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GCMRC Science Updates – Part 2

Adaptive Management Work Group Meeting
August 22-23, 2018

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Grand Canyon Monitoring and Research Center

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

Outline

- Aquatic Foodbase
- Humpback Chub
- Trout
- Nutrients as Ecosystem Drivers
- Odds and Ends

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Aquatic Foodbase

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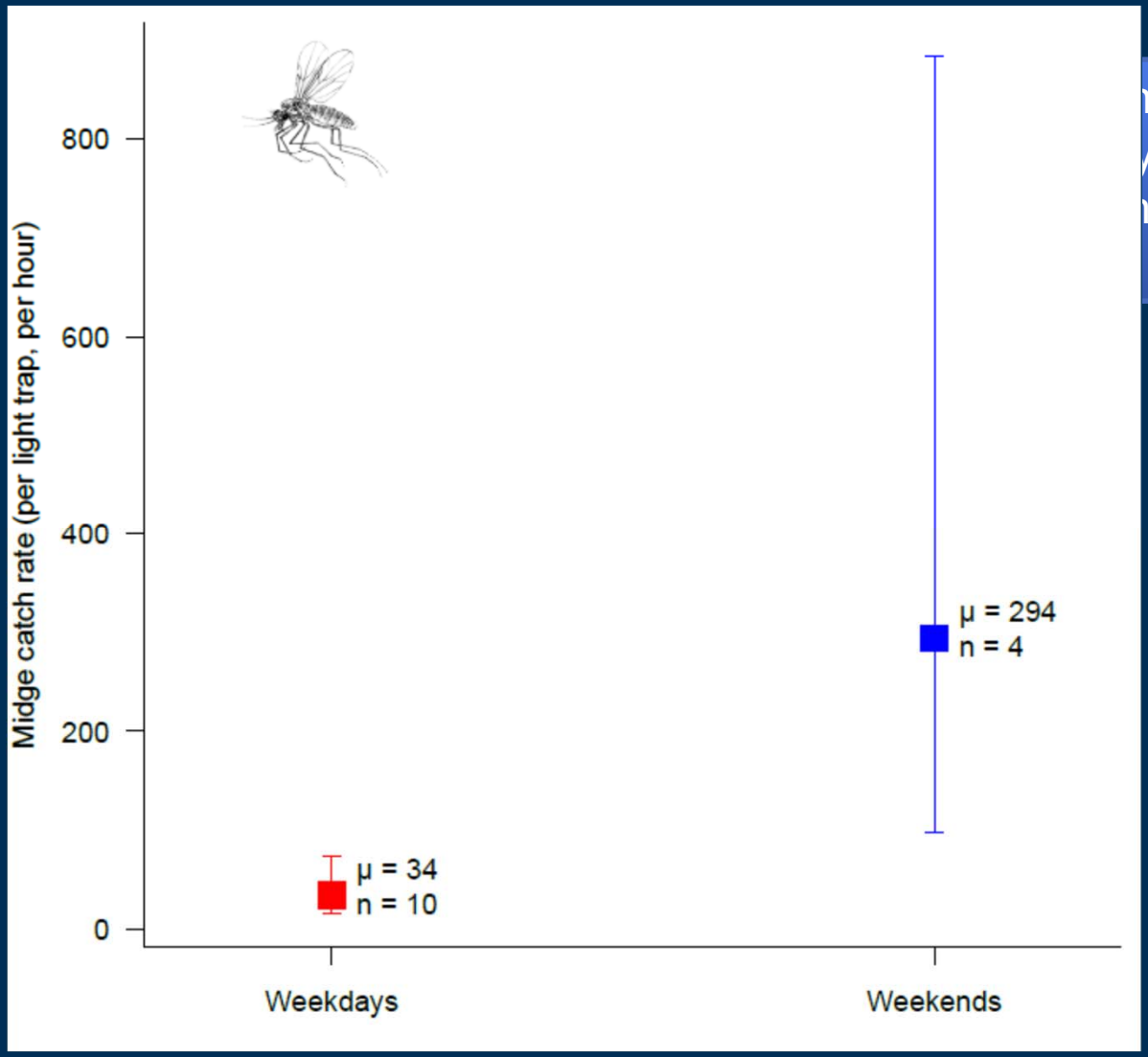
Midge Catches in Light Traps – Weekday vs. Weekends in Glen Canyon



itoring of midges in Glen
yon in early August shows
er catches on weekends
vs. weekdays

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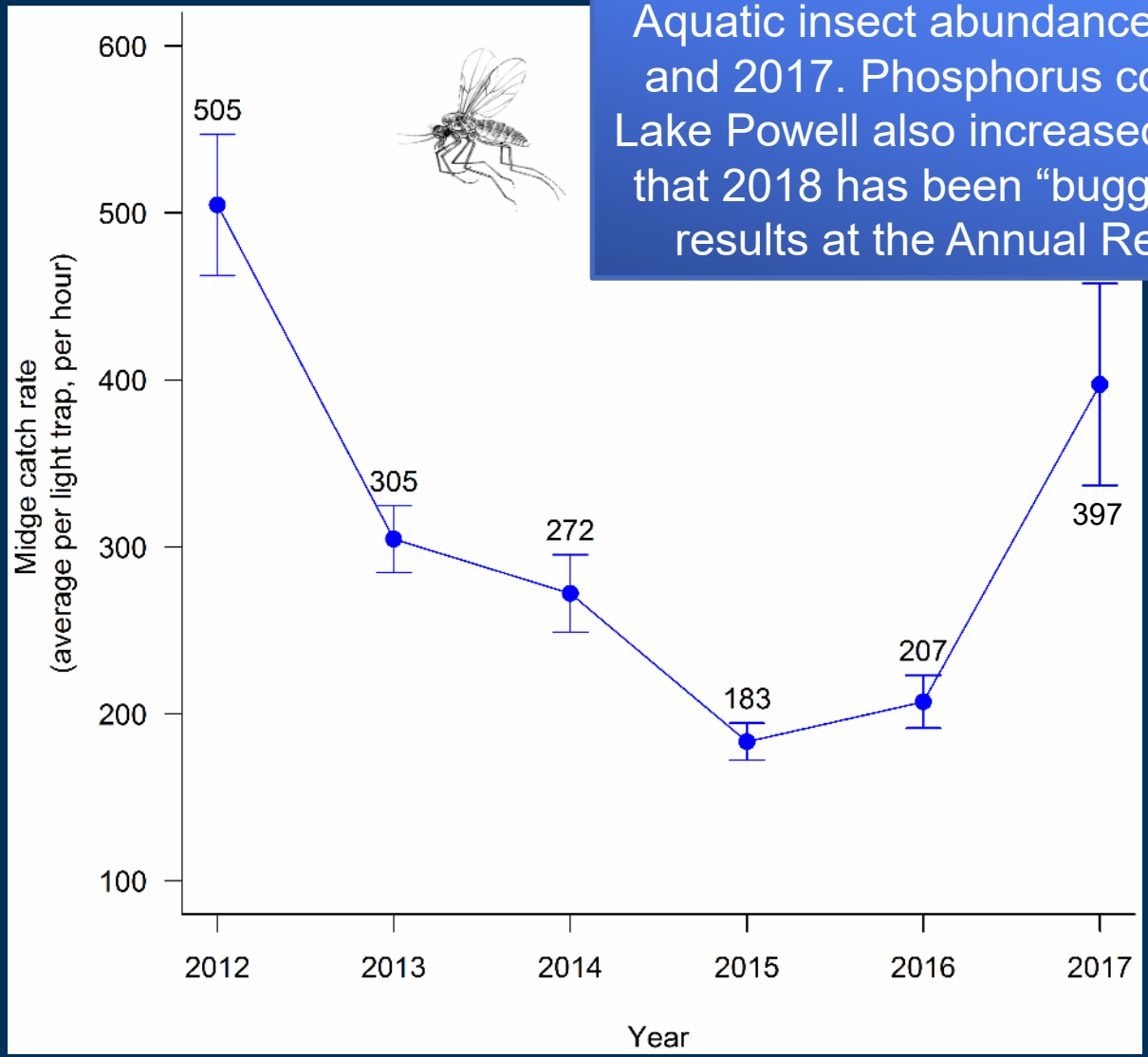
Provisional data from Kennedy and Muehlbauer, subject to change. Do not cite.

Midge Catches in Light Traps – Glen, Marble, and Grand Canyons

Aquatic insect abundance increased in 2016 and 2017. Phosphorus concentrations from Lake Powell also increased. Anecdotal reports that 2018 has been “buggier”. Stay tuned for results at the Annual Reporting meeting.



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Provisional data from Kennedy and Muehlbauer, subject to change. Do not cite.

Humpback Chub

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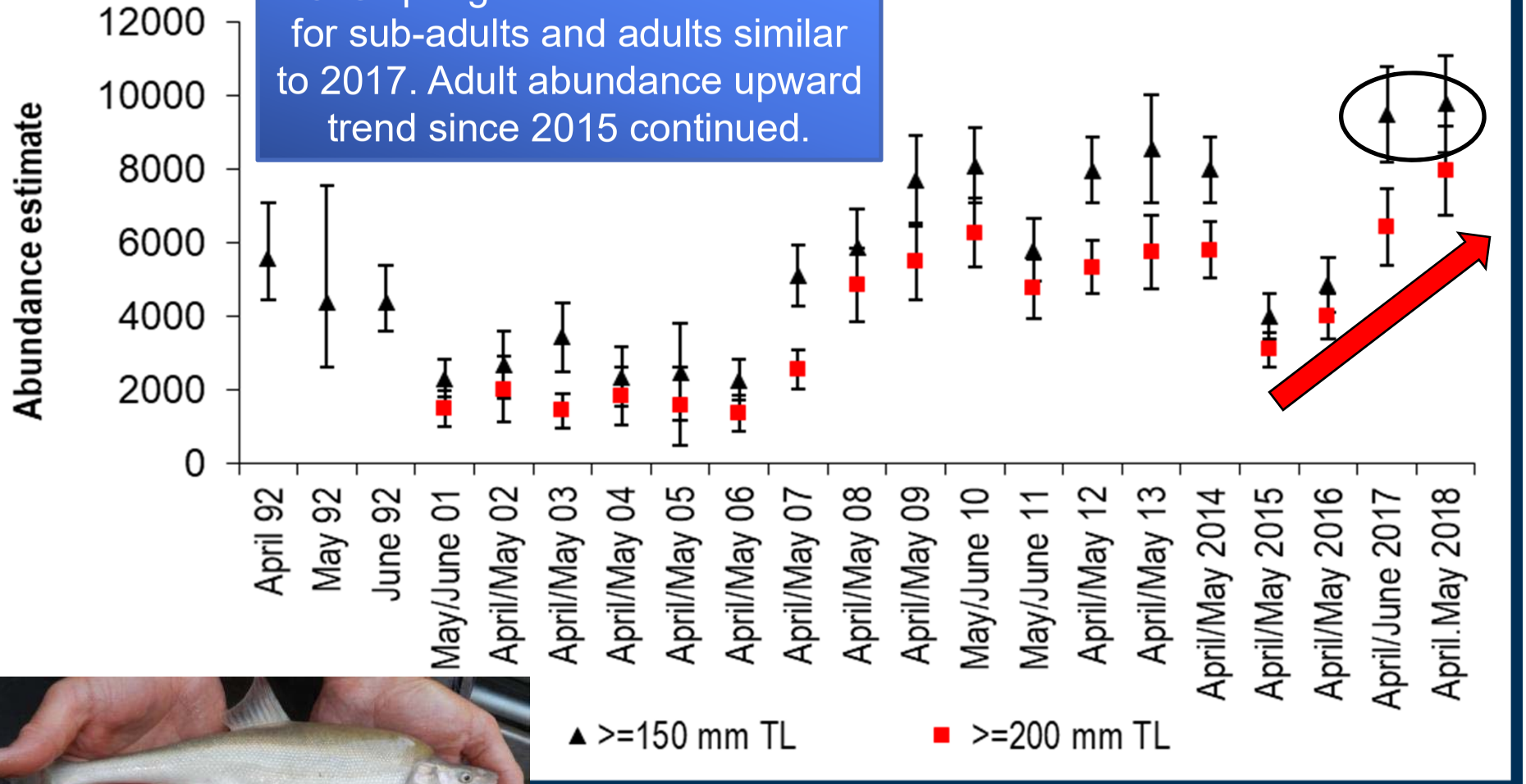
Annual Spring Abundances of Adult Humpback Chub in Lower Little Colorado River

