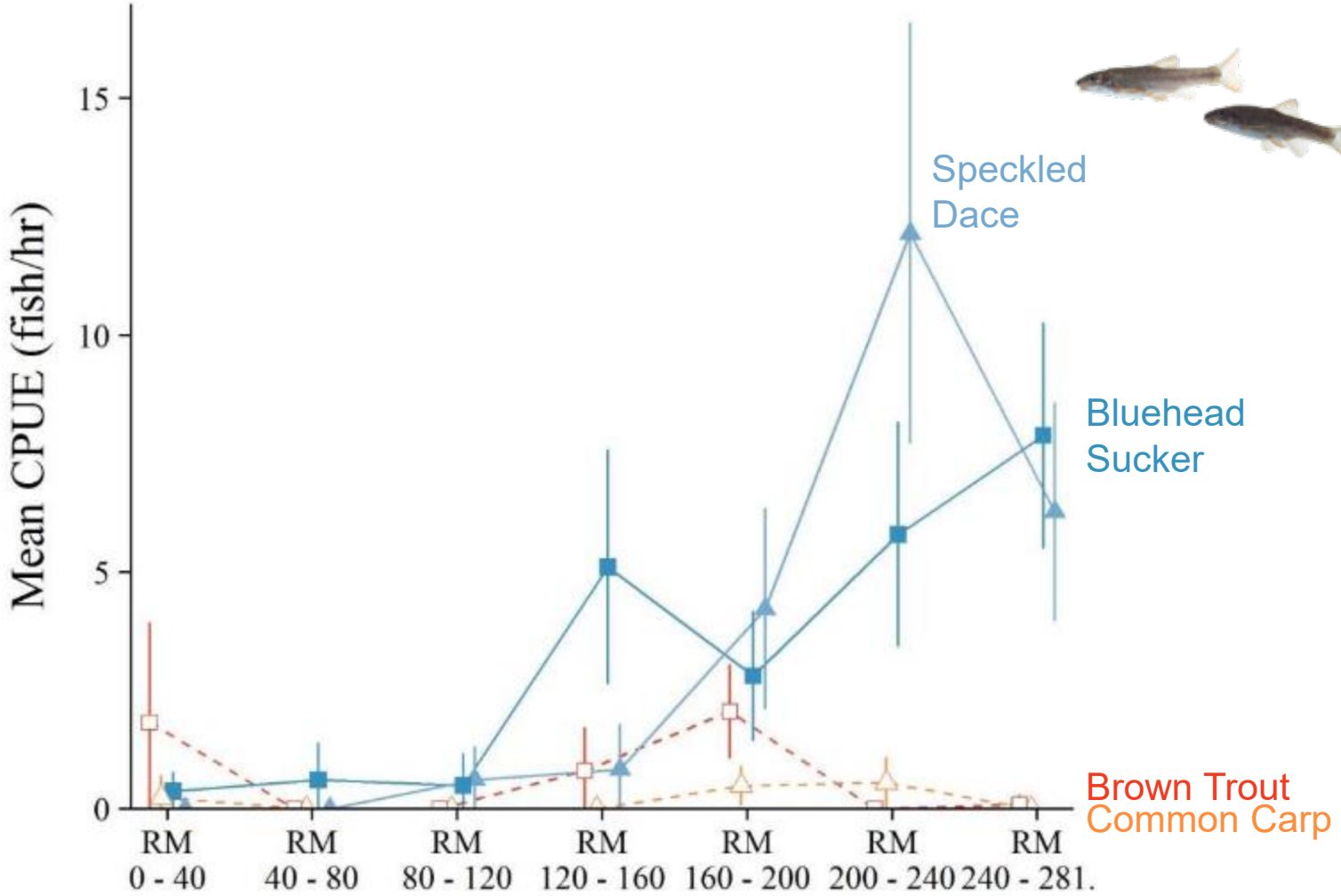
2019 CPUE – Electrofishing, cont.



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2019 Rare Nonnative Catch

Fathead Minnow	48
Brown Trout	33
Common Carp	12
Red Shiner	10
Striped Bass	3
Channel Catfish	1
Green Sunfish	1
Yellow Bullhead	1

