HIGHLIGHTS OF: Assessment of Potential Augmentation and Management Strategies for Razorback Sucker *Xyrauchen texanus* in Lake Mead and Grand Canyon: A 2021 Science Panel Summary

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LINK to Panel Summary

- https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1136&context=eco_pubs

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Overarching Question

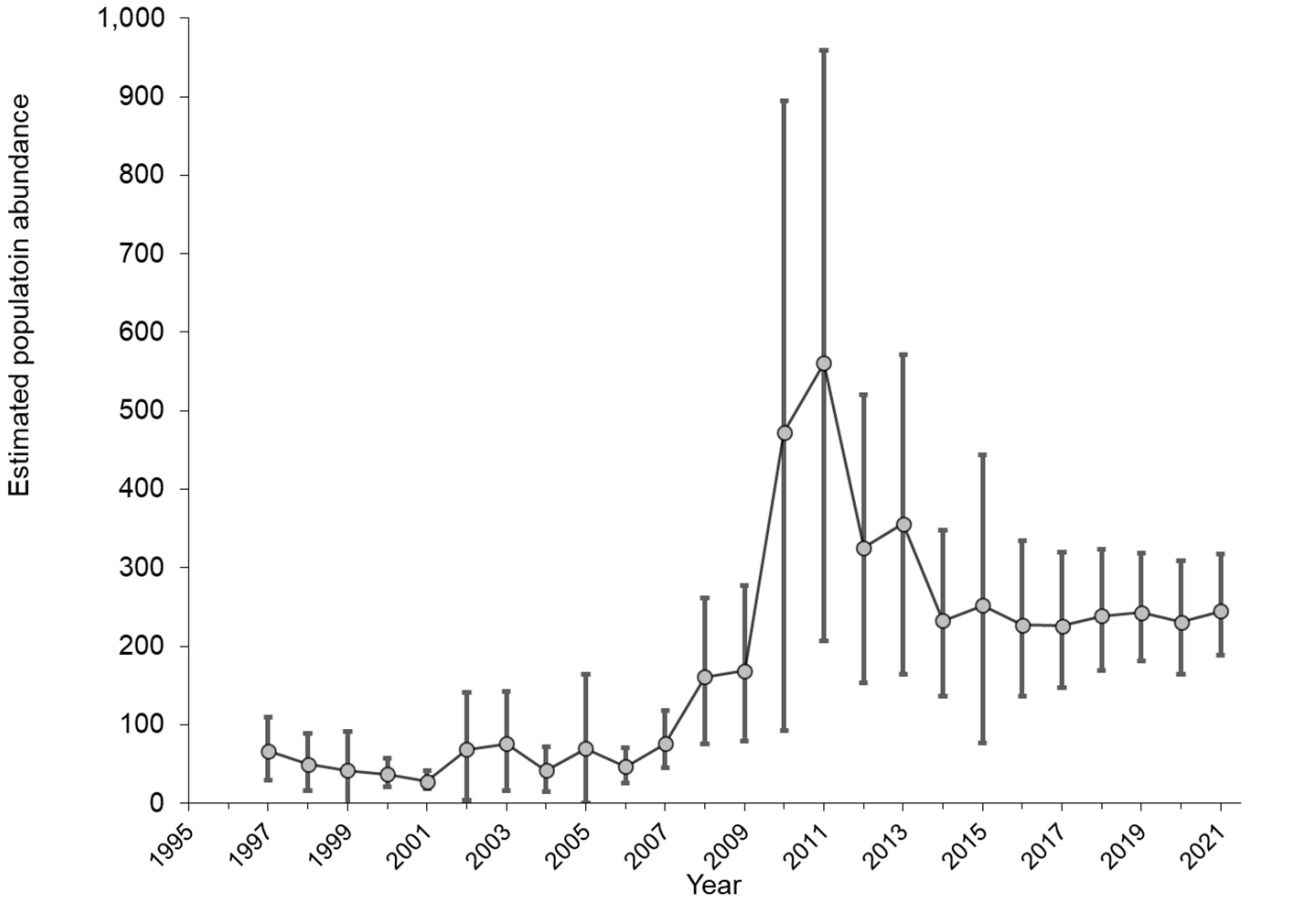
- Is the current population of Razorback Sucker in Lake Mead and Grand Canyon sustainable, and should it be augmented?