2018 spring abundance estimate for sub-adults and adults similar to 2017. Adult abundance upward trend since 2015 continued.



(Preliminary Data from VanHaverbeke et al. USFWS. 2018. Do Not Cite.)

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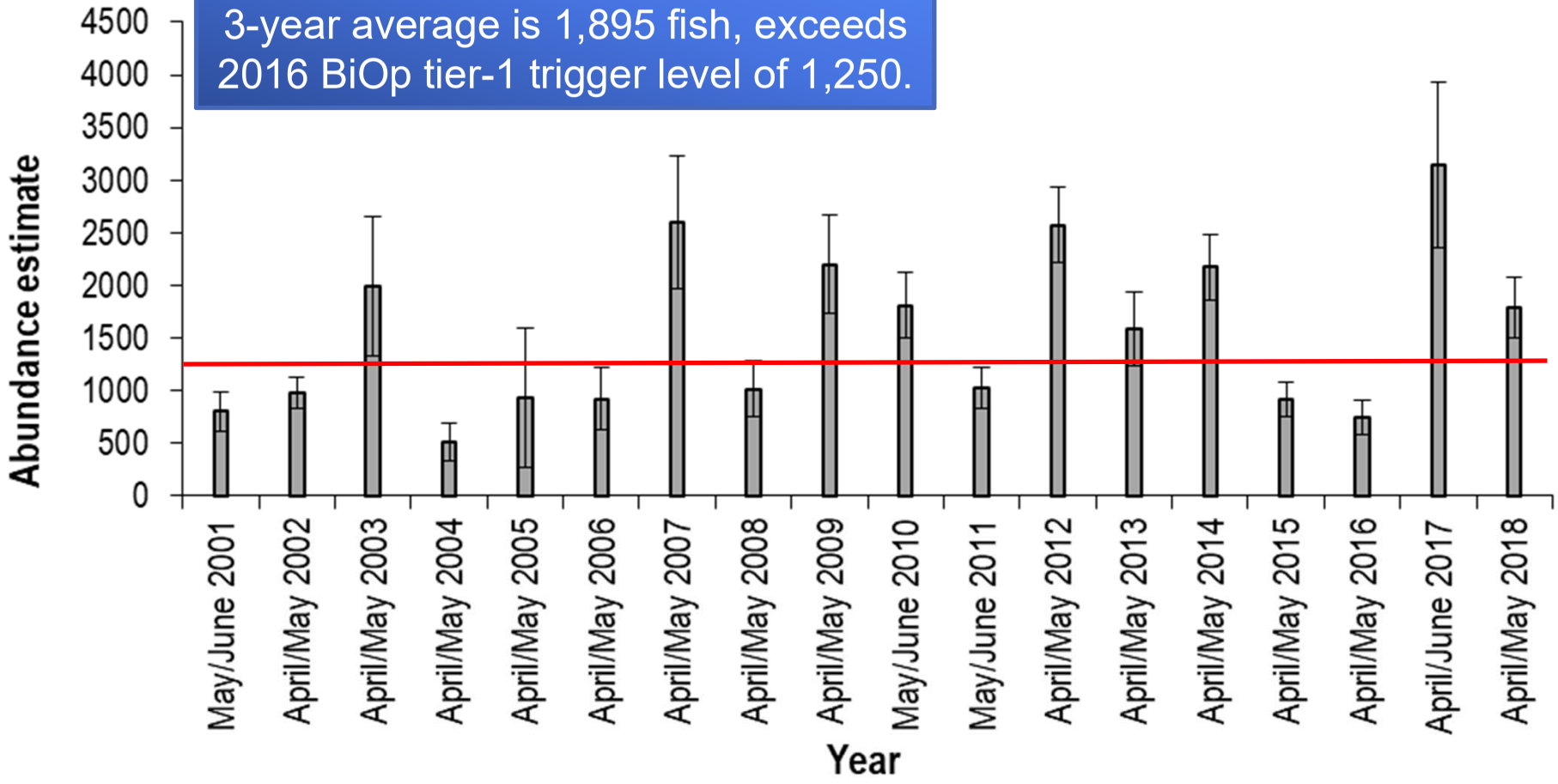
Annual Spring Abundances of Humpback Chub 150-199 mm in Lower 13.6 km of LCR

2018 spring abundance estimate for sub-adults in the Little Colorado River. 3-year average is 1,895 fish, exceeds 2016 BiOp tier-1 trigger level of 1,250.



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(Preliminary Data from VanHaverbeke et al. USFWS. 2018. Do Not Cite.)

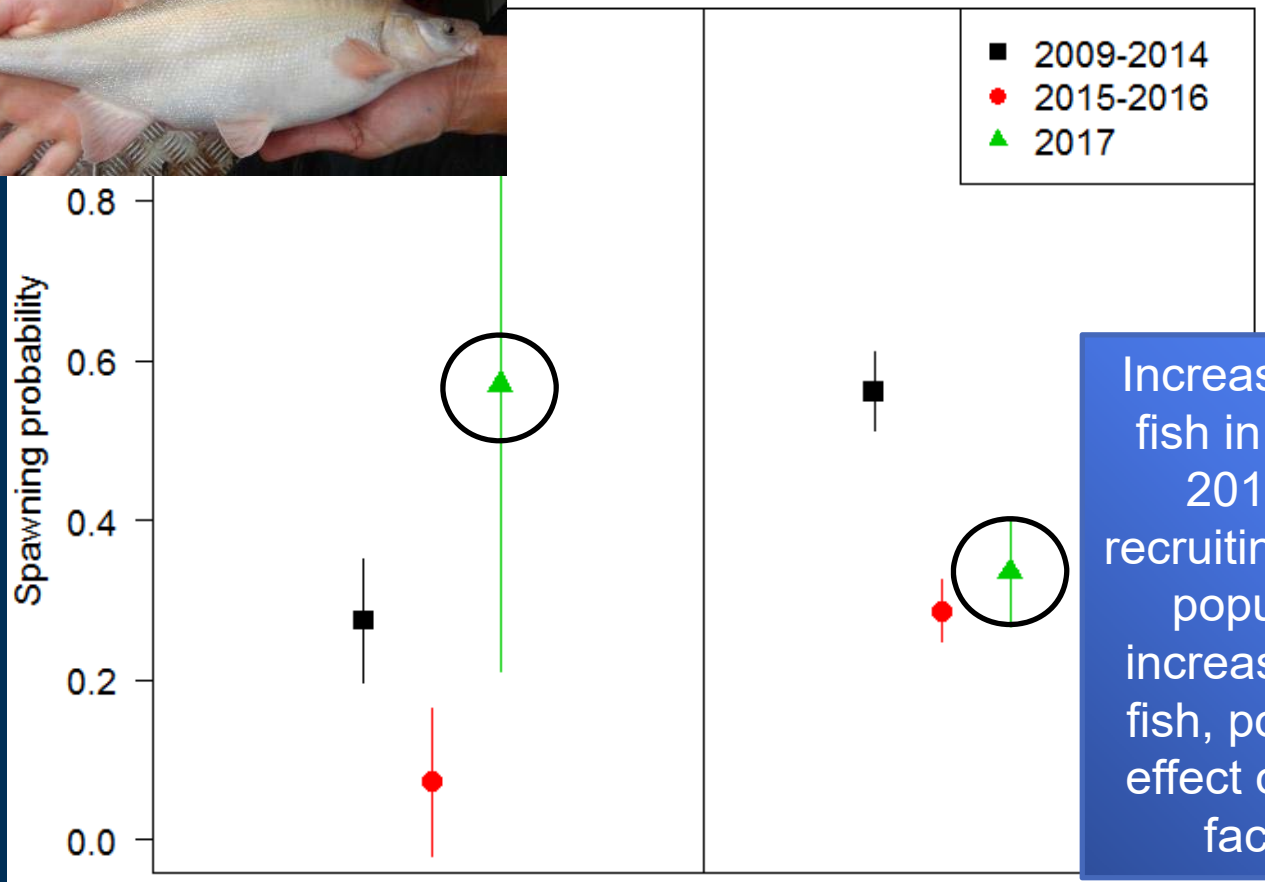
Adult Humpback Chub Abundance

(LCR spawners ≥ 200mm TL)

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

USGS *USGS Preliminary data. Do not cite. Vertical lines represent 95% confidence intervals.*

Adult Humpback Chub Spawning Probabilities



Increase among small fish in 2017 could be 2011/12 cohorts recruiting into spawning population. Slight increase among large fish, possible delayed effect of low condition factor in 2016.

USGS *USGS Preliminary data. Do not cite. Vertical lines represent 95% confidence intervals.*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Humpback Chub Catch Below LCR Confluence and in Western Grand Canyon

Similar catch of humpback chub near Little Colorado R. and Fall Canyon (RM 212). Note difference in temperature which strongly influences capture probability. Goal is to estimate vital rates at Fall Canyon site.