Context: caught 7,709 Flannelmouth Sucker in 2019

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Razorback Suckers

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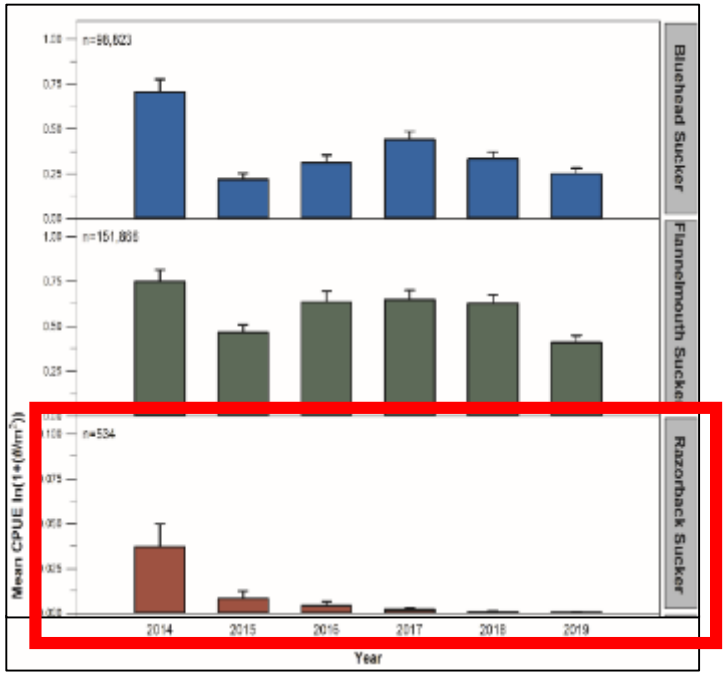
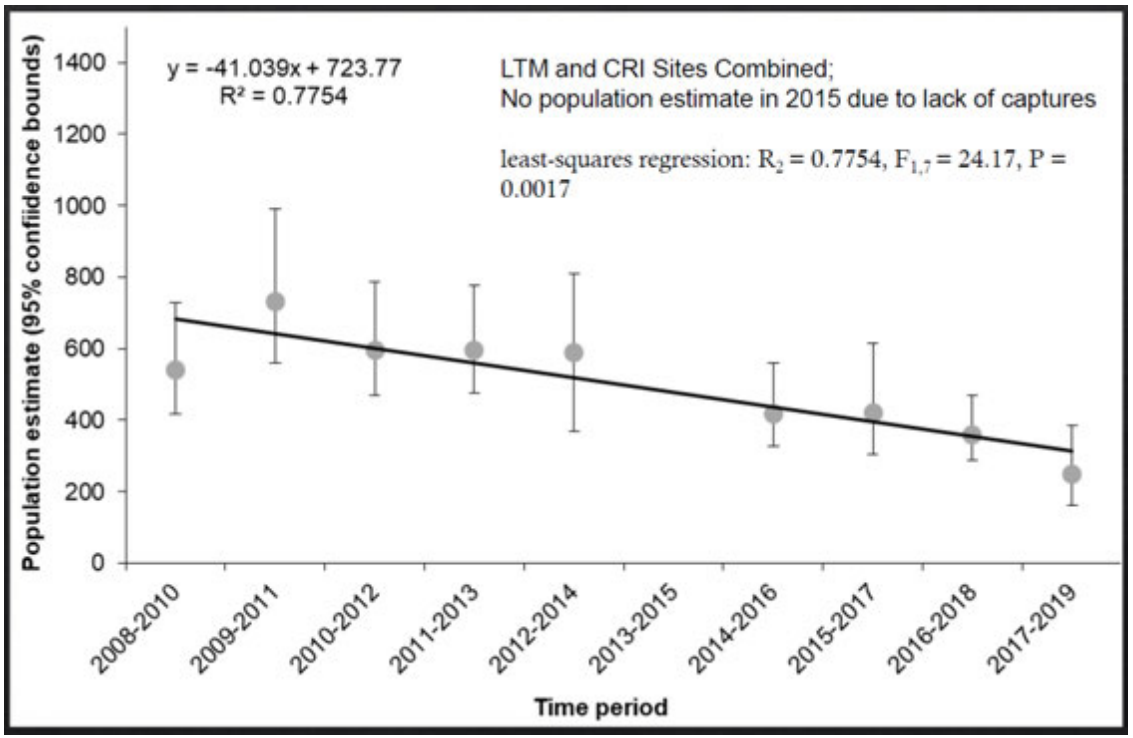
(*Feb 12, 2020*)