Data Presentations

Table 1: List of data presentations provided to the 2021 Expert Science Panel.

Presenter & affiliation	Presentation title
Julie Stahli, U.S. Fish and Wildlife Service	Brief overview of recovery plan and goal development for Razorback Sucker
Brandon Albrecht & Ron Rogers, BIO-WEST, Inc.	Long-term monitoring in Lake Mead and Grand Canyon
Steve Platania, American Southwest Ichthyological Researchers	Larval fish monitoring in lower Grand Canyon
Charles Yackulic, Grand Canyon Monitoring and Research Center	Monitoring of western Grand Canyon and potential changes in habitat
Dave Rogowski, Arizona Game and Fish Department	Fish assemblage monitoring in western Grand Canyon and above and below Pearce Ferry Rapid
Thomas Dowling, Wayne State University	Current genetic status and trends in razorback sucker in Lake Mead and Grand Canyon
Matt Bogaard, Kansas State University	Razorback Sucker movement behavior in river-reservoir inflows of Lake Powell
Casey Pennock, Utah State University	Demographics and population viability analysis of Lake Mead Razorback Sucker

What is the current status of the population(s) in Lake Mead and Grand Canyon



- Perception of decline?
  - Depends on time series
- Some recruitment is occurring
- Currently sustainable at 200-500
- BUT, long-term persistence questionable
- AND, lack of RZN < 200 mm
  - Recruitment Bottleneck

Lake Mead specific Highlights

- **Is the current level of 5,800 fish a suitable starting goal towards recovery?**
  - *Agreement, 5,800 sexually mature fish is a reasonable starting goal.*

Lake Mead specific Highlights (cont.)

- **Is the current level of 5,800 fish a suitable starting goal towards recovery?**
  - *5,800 sexually mature fish is a reasonable starting goal.*
- **What evidence exists for conditions allowing for successful recruitment of Razorback Sucker in Lake Mead?**
  - *Turbidity at river inflows and lateral washes (e.g., Las Vegas Wash) along with submergent and flooded vegetation with variation in reservoir water level is predicted to contribute to successful recruitment*

Lake Mead specific Highlights (cont.)

- **Is the current level of 5,800 fish a suitable starting goal towards recovery?**
  - *5,800 sexually mature fish is a reasonable starting goal.*
- **What evidence exists for conditions allowing for successful recruitment of Razorback Sucker in Lake Mead?**
  - *Turbidity at river inflows and lateral washes (e.g., Las Vegas Wash) along with submergent and flooded vegetation with variation in reservoir water level is predicted to contribute to successful recruitment*
- **What do you predict are the limiting factors for a larger population in Lake Mead?**
  - *This is a critical uncertainty, but most of the ESP thought predation by nonnative fishes was limiting the population.*

Grand Canyon Specific Highlights

What role does the Grand Canyon play in greater metapopulation viability and dynamics?

- Populations of Razorback Sucker in Lake Mead and Grand Canyon represent core (Lake Mead) and satellite (Grand Canyon) populations rather than a metapopulation, because Grand Canyon appears to be reliant on fish in Lake Mead moving upstream to recolonize.

- The Grand Canyon population could be contributing to the Lake Mead core population (e.g., via larvae drifting downstream), but this contribution is likely minimal because the number of adult fish in Grand Canyon appears low and all recently tested larvae (*n* = 14) were hybrids with Flannelmouth Sucker *Catostomus latipinnis* (T. Dowling, unpublished data).

Could Grand Canyon contribute to the greater metapopulation viability?