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(Preliminary data from Yard and Korman, 2018. Do Not Cite.)

2018: Humpback Chub (n=224) total length and river mile

Many untagged humpback chub at RM 195 including ripe female and several ripe males. Note temperature (which strongly influences capture probability) increases downstream.

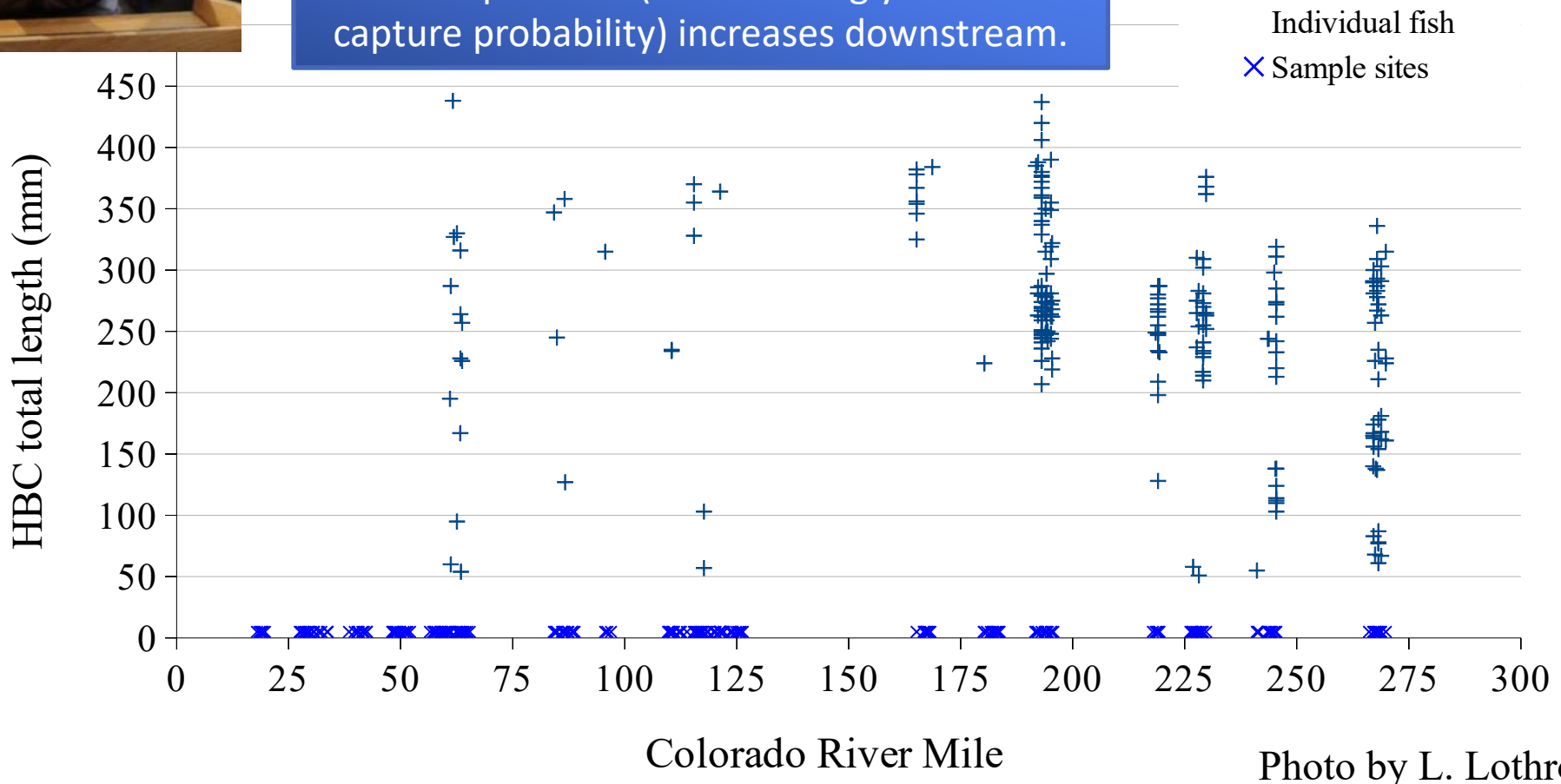

Photo by L. Lothrop

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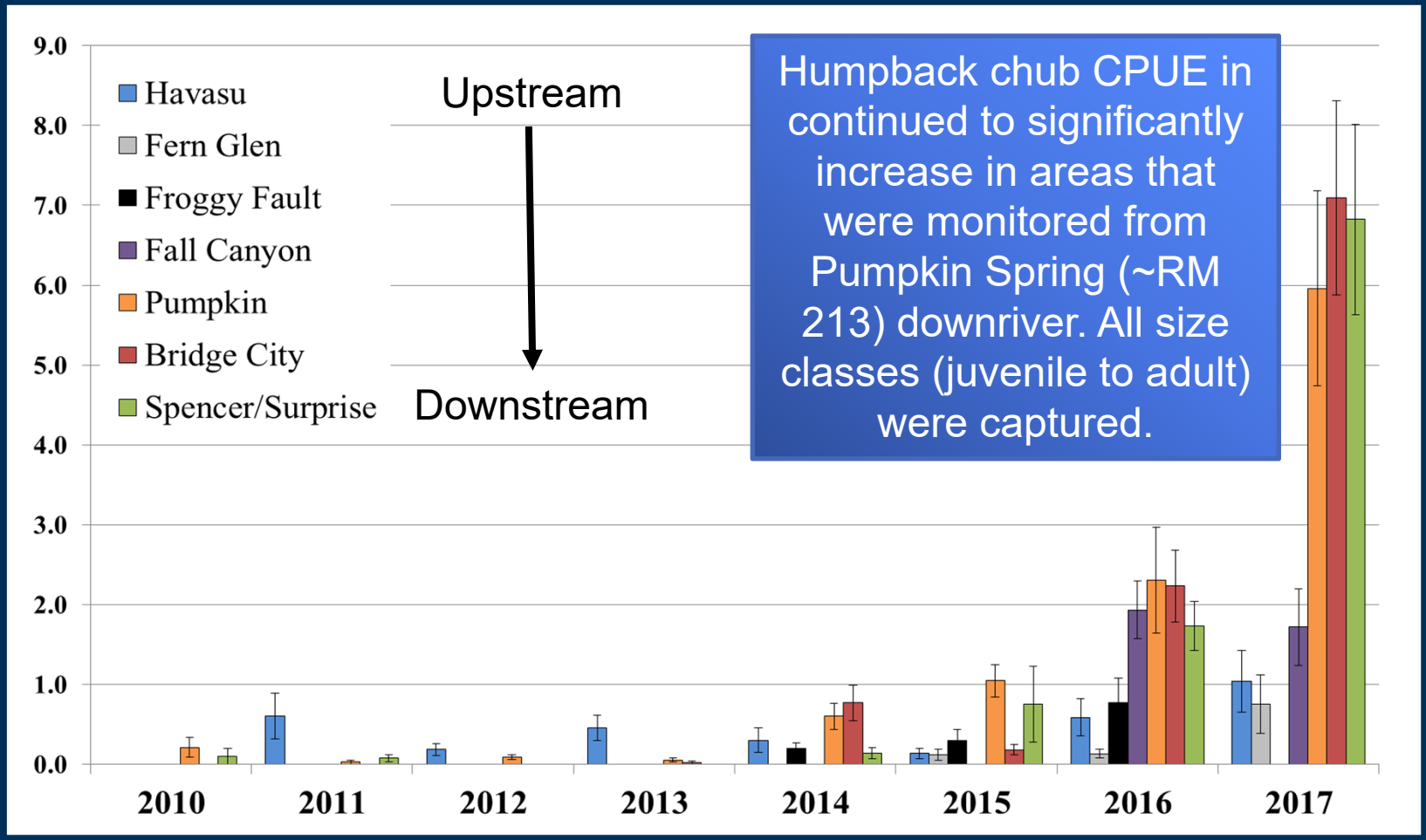
(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)

Humpback Chub CPUE by Year in Western Grand Canyon



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(Preliminary Data from VanHaverbeke et al. USFWS. 2017. Do Not Cite.)

Rainbow Trout and Brown Trout

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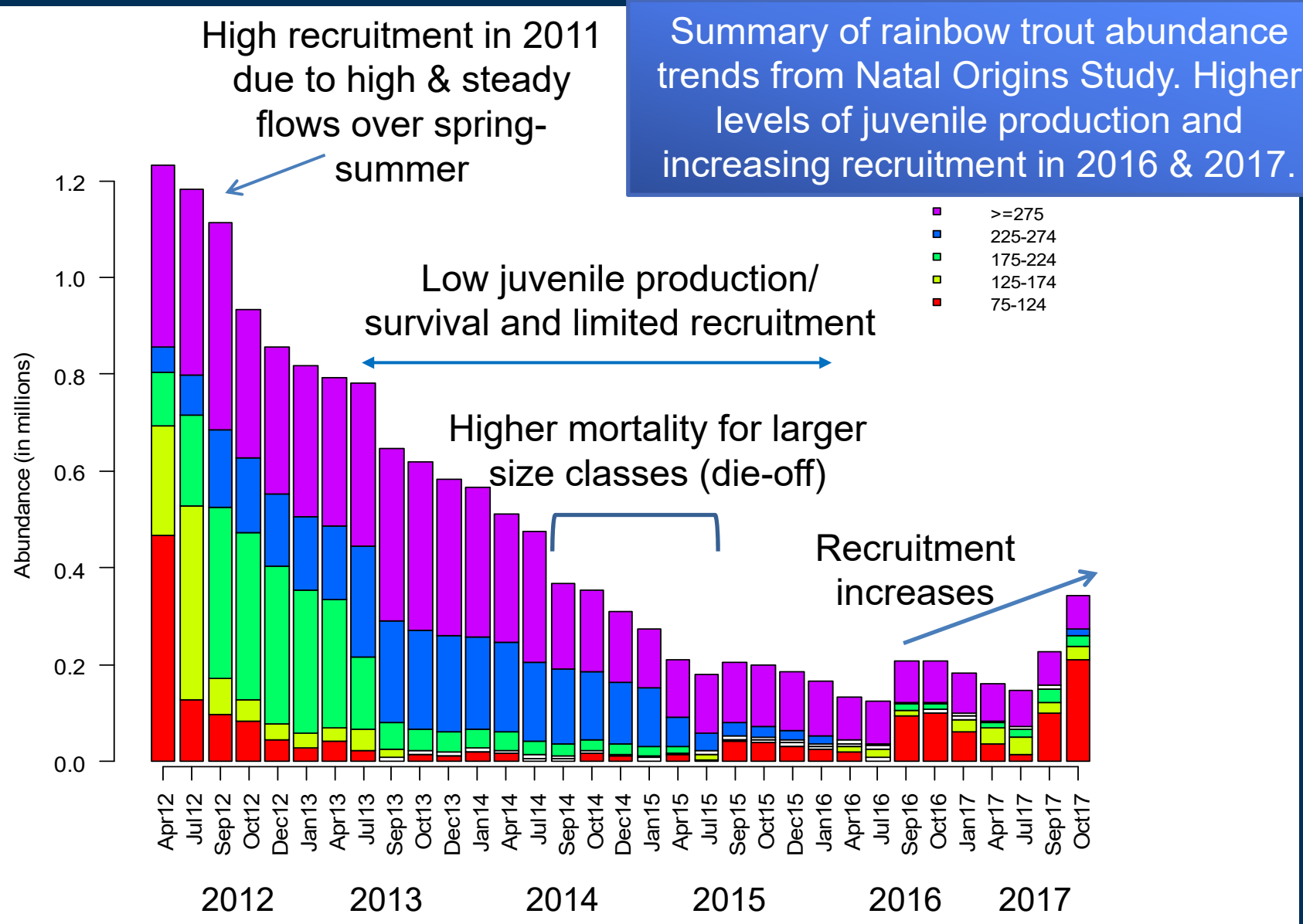
Rainbow Trout Abundance in Glen Canyon