Razorback sucker

Grand Canyon young-of-year:
Seining - 57 sites
~200 miles of river



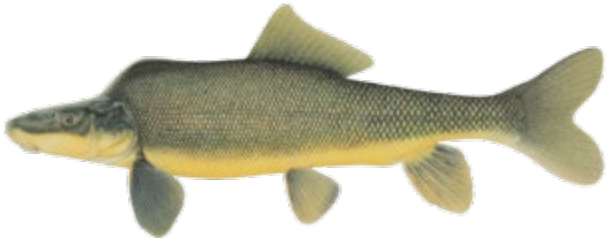
Lake Mead population estimate



- Status: Significant concern
- Trend: Decreasing
- Confidence: Medium to High

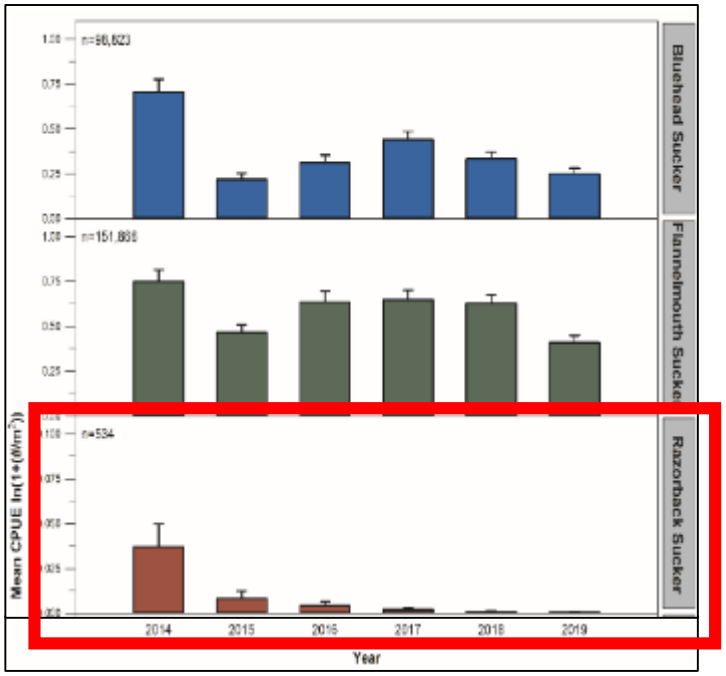
Provisional data. Do not cite. (*Feb 12, 2020*)

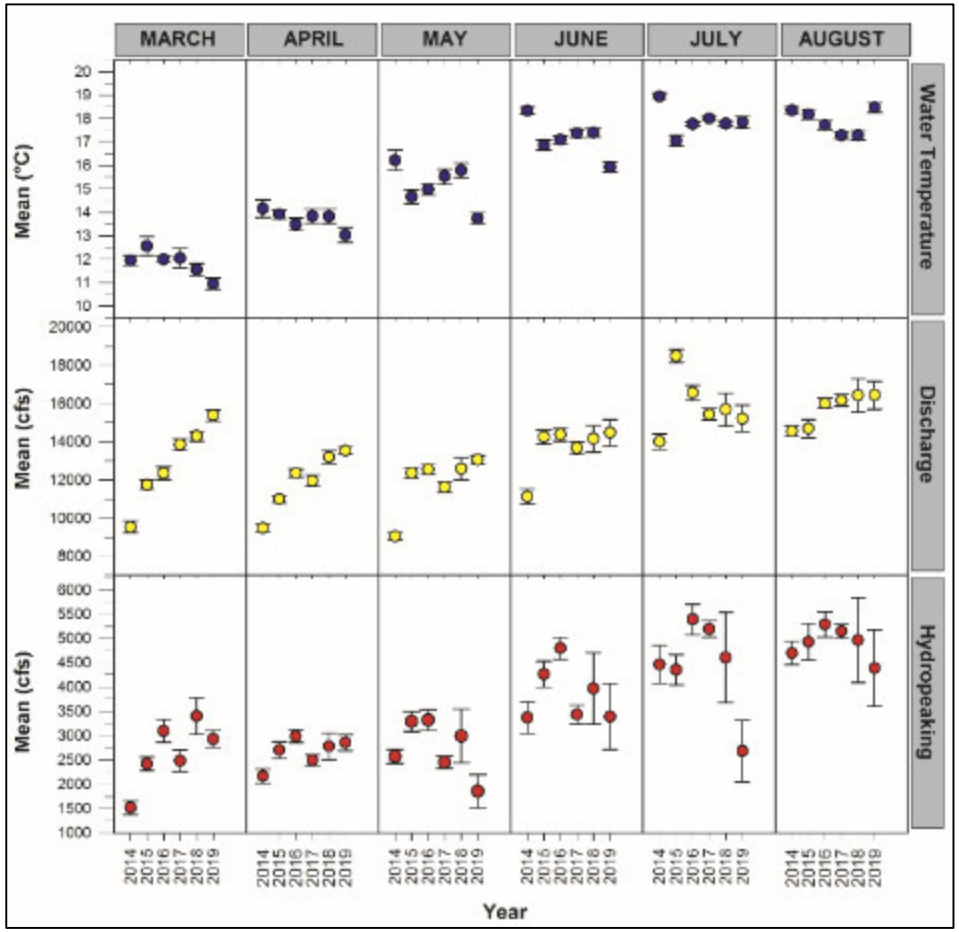
Drivers and constraints



Razorback sucker:

- Thermal regime
- Flow variability

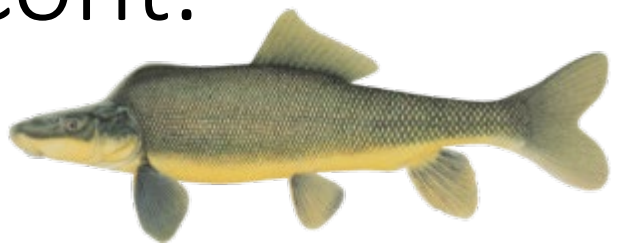




(*Feb 12, 2020*)

Provisional data. Do not cite.

Drivers and constraints, cont.



