GCDAMP Annual Reporting Meeting Update: Fishes

David Ward
Monitoring, Research and Management — Who Does What

Monitoring

Research

Management
Images downstream of Glen Canyon Dam
Rainbow Trout CPUE

Goal: RBT electrofishing CPUE > 1 fish/min

AGFD preliminary data, do not cite
Brown Trout

409 captured
72 were recaptures
15.7% of catch

AGFD Preliminary Data, do not cite
Brown Trout Length

*No Spring trip in 2018

AGFD Preliminary Data, do not cite
Rainbow Trout Abundance at Lees Ferry

Phase 1: high abundance (large 2011 cohort)
Phase 2: collapse due to poor condition
Phase 3: low abundance due to low recruitment
Phase 4: moderate abundance from limited recruitment (2017)

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase</th>
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<tbody>
<tr>
<td>2012</td>
<td>5??</td>
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<tr>
<td>2013</td>
<td>5??</td>
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<tr>
<td>2014</td>
<td>5??</td>
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<td>2015</td>
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<td>2016</td>
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<td>2017</td>
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<td>2018</td>
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<td>2019</td>
<td>5??</td>
</tr>
<tr>
<td>2020</td>
<td>5??</td>
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Size Class (mm):
- >=275
- 225-274
- 175-224
- 125-174
- 75-124

Condition Factor (>275 mm):
- 1.2
- 1.1
- 1.0
- 0.9
- 0.8

Abundance in 3 km ('000s)
Brown Trout Grow Much Faster than Rainbow Trout, and Rarely Lose Weight
Abundance of largest brown trout stable over last ~2 years.
But BNT recruitment is increasing over last few years. Some evidence that when spawning RBT abundance is low, BNT have high reproduction rates.
Immigration of large BNT to Lees Ferry was associated with 2 of 6 fall HFE’s and 0 of the other 14 fall seasons.
Difficult decisions made for FY21-23 workplan impact ability to measure effectiveness of BNT management.

What would our estimate be now if we had stopped collecting some of the data a few years ago?

What may happen in 2023 (should expect even larger increase in uncertainty as drop from 2 to 1 sites).

What was chosen for 2021.

Alternative with minimal impact on model’s uncertainty.

What would our estimate be now if we had stopped collecting some of the data a few years ago?
Confluence of the Colorado River and Little Colorado River
Trends in Rainbow Trout Abundance at the LCR

|------|------|------|------|------|------|------|------|------|------|------|------|------|

- **2008-2009 Glen recruitment**

- **>=225 mm**

- **2011 Glen recruitment**
Monitoring in lower 13.57 km of LCR
Annual spring and fall abundances of HBC ≥150 mm and ≥200 mm in lower 13.6 km of LCR
Fall abundances of adult humpback chub (>199mm TL) in the Little Colorado River

Provisional data. Do not cite.
Spring subadults in LCR (150-199 mm)
Fall age-0 and next spring age-1 in LCR
Assessing Risk of Predatory Fishes?

Photo by Jan Boyer
AZGFD
Survival of larval humpback chub (12 mm TL) as predator size increases for four species of small-bodied predatory fish commonly found in the Little Colorado River. Probability of survival calculated using JMP Prediction Profiler, based on 10 replicated 24-hr laboratory trials for each predator species (4 predators and 12 prey in each trial).
Predation vulnerability of HBC at 30% of predator size

Predator Species:
- Rainbow trout
- Brown trout
- Smallmouth bass
- Green sunfish
- Channel catfish
- Plains killifish
- Red shiner
- Fathead minnow

% Survival:
- 0
- 20
- 40
- 60
- 80
- 100
- 120

USGS: science for a changing world
Translocations to above Chute Falls
Translocations decrease the need for trout removals and appear to save money.
Translocations increase adult abundance in most (but not all) years
Brown Trout: Bright Angel Creek update and movement modeling

2020-21 Bright Angel Creek Brown Trout resurgence driven by large young-of-year class

Multistate mark-recapture model: fall HFES increase Brown Trout immigration into Lees Ferry
NPS Translocation Activities: 2020

• Bright Angel Creek translocation
  – June 9, 2020
  – 415 juvenile humpback chub, collected in 2019

• Completed:
  – Shinumo Inflow monitoring (2 trips)
  – Havasu monitoring (October)

• COVID cancellations:
  – LCR collection, May-June
  – Havasu spring sampling, May
NPS - Analysis of Tributary Translocations

Humpback chub growth and population dynamics driven by:
- Survival/growth comparable to the LCR
- Rainbow trout density (-)
  - Growth – Havasu and Shinumo
  - Recruitment - Havasu
- Monsoon flooding (+)
  - Growth – Havasu and Shinumo
  - Survival – Havasu
  - Exception – flooding following fire (e.g., 2014 Shinumo)
- Humpback chub density (-)
  - Survival and recruitment - Havasu
Mainstem Fish monitoring
Population Sizes

A) Rainbow Trout

B) Brown Trout

C) Common Carp

D) Flannelmouth Sucker

E) Bluehead Sucker

F) Speckled Dace

CPUE (fish/hr)

Year
Western Grand Canyon is important for native fish species.
Hoop net CPUE by reach for 2020
Box plots showing that far western Grand Canyon is important for small juvenile fish (growth, recruitment...)

AGFD preliminary data, do no cite. Fish caught 2017-2019, aggregated by ~5 mile sampling reach.
Growth in western GC is comparable (or better) than in the Lower Little Colorado River

- Evidence of age-0 production: 2017 cohort was large
- Growth in western Grand Canyon is fast (more like LCR than JCM East)
- Large adults are highly mobile
- Survival in JCM West may be low, but more information is needed about movement
- Need more years of data! (Recall history of JCM East)
Densities (fish/mile) of adult HBC (≥200 mm) within six, 2-mile long mark-recapture reaches between Diamond Creek and Pearce Ferry

Provisional data, do not cite
Pearce Ferry rapid fish assemblage comparison native vs nonnative

<table>
<thead>
<tr>
<th>Species category</th>
<th>Upstream</th>
<th>Downstream</th>
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<tbody>
<tr>
<td>Native</td>
<td>599</td>
<td>40</td>
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<tr>
<td>Nonnative</td>
<td>9</td>
<td>1023</td>
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Native and nonnative fish populations in Pearce Ferry
Why have fish populations changed over time?

Hypotheses

– Water temperatures changed
– Nutrients changed
– Changes to the foodbase
– Changes in predator densities
– Timing of High Flow Events
– Other??
Questions?