Summary of rainbow trout abundance trends from Natal Origins Study. Higher levels of juvenile production and increasing recruitment in 2016 & 2017.



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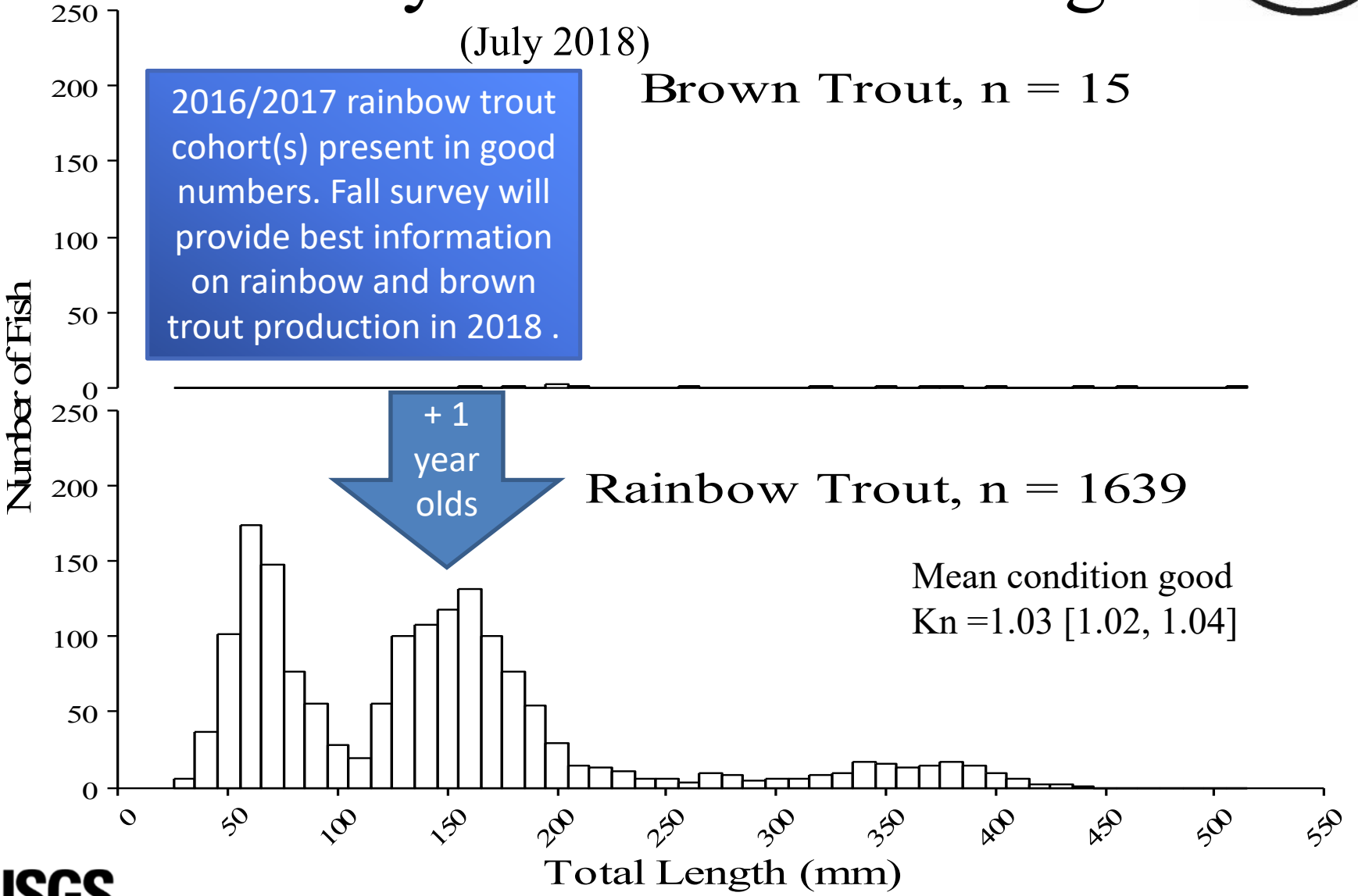
(Preliminary data from Korman and Yard 2018. Do Not Cite.)

Length frequency histograms of trout at Lees Ferry from electrofishing



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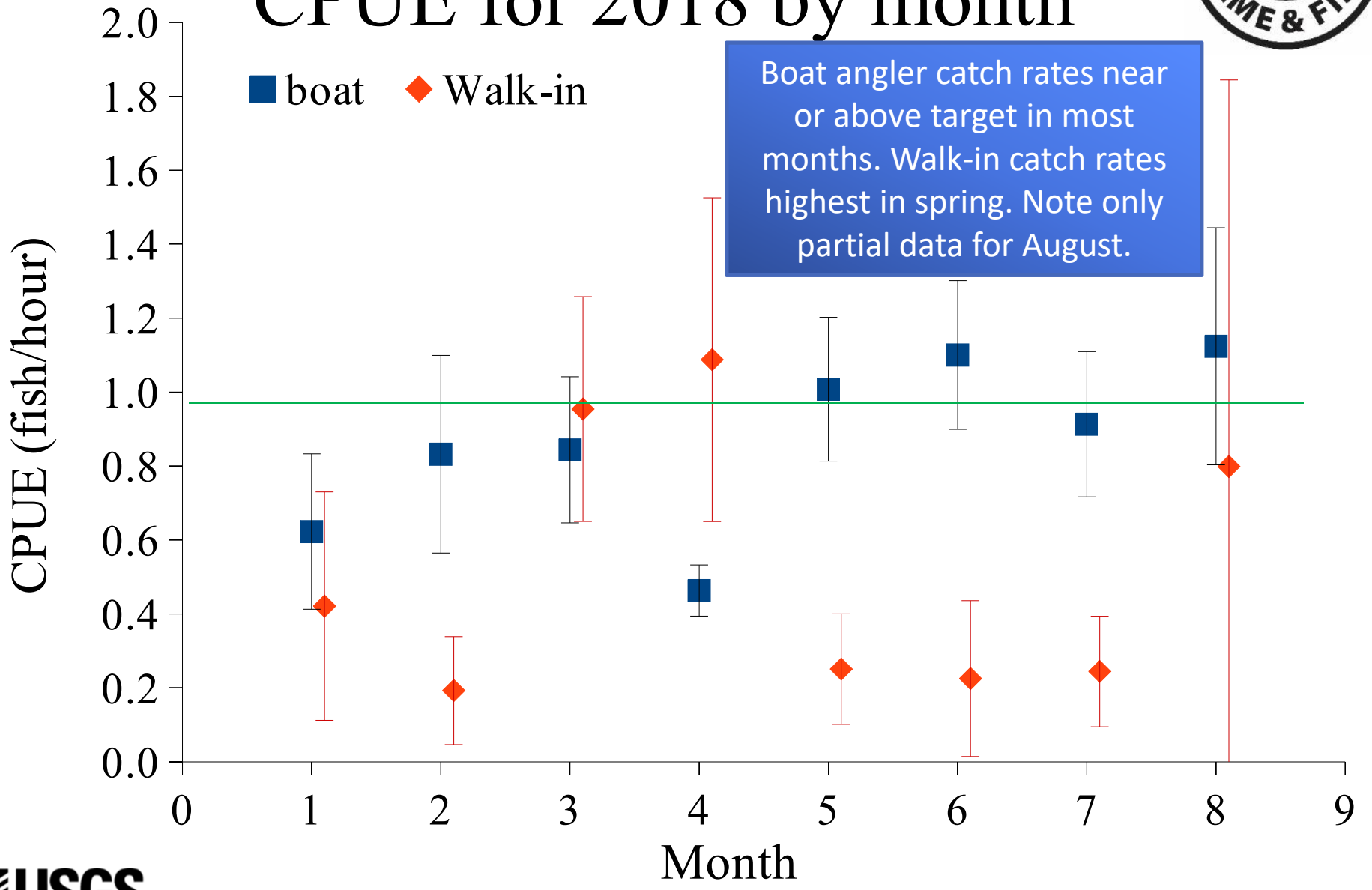
(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)

Angler Rainbow Trout CPUE for 2018 by month



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(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)

Rainbow Trout Catch Downstream of Little Colorado River Confluence

Increase in rainbow trout catch in 2018 likely due to recent large year class(es) in Glen Canyon, and perhaps Marble Canyon, and subsequent downstream dispersal of small fish. Similar to what we believe happened in 2011-2012.