Razorback sucker:

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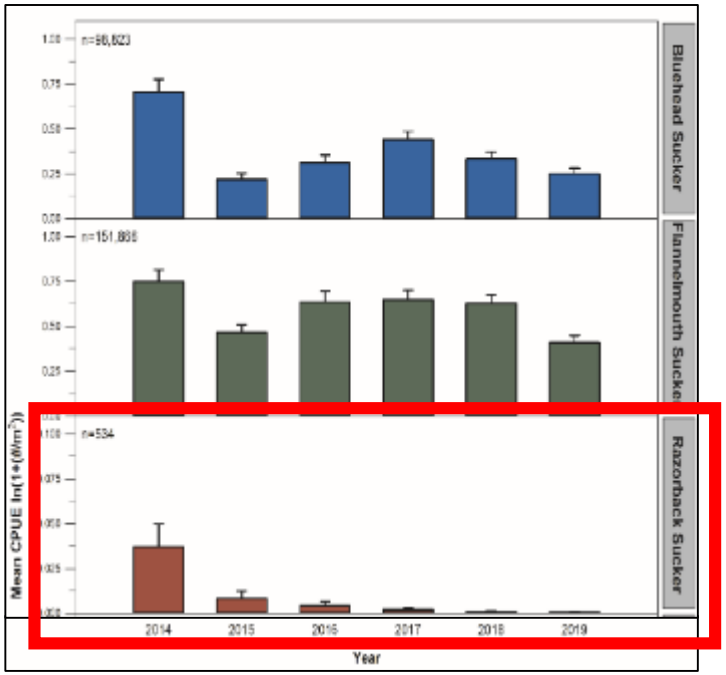

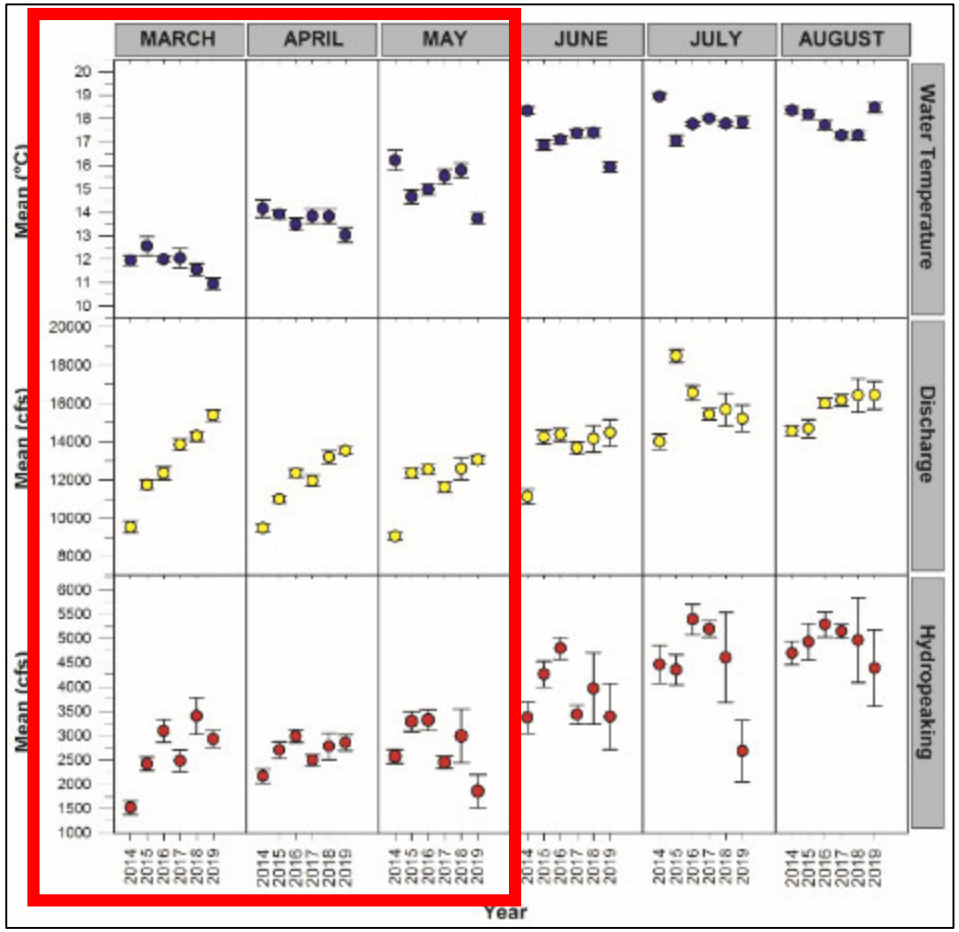

(*Feb 12, 2020*)

Provisional data. Do not cite.