- See above – larval drift.

- The connectivity between Lake Mead and Grand Canyon could change if flows were altered in the future under different reservoir filling actions such as Pearce Ferry Rapid being inundated and becoming more passable, or if the rapid becomes more passable naturally through erosion or lateral movement of the river channel.

What conditions would be needed to establish and maintain a population in Grand Canyon?

- Rather speculative…. habitat improvements in the form of creating off-channel rearing habitats in western Grand Canyon to increase the likelihood of entraining larvae might improve habitat for early life stages of Razorback Sucker prior to any augmentation in the mainstem Colorado River in Grand Canyon, if the goal is to establish a naturally recruiting popuation

- Concerns that cold temperatures (depending on water management) in mainstem could be limiting

What are critical uncertainties with regard to the overarching question and Grand Canyon?

- Hybridization with Flannelmouth suckers
  - Already occurring
  - Occurred evolutionarily
  - Hybrids could swamp
    - Lake Mead

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    - Lake Mead
- Is spawning success already limited
  - Limited numbers of spawning adults
  - Larval drift
    - Exacerbated by limited low velocity habitat?
  - Low survival
  - All of above

Connectivity: To what degree is Pearce Ferry Rapid a barrier to movement of fish between Lake Mead and Grand Canyon?

- 2 way connectivity seems likely to be:
  - Limited
  - Temporally variable
  - Downstream biased

Should augmentation occur in Lake Mead?

- Majority (but not all) agreed augmentation should occur in Lake Mead
- Where? Multiple locations
  - Spread the risk
  - Do site specific features contribute to post-stocking survival?
- How many? What kind? What age/size?
  - ~600/year, 300 from Lake Mead and 300 from Lake Mohave
  - < 200 mm should be included
- How often?
  - ~1 time per year for 3 years while assessed, then re-evaluate

Should augmentation occur in Grand Canyon?

- Near consensus, try experimental augmentation
- Where? Tributaries
- How many? What kind? What age/size?
  - Not less than 300/event
  - Mixture of Lake Mead and Lake Mohave
  - Include juveniles
- How often?
  - ~1 time per year for 3 years while assessed, then re-evaluate

Series of research ideas to address knowledge gaps in Grand Canyon with regard to RZB

- Improvement/construction of off channel rearing habitat to increase retainment of larvae?
- Inject augmented fish with hormones to promote immediate spawning
- Temperature control device on Glen Canyon Dam
- Are food resources abundant enough to support a resident population
- Will juvenile fish introduced into Grand Canyon become resident or move to Lake Mead

Monitoring and learning are critical!

- Any augmentation should be done in an experimental fashion to enhance the ability to learn about limiting factors
- All fish must be PIT tagged and fin clipped (genetics)
- Monitor with PIT tag antennae
- Prioritize management actions/augmentation to promote learning
  - E.g., limiting factors to early life history = top priority
  - E.g., choose tributaries that can be monitored with PIT antennae

Acknowledgements

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Other management recommendations: predators and addressing knowledge gaps

- Localized reduction of non-native fishes at turbid inflows during spawning
- System wide nonnative fish eradication
- Fine scale experiments at sites throughout reservoir to test for factors potentially limiting to recruitment
- Evaluate predator-free areas:
  - Remove predators
  - Turbidity curtains
- *Series of research ideas to address knowledge gaps*

Are current Monitoring efforts adequate in Lake Mead and Grand Canyon?

- Lake Mead
  - Worth investigating different gear types to target younger age classes in Lake Mead
    - E.g, smaller benthic trawl
  - More data on co-occurring non-natives
  - More standardized and documented PIT tag detection efforts

Are current Monitoring efforts adequate in Grand Canyon?

- Grand Canyon
  - Current small bodies sampling has not detected larval or juvenile RZB
    - Labor-intensive
- Consider larval trigger
  - E.g., Do small bodies sampling if RZB are detected that year or year prior