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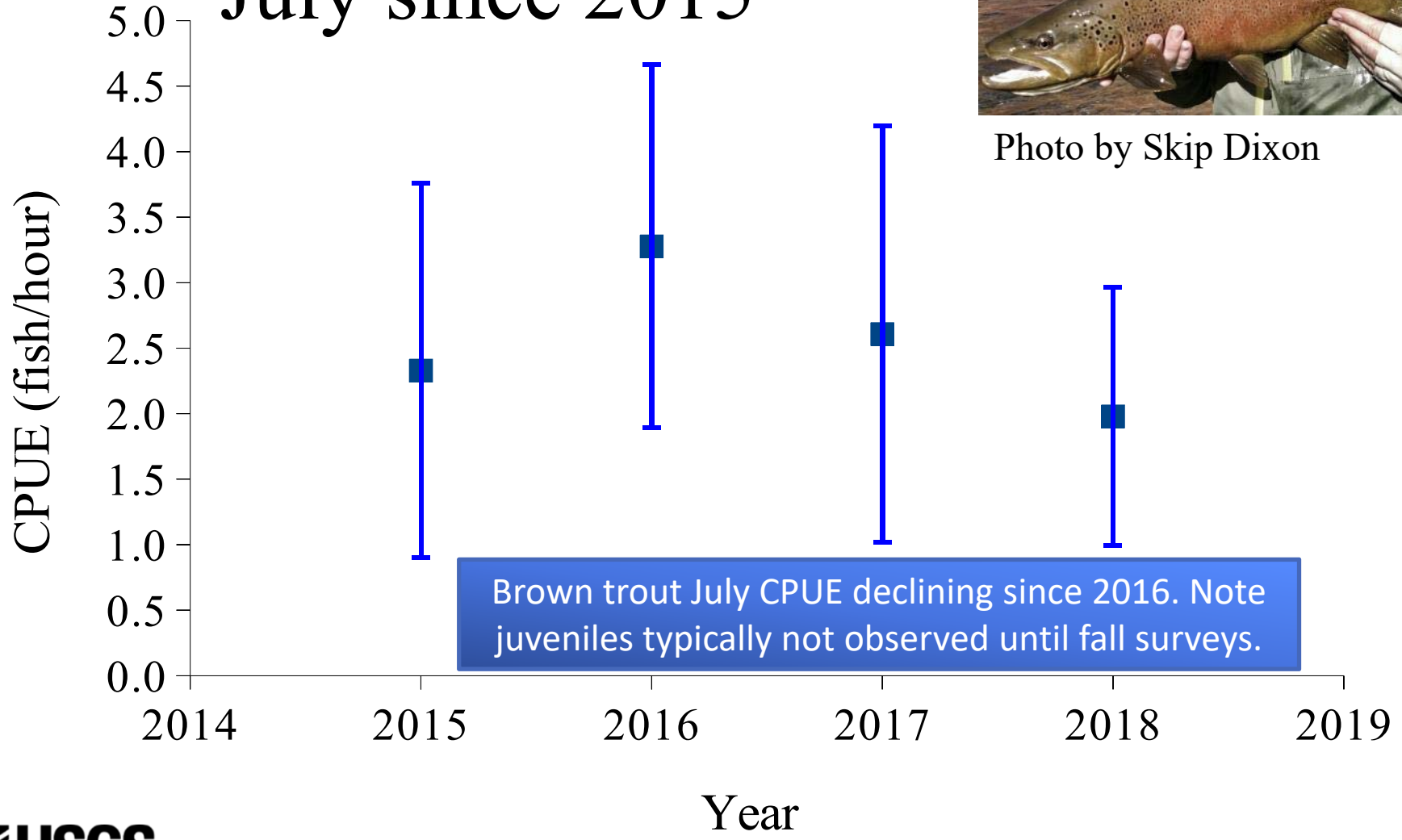
(Preliminary data from Yard and Korman, 2018. Do Not Cite.)

Brown Trout electrofishing CPUE in July since 2015

Photo by Skip Dixon



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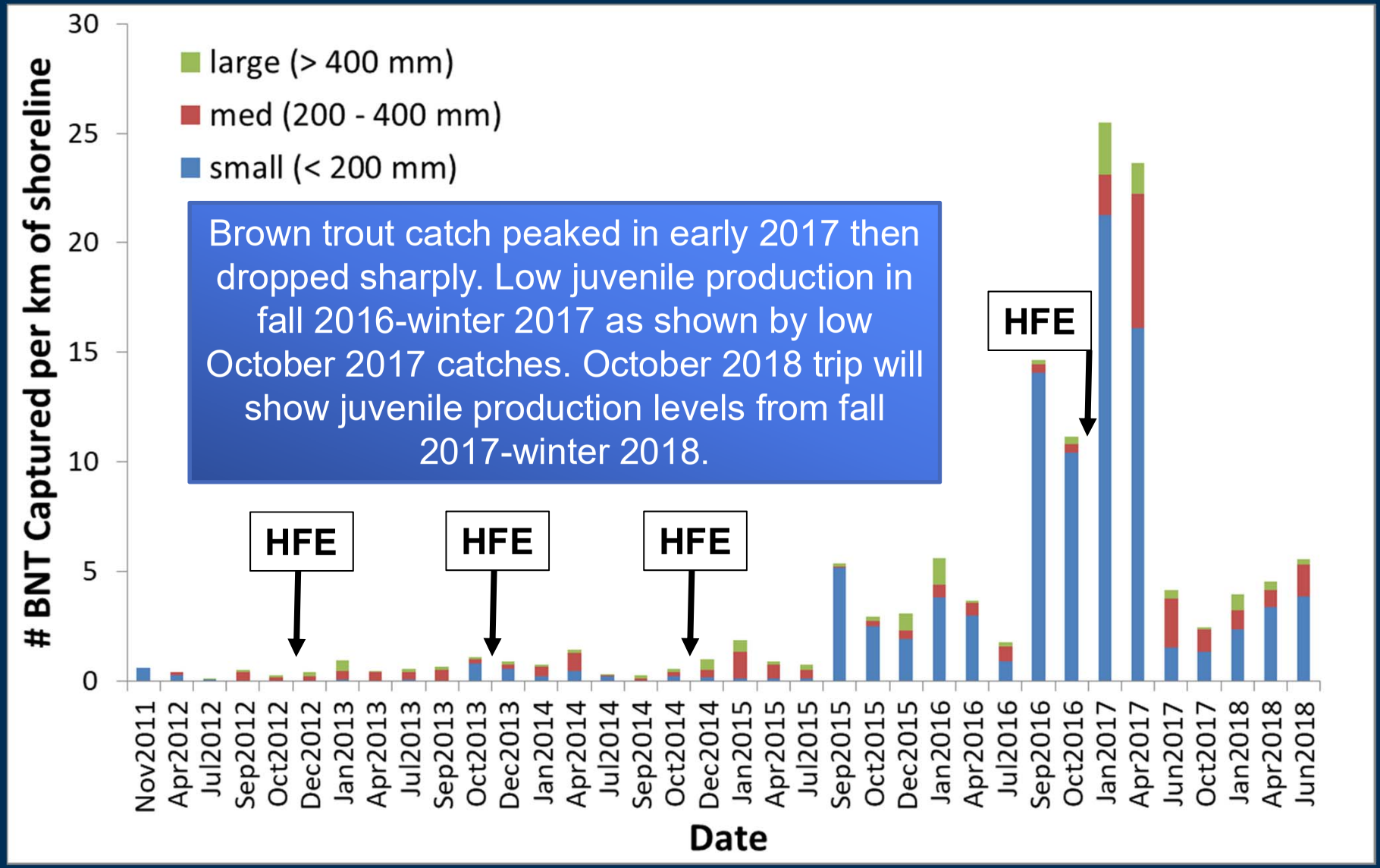
(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)

Brown Trout in Glen Canyon



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(Preliminary data from Yard and Korman, 2018. Do Not Cite.)

Bright Angel Brown Trout Removal and Humpback Chub Translocations

2017-18 Brown Trout Control

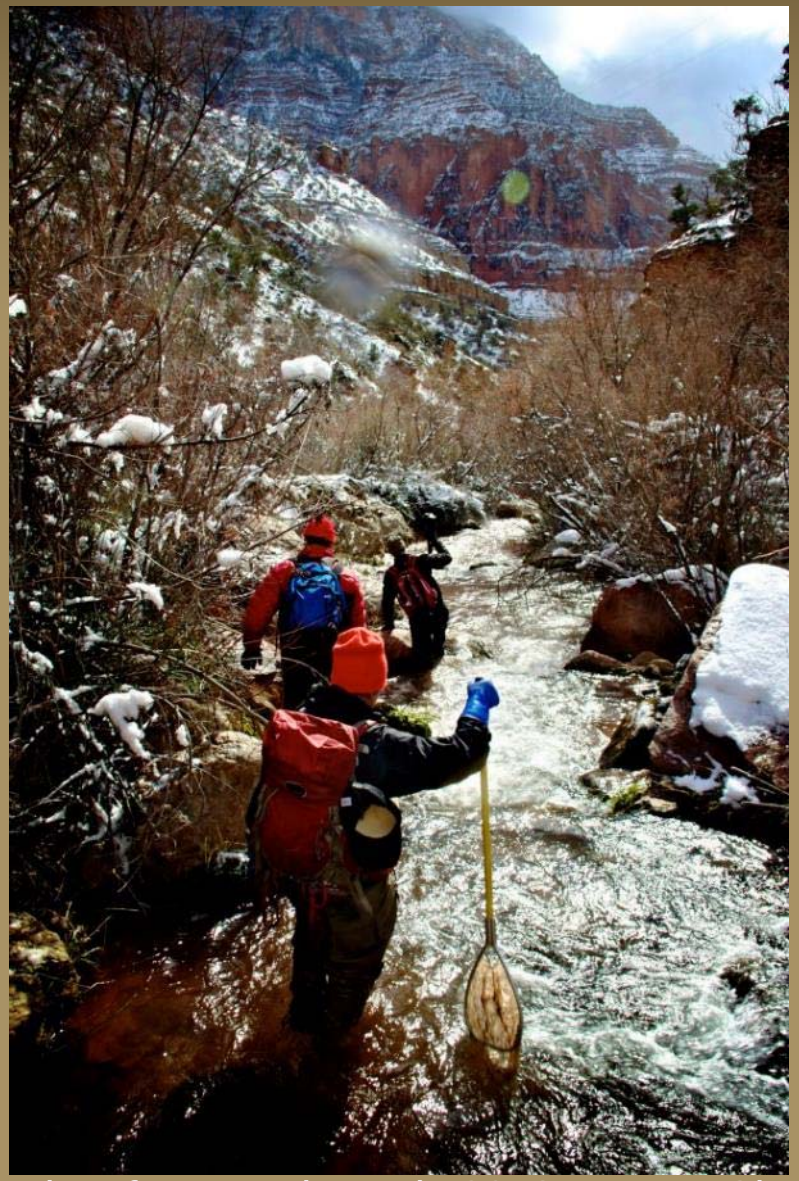
- 90% reduction in catch since 2012
- Native fish catch continues to increase

Humpback Chub Translocations

- Small number detected on remote PIT-tag antennas

Havasu Creek

- Estimate 50% of population produced *in situ*



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(Preliminary data from Healy et al., 2018. Do Not Cite.)