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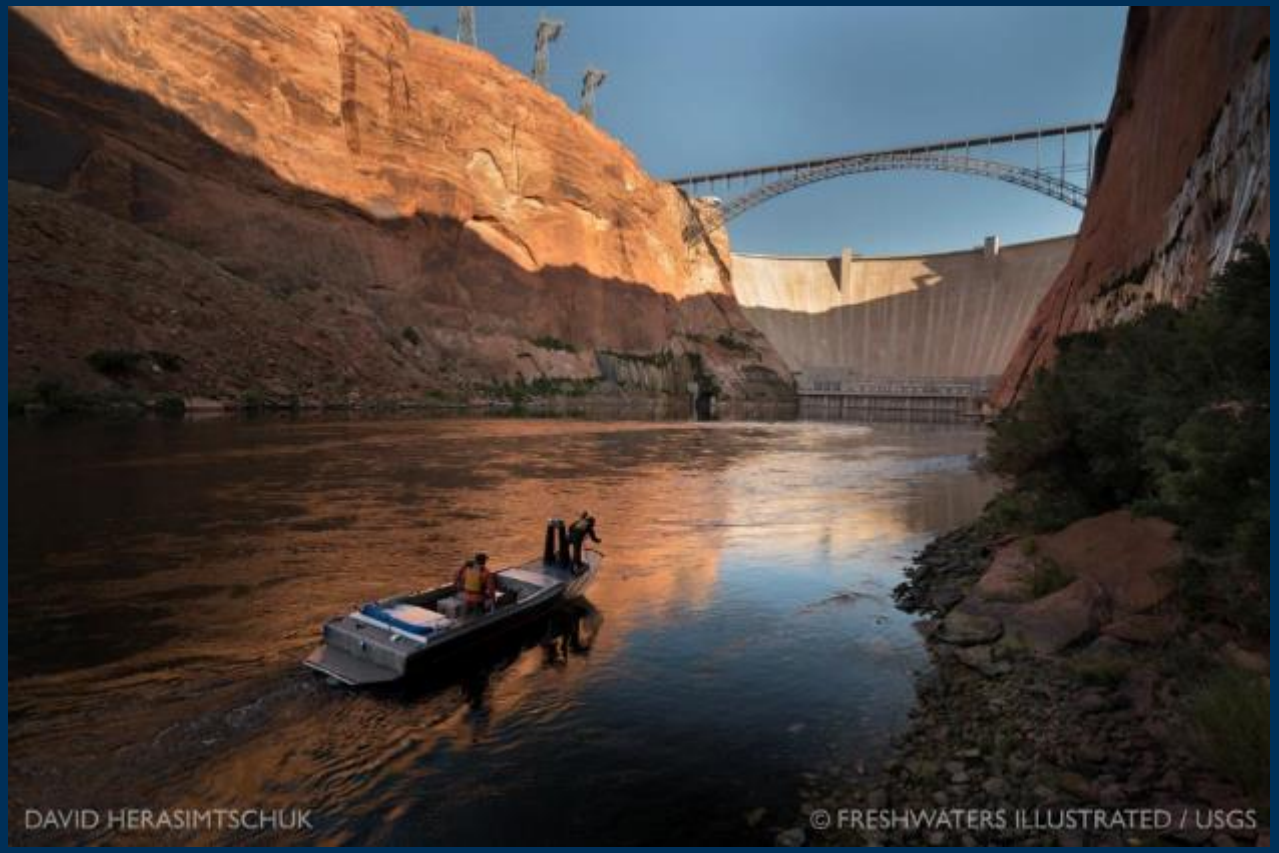
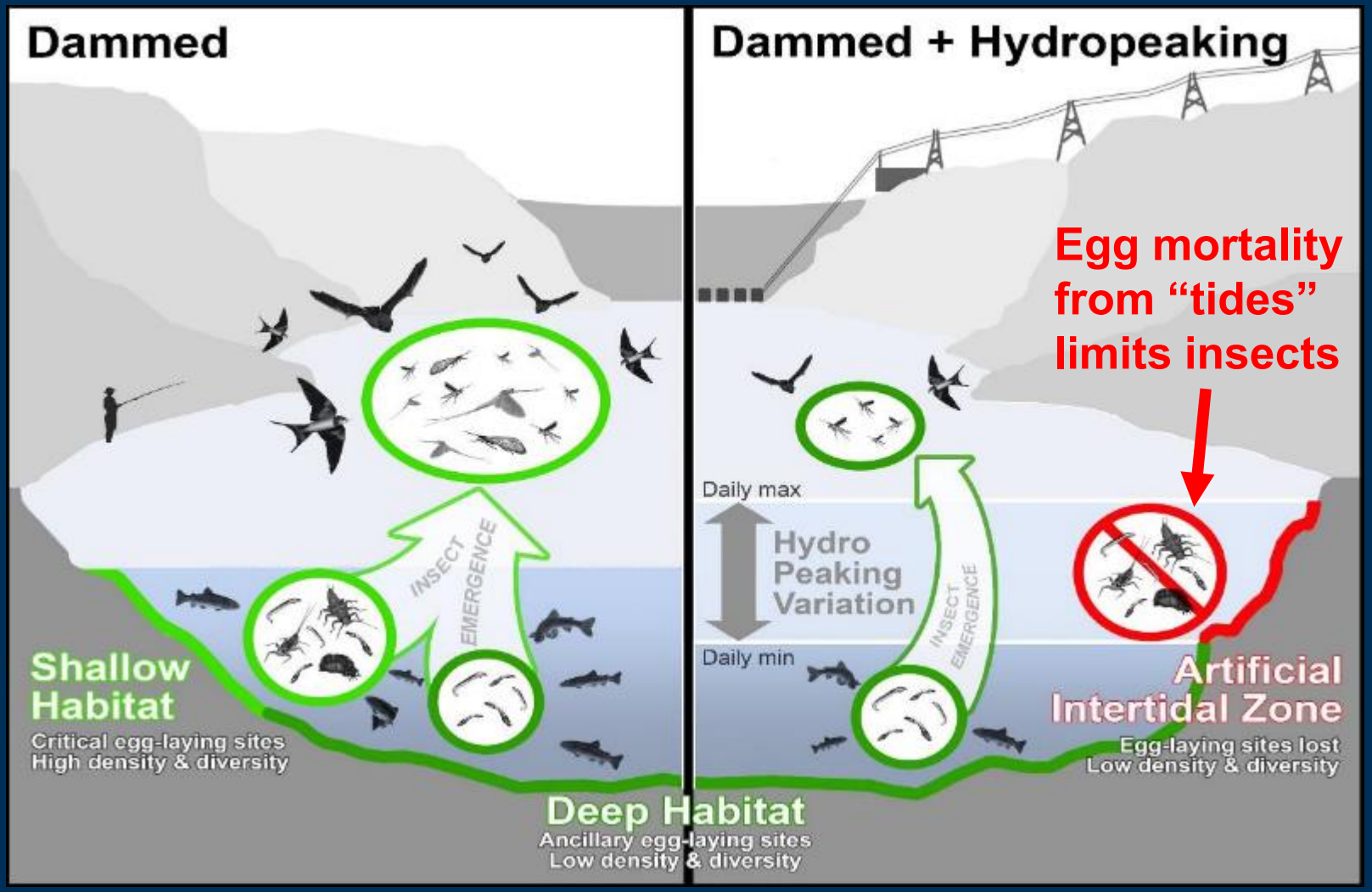


