GCMRC Science Updates – Part 2

Adaptive Management Work Group Meeting
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U.S. Department of the Interior
U.S. Geological Survey
Outline

- Aquatic Foodbase
- Humpback Chub
- Trout
- Nutrients as Ecosystem Drivers
- Odds and Ends
Aquatic Foodbase
Midge Catches in Light Traps – Weekday vs. Weekends in Glen Canyon

Monitoring of midges in Glen Canyon in early August shows higher catches on weekends vs. weekdays.

Provisional data from Kennedy and Muehlbauer, subject to change. Do not cite.
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.
Humpback Chub
Annual Spring Abundances of Adult Humpback Chub in Lower Little Colorado River


(Preliminary data from VanHaverbeke et al. USFWS. 2018. Do Not Cite.)
Annual Spring Abundance 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.

2016 BiOp tier-1 trigger level of 1,250. 3-year average is 1,895 fish, exceeds 2016 BiOp tier-1 trigger level.

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 Do Not Cite.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 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 Do not cite.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 Preliminary data. Do not cite. Vertical lines represent 95% confidence intervals.
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.

(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 Do Not Cite.)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.

(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)
Humpback Chub CPUE by Year in Western Grand Canyon

Humpback chub CPUE in continued to significantly increase in areas that were monitored from Pumpkin Spring (~RM 213) downriver. All size classes (juvenile to adult) were captured.

(Preliminary Data from VanHaverbeke et al. USFWS. 2017. Do Not Cite.)
Rainbow Trout and Brown Trout
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.

High recruitment in 2011 due to high & steady flows over spring-summer

Low juvenile production/survival and limited recruitment

Higher mortality for larger size classes (die-off)

Recruitment increases

(Preliminary data from Korman and Yard 2018. Do Not Cite.)
Length frequency histograms of trout at Lees Ferry from electrofishing (July 2018)

Brown Trout, n = 15

2016/2017 rainbow trout cohort(s) present in good numbers. Fall survey will provide best information on rainbow and brown trout production in 2018.

Rainbow Trout, n = 1639

Mean condition good
Kn =1.03 [1.02, 1.04]
Angler Rainbow Trout

CPUE for 2018 by month

Boat angler catch rates near or above target in most months. Walk-in catch rates highest in spring. Note only partial data for August.

(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.

(Preliminary data from Yard and Korman, 2018. Do Not Cite.)
Brown Trout electrofishing CPUE in July since 2015

Brown trout July CPUE declining since 2016. Note juveniles typically not observed until fall surveys.

(Preliminary Data from Rogowski et al. AGFD. 2018. Do Not Cite.)
Brown Trout in Glen Canyon

Brown trout catch peaked in early 2017 then dropped sharply. Low juvenile production in fall 2016-winter 2017 as shown by low October 2017 catches. October 2018 trip will show juvenile production levels from fall 2017-winter 2018.

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

(Preliminary data from Healy et al., 2018. Do Not Cite.)
Nutrients as Ecosystem Drivers
Correlation Between Rainbow Trout Recruitment in Glen Canyon and Various Predictors

Flow variables poor predictors of rainbow trout recruitment. Nutrients (phosphorus) explain more variability. Phosphorus + number of trout the previous year explain the most variability.

- Annual Volume
- Phosphorus
- Spring HFE
- Fall HFE
- Hydropeaking
- All Flow predictors
- Phosphorus + Prior Catch of RBT
- Prior Catch of RBT > 150 mm

Preliminary data. Do not cite.
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 model (2 covariates*)

- Phosphorus + Prior Catch of RBT

Flow model (4 covariates**)

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

Yackulic, preliminary data, 2018. Do not cite.
Nutrients are important for primary productivity. Primary productivity positively related to phosphorous in winter, spring and summer.

Spring
Summer
Monsoon
Winter

Yackulic, preliminary data, 2018. Do not
Primary productivity forms the base of the food web. Invertebrate drift biomass in the Colorado River positively related to primary productivity.
Primary productivity is related to native fish condition (fat/skinny) and spawning rates in humpback chub

Yackulic, preliminary data, 2018. Do not cite.
-12 mile in Glen Canyon: Green sunfish re-invaded upper slough. One smallmouth bass captured and five striped bass observed in lower slough.
Striped Bass Catch 1984-2017

Catches are episodic. Highest numbers downstream, but periodically captured in Glen and Marble Canyons.
• 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
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- National Park Service
- US Fish and Wildlife Service
- Ecometric Research, Inc.
- US Geological Survey-GCMRC
Questions?
Mud snails relatively abundant, but Gammarus and blackflies remain rare. Midge drift varied little year to year since 2011.

Provisional data from Kennedy and Muehlbauer, subject to change. Do not cite.
Correlation Between Rainbow Trout Recruitment in Glen Canyon and Various Predictors

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- Phosphorus + Prior Catch of RBT
- Phosphorus + Annual Volume + Prior Catch of RBT
- Phosphorus + Annual Volume
- Phosphorus
- Annual Volume
- Flood
- Hydropeaking
- Prior Catch of RBT > 150 mm

Preliminary data. Do not cite.