Nutrients as Ecosystem Drivers

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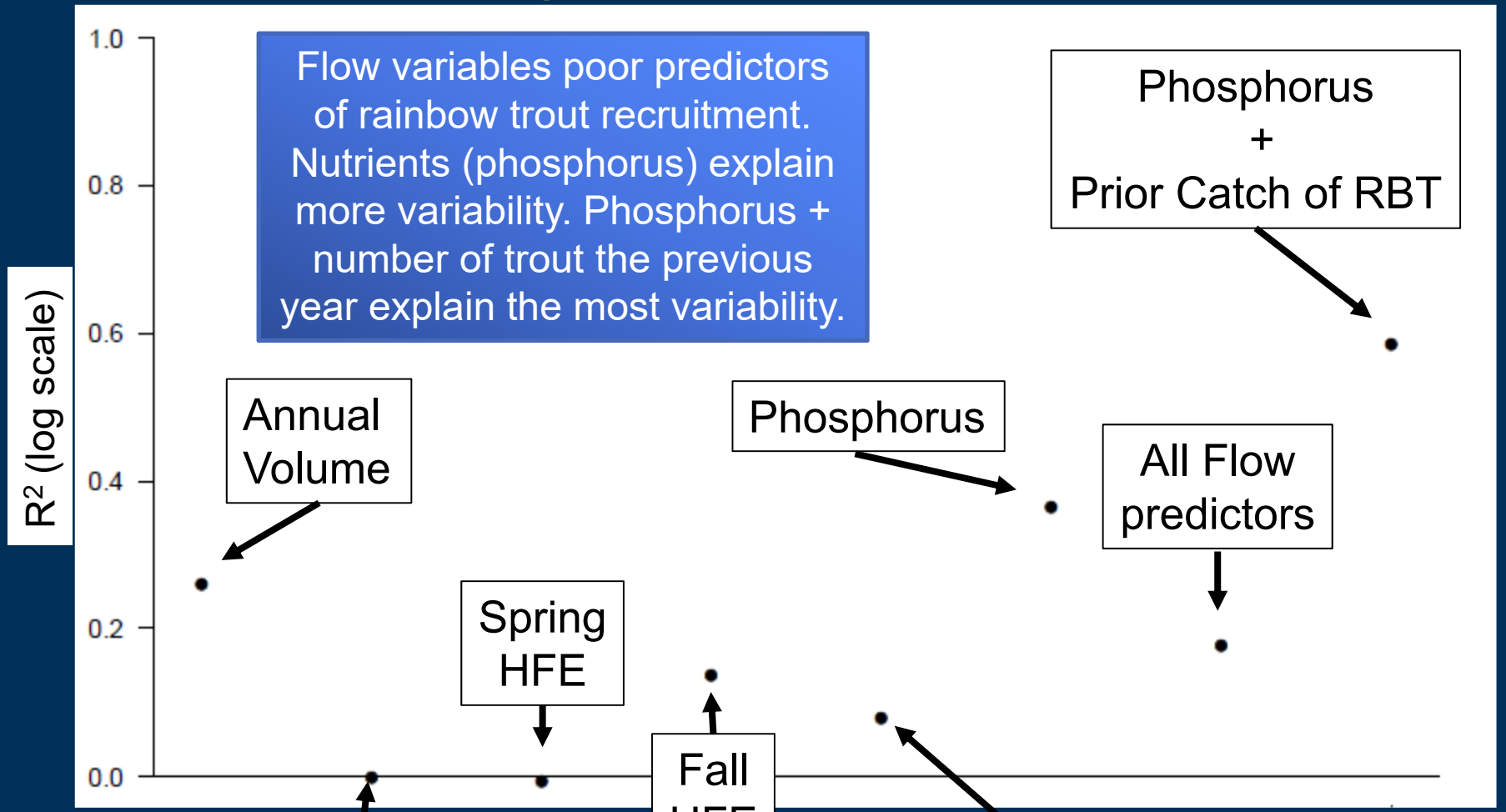
Correlation Between Rainbow Trout Recruitment in Glen Canyon and Various Predictors



Preliminary data. Do not cite.

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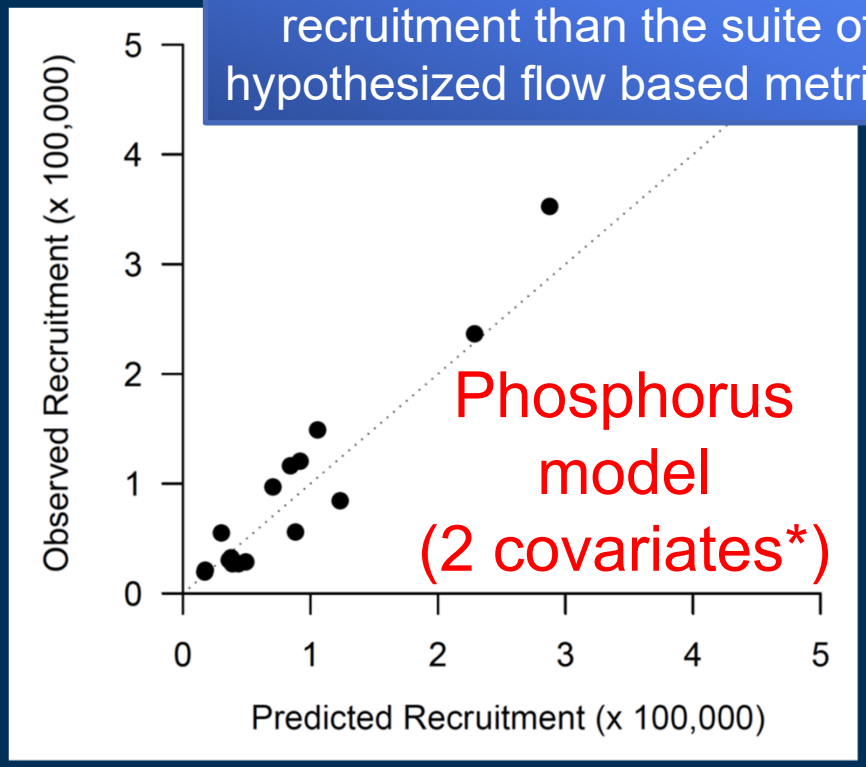
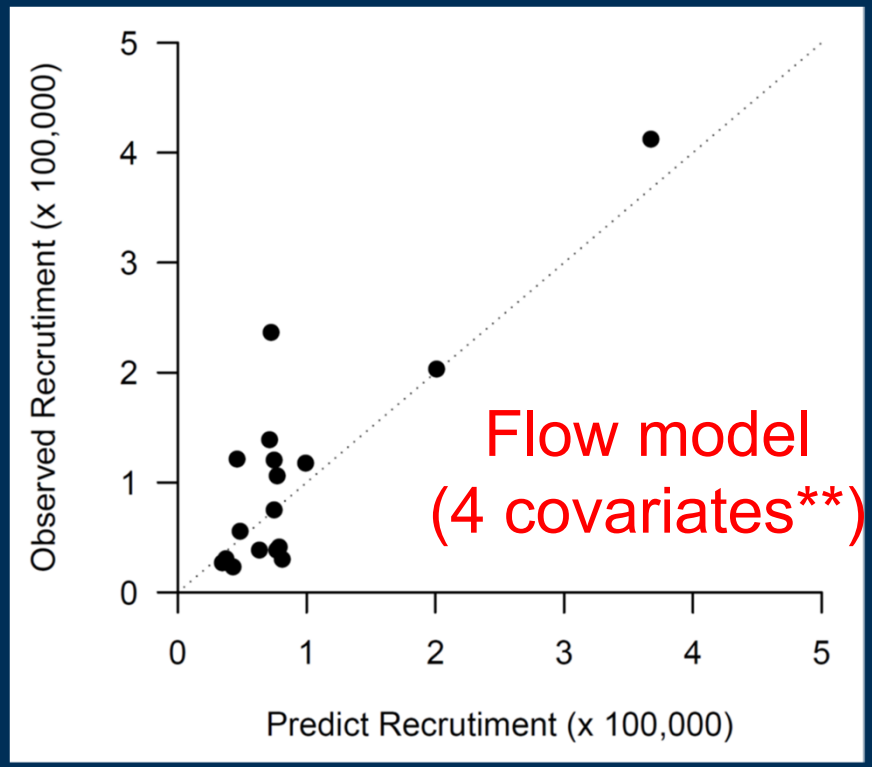
Correlation Between Rainbow Trout Recruitment in Glen Canyon and Various Predictors

Phosphorous is more closely linked to rainbow trout recruitment than the suite of hypothesized flow based metrics.



*Phosphorus + Prior Catch of RBT



**Annual Volume + Hydropeaking Index + Fall HFE + Spring HFE

Yackulic, preliminary data, 2018. Do not cite.