Year 2 of Bug Flows – Project F

Ted Kennedy & Jeff Muehlbauer

Theory behind Bug Flows



USGS

Kennedy et al. 2016 *BioScience*

(*Feb 12, 2020*)

Does it matter to have so few insects?

Resource Category	Upper Basin					Lower Basin
	Black Rocks	Westwater Canyon	Desolation/ Gray canyons	Cataract Canyon	Dinosaur National Monument	Grand Canyon
	Extant				Extirpated	Extant
1. Diverse rocky canyon river habitat						
2a. Suitable flow						
2b. Suitable temperature						
3. Adequate and reliable food supply						
4. Habitat with few nonnative predators and competitors						
5. Suitable water quality						
6. Unimpeded range and connectivity						
7. Persistent populations						
8. High genetic diversity						

The main issue for Humpback Chub in Grand Canyon

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From USFWS 5-year review
SSA on Humpback Chub

(*Feb 12, 2020*)

Purpose of Bug Flows Experiment

- Improve egg-laying conditions for insects!

- Long-term predictions:
  - Increase midge abundance
  - Increase caddisfly abundance/diversity
  - Improve fish food base

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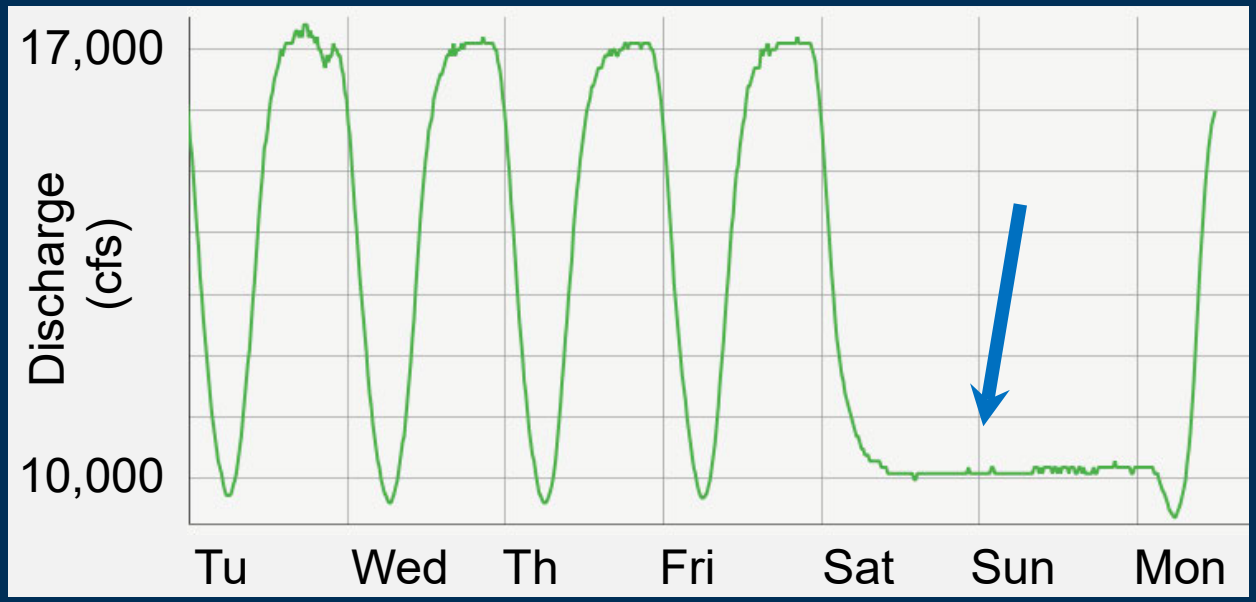
(*Feb 12, 2020*)

Design of Bug Flows

- "Give bugs the weekends off!"
- Stable, low flows on summer weekends
  - Eggs laid on weekends won't dry/die



*** May – August 2018, 2019 ***

USGS

Data from Lees Ferry Gage, 19-25 June 2018
https://waterdata.usgs.gov/az/nwis/uv?site_no=09380000

(*Feb 12, 2020*)

Anglers ❤ Bug Flows

"The bug flows are providing great weekend fly fishing activity…"

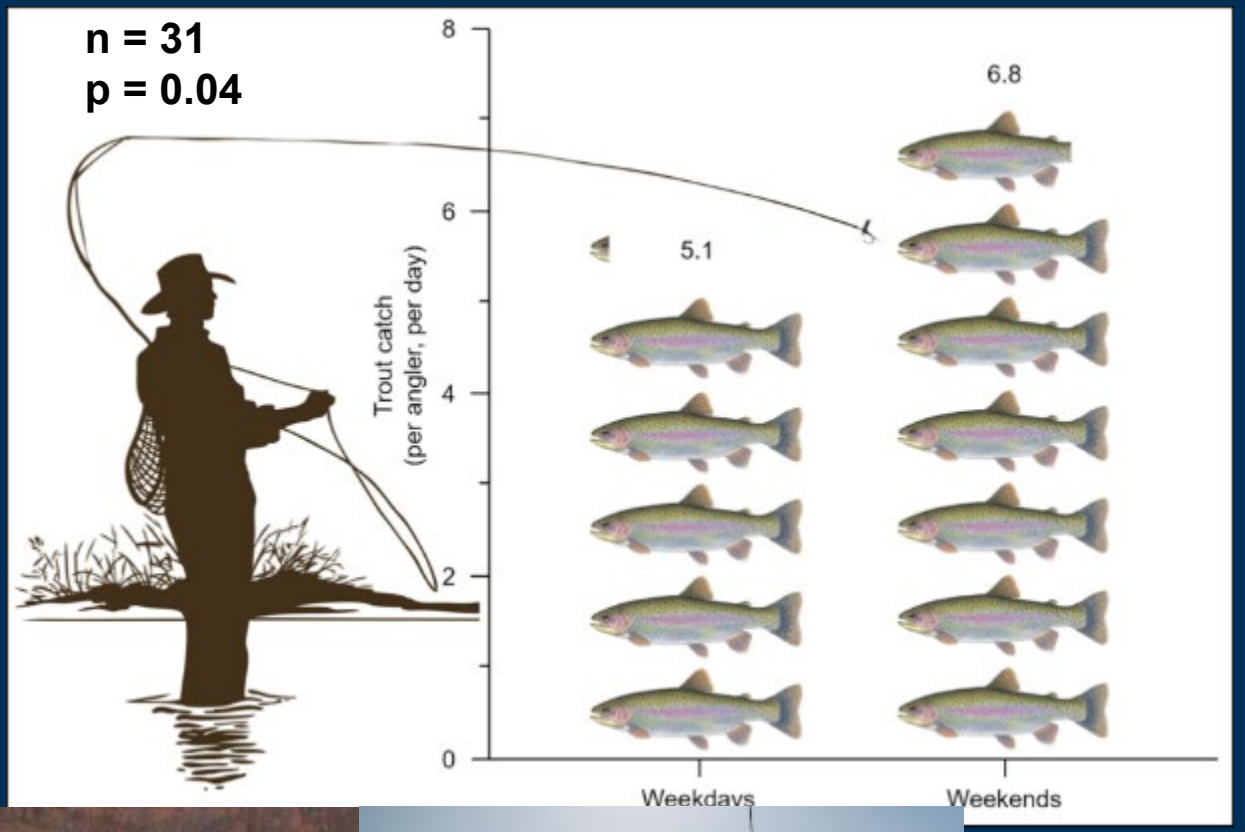
"The low weekend flows have opened more bars to wade fishing…"

USGS

leesferrybackhaul.com

(*Feb 12, 2020*)