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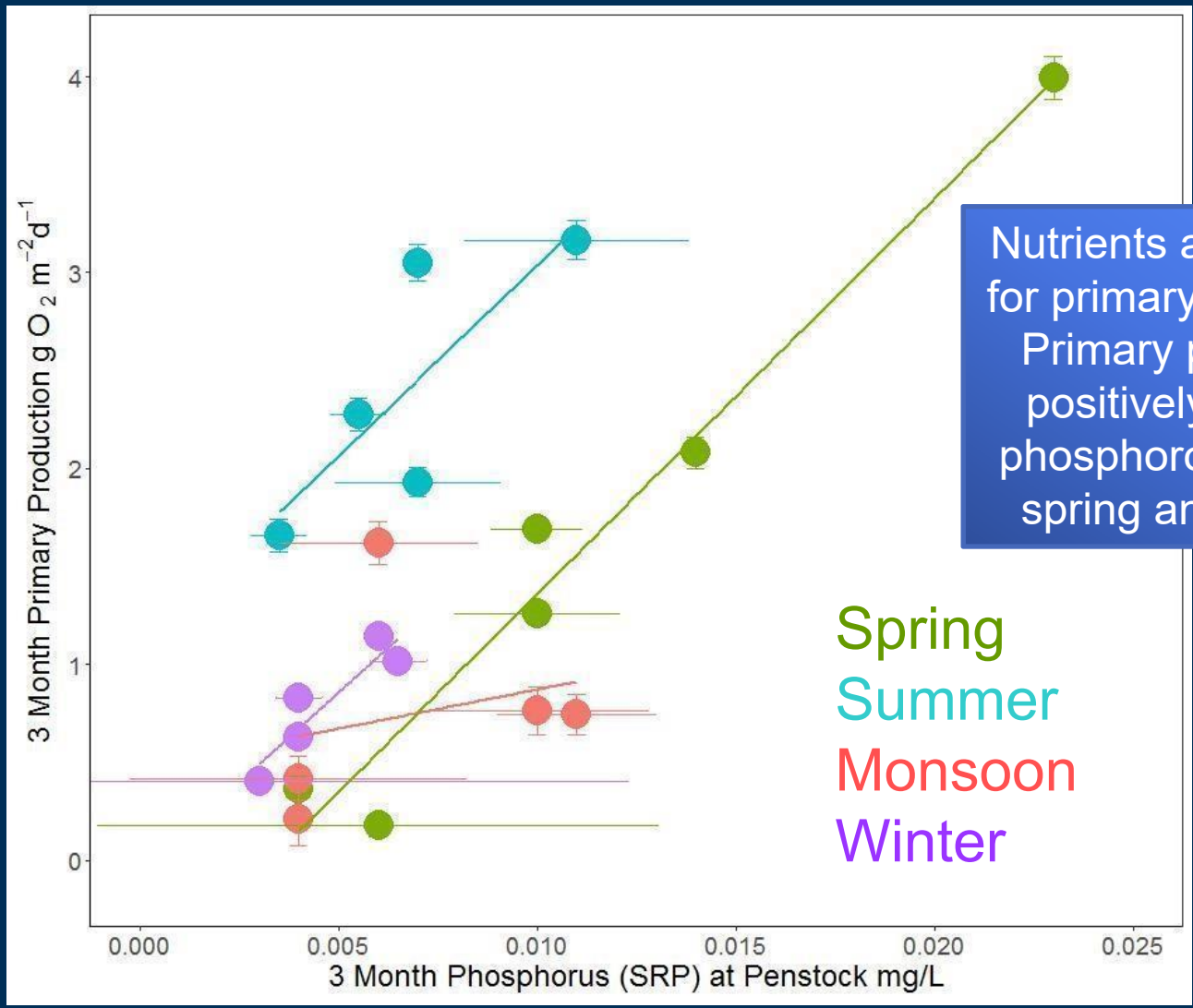
Colorado River Primary Productivity vs. Phosphorus Concentrations



Nutrients are important for primary productivity. Primary productivity positively related to phosphorous in winter spring and summer.

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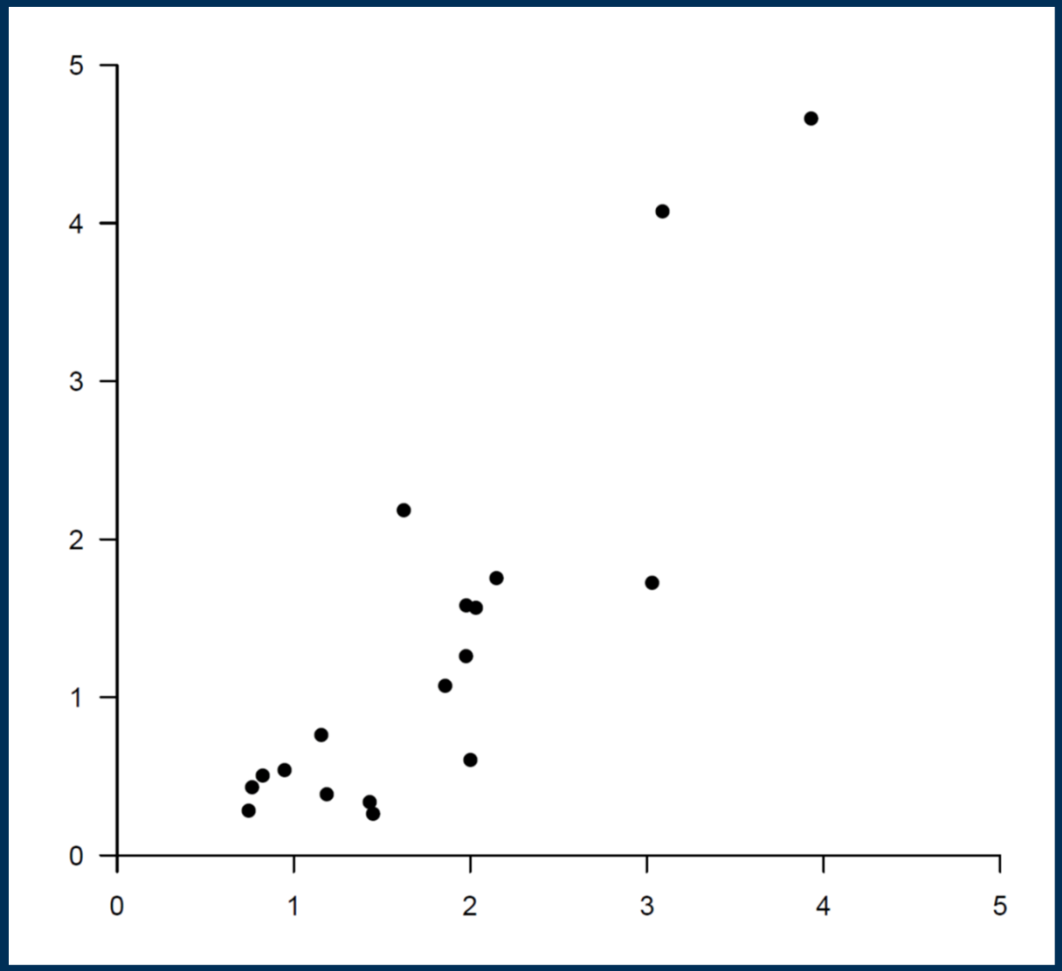
Yackulic, preliminary data, 2018. Do not

Colorado River Invertebrate Drift Biomass vs. Primary Productivity

Primary productivity forms the base of the food web. Invertebrate drift biomass in the Colorado River positively related to primary productivity.



Yackulic, preliminary data, 2018. Do not cite.

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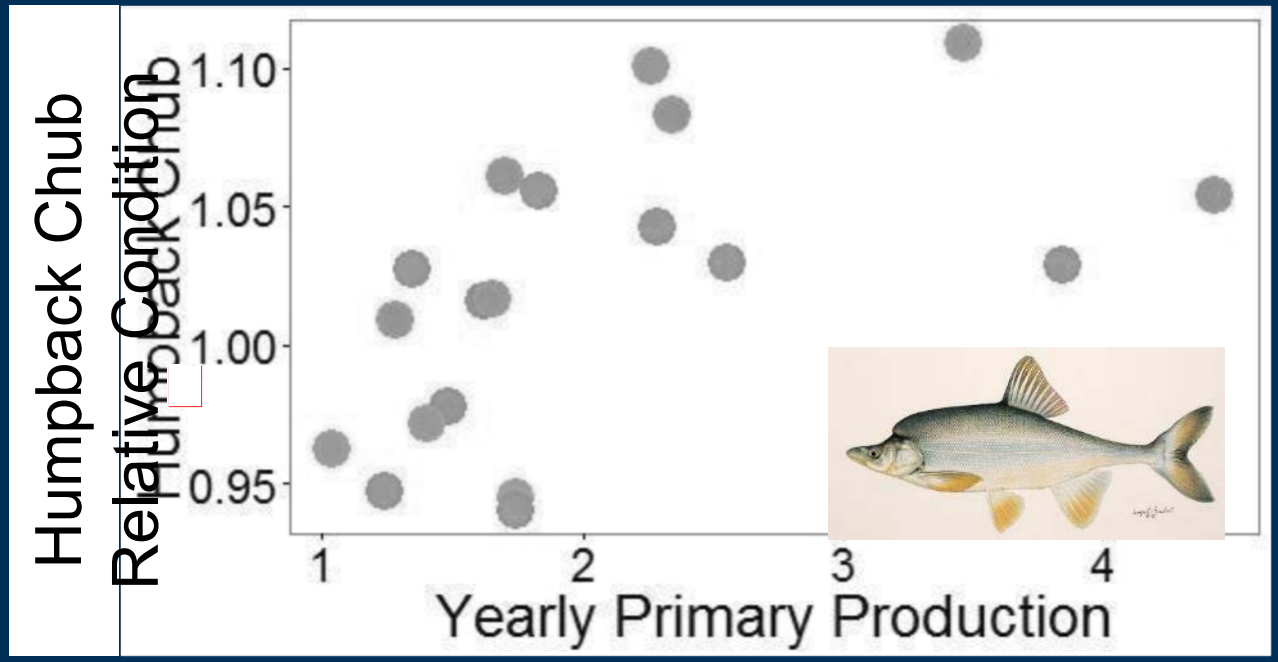
Primary productivity is related to native fish condition (fat/skinny) and spawning rates in humpback chub



Yackulic, preliminary data, 2018. Do not cite.

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Odds and Ends: Rare Native and Nonnative/Unwanted Fishes

-12 mile in Glen Canyon: Green sunfish re-invaded upper slough. One smallmouth bass captured and five striped bass observed in lower slough.