Bug Flows = Better Fishing



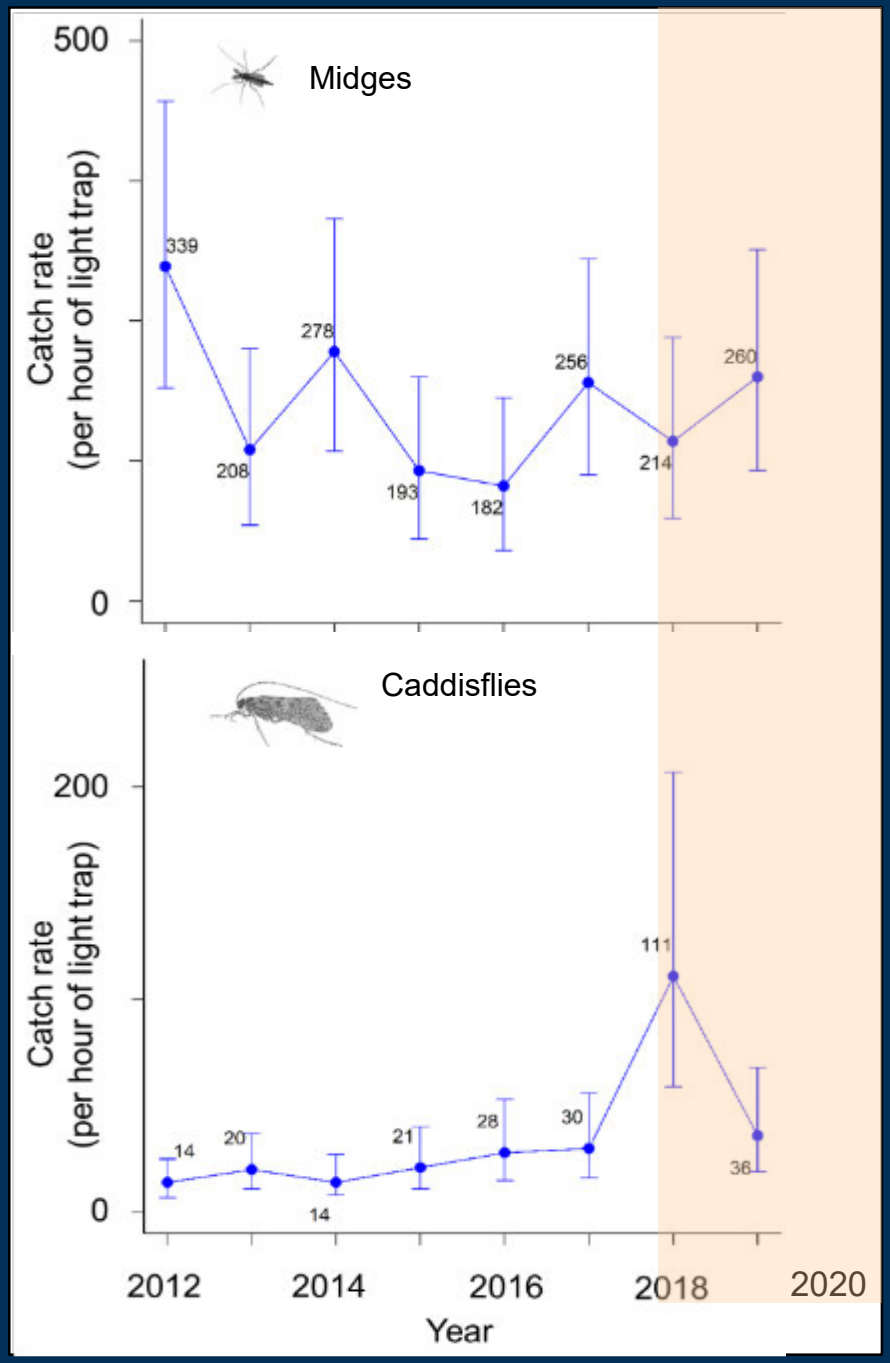
Metcalfe et al. 2020
Boatman's Quarterly Review

USGS

(*Feb 12, 2020*)

Insect Response

Equivocal experiment ongoing



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Unpublished data, subject to change, do not cite.

(*Feb 12, 2020*)

Scientific Conclusions

- **Take it to the bank**
  - Better trout fishing

- **Jury is still out**
  - Aquatic insect response
  - Native fish response

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(*Feb 12, 2020*)

Bug Flows and LTEMP

- **Trigger**
  - "None"

- **Off-Ramps**
  - No benefit to *Food Base? (TBD) or,*
  - ~~**No benefit to *Trout Fishery or,***~~
  - No benefit to *Native Fish? (TBD)*

- **Replicates**
  - "Target 2 to 3 replicates"

No LTEMP downside to Bug Flows in 2020

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LTEMP Chapter 2, Table 2-9, p. 2-54

(*Feb 12, 2020*)

Acknowledgements

- US Dept. of the Interior, Bureau of Reclamation and the Glen Canyon Dam Adaptive Management Program
- Arizona Game and Fish Department
- National Park Service
- US Fish and Wildlife Service
- US Geological Survey-GCMRC

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Questions?
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(Feb 12, 2020)