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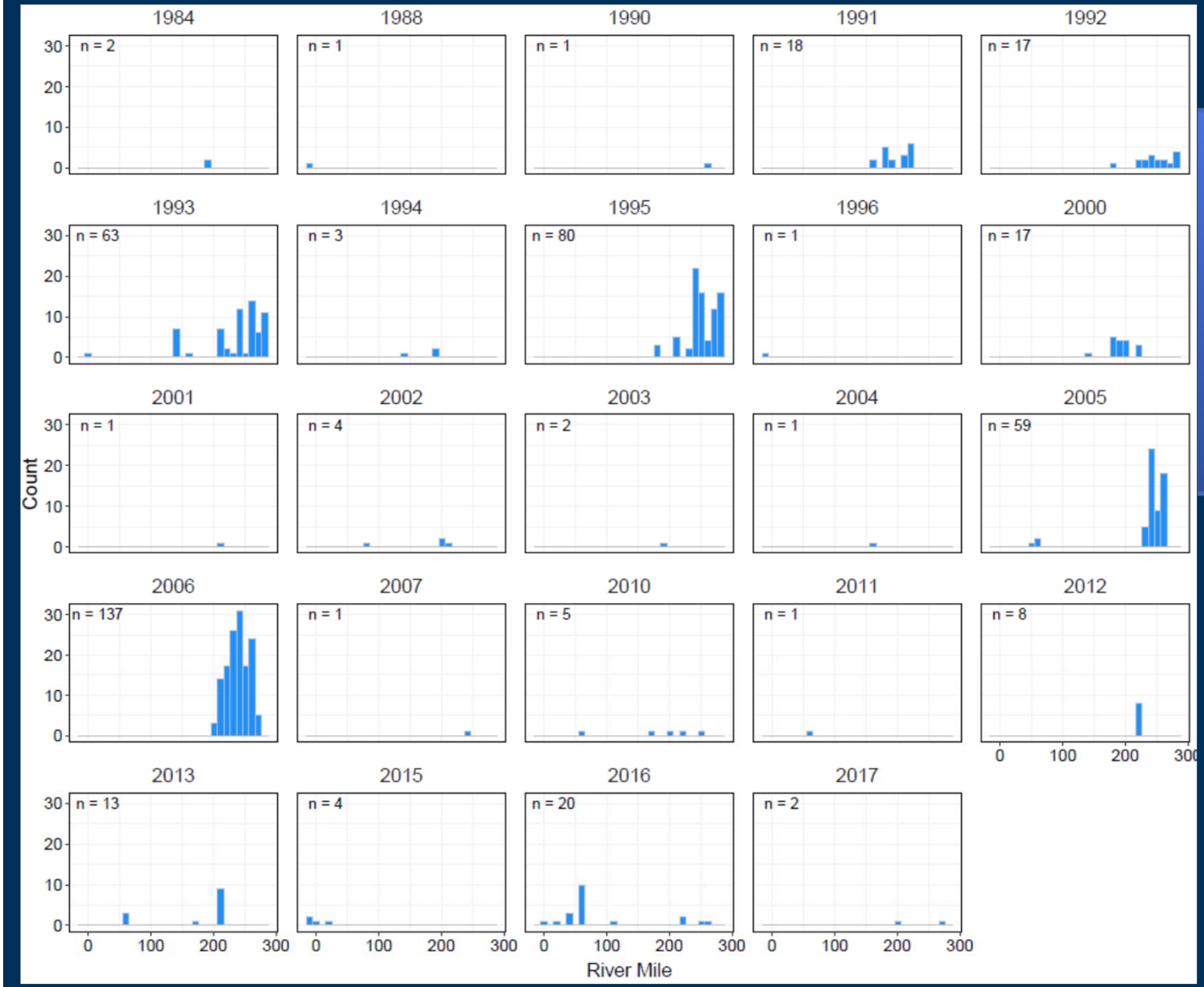
Striped Bass Catch 1984-2017



Catches are episodic. Highest numbers downstream, but periodically captured in Glen and Marble Canyons

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Downstream

- 1 Wild Razorback Sucker (549 mm TL) +
  Razorback/Flannelmouth Sucker hybrid at RM 243 (543 mm TL)
- 2 Flannelmouth/Bluehead Sucker hybrids
- No – unusual rare-nonnatives

USGS

Photo: J. Boyer

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
- Ecometric Research, Inc.
- US Geological Survey-GCMRC

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Questions?
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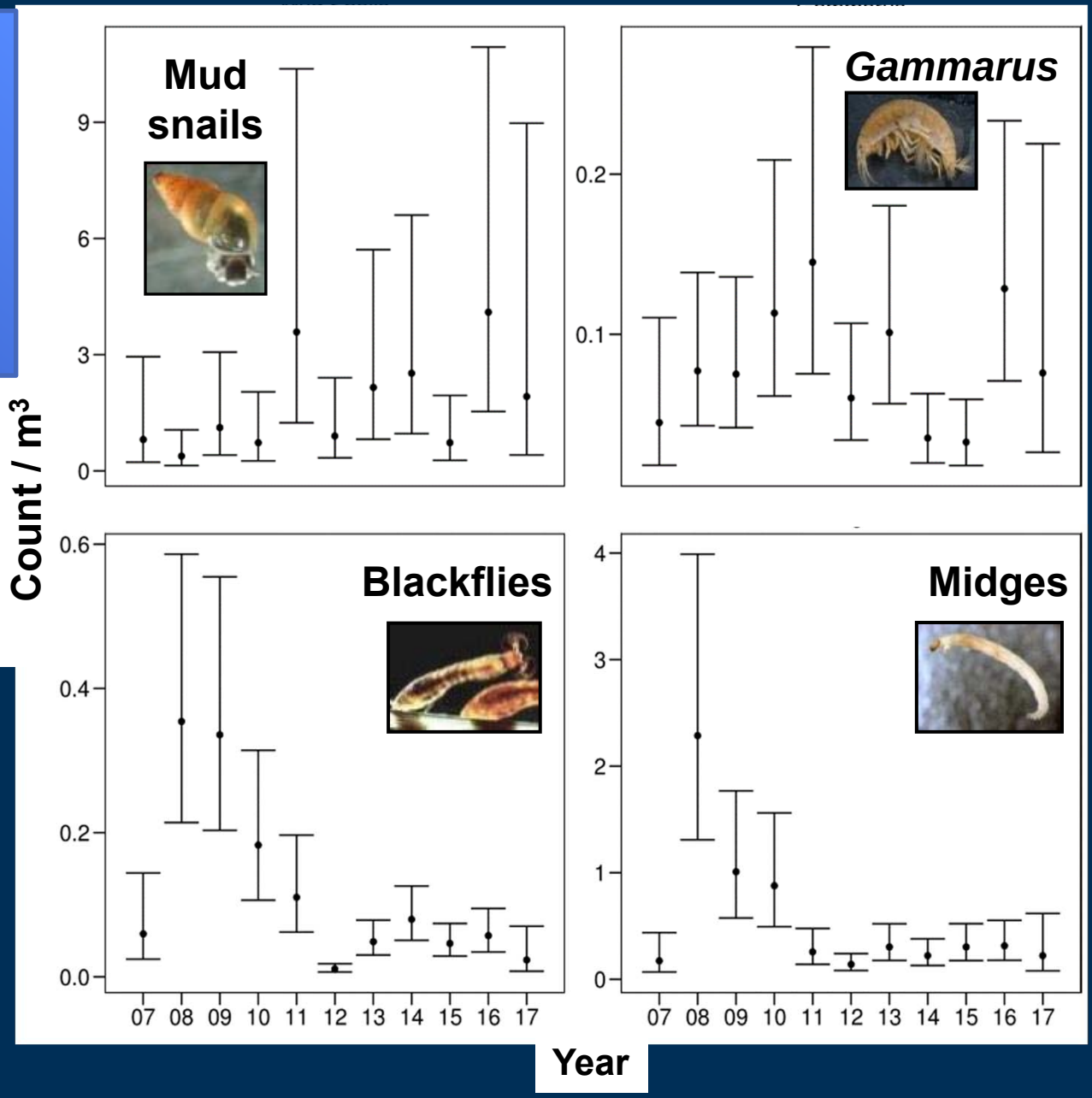
Aquatic Foodbase: Invertebrate Drift at Lees Ferry

Mud snails relatively abundant, but Gammarus and blackflies remain rare. Midge drift varied little year to year since 2011



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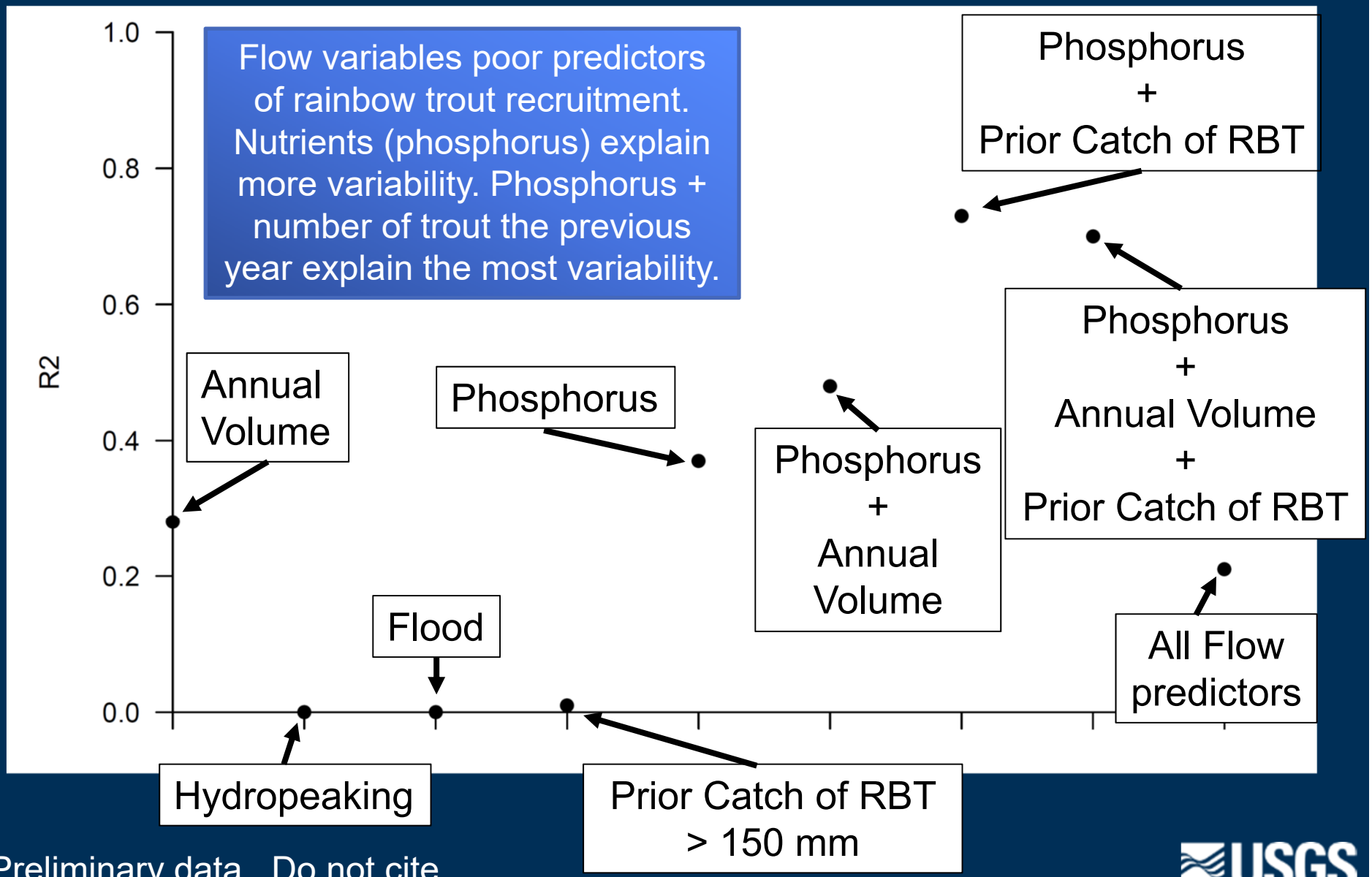

Preliminary data. Do not cite.

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