

## Smallmouth bass biological recommendation

Please review the following questions and provide responses to Matt by Thursday 12pm AZ time. The focus is the biological and environmental conditions. Please rate questions 1 and 2 on a scale of 1 (no risk) to 10 (certain to happen).

- 1) What is the risk of bass spawning in the upper stretch of the river if we off ramp bass flows before dam release temperature fall below 15.5C? This may result in an unknown period with temps in the Ferry exceeding 16C. For example, in 2023 the Ferry did not fall below 15.5C until Nov 20.

I think the risk of bass spawning in the Lees Ferry Reach is high (I would say 8 on a 0-10 scale) if we off-ramp bass flows before Lake Powell turns over and penstock release temperatures are still high. Smallmouth bass in general are very plastic in their spawn timing in AZ and appear to be more tied to water temperature than photoperiod. I don't have time to find the citations this morning but I can look for some and provide them to you later.

- 2) Given the conditions in question 2, what is the risk of offspring surviving into spring 2025?

This question is nuanced. If winter water temperatures are extremely cold (frazzle ice type cold) you can get overwinter mortality of juvenile warm water fish, but we don't ever get that cold in AZ – so the likelihood of direct mortality from cold water for juvenile bass spawned in the fall in my view is low.

On the other hand, If water temps are cold, but not super cold ---small warm water fish metabolism does not shut down all the way ---and then the small fish still have to eat some to survive --and if they can't get enough to eat they can starve over the winter. In my view we are in-between these two scenarios for Lees Ferry. We will not get super cold to get direct mortality – and we will also not be warm enough over the winter for small fish metabolism to be high enough that they can't get enough to eat. Small trout at Lees Ferry typically always do well - as there are typically quite a bit of very small things to eat. Green sunfish have demonstrated this for us. They are getting enough to eat to survive. If we sit at about 10-12 C over the winter --- in my view juvenile bass will just hunker down – they won't die and they don't need to eat much at those temps - and they will survive. Therefore, I believe risk of survival of early juvenile bass over the winter is very high (I would say 9 on a 0-10 scale).

- 3) In your expert opinion, how many days in the fall would the river need to be above 15.5C for a spawn to succeed?

Any currently present bass in the system are probably already tucked into warmer places where they are hunkered down, warmer spring inflows that come in subsurface etc. Females in those places have been ripening eggs all summer and they are just waiting for their chance to venture out and find a good place to spawn. It will not take them long to do that if they get a window. I would not want water temps at the Ferry to be above 15.5 C for more than a few days and definitely not longer than a week ---or they will be likely to get off a successful spawn. Our knowledge of capture probability at Lees Ferry for adult bass is not good, but all indications are that there are likely quite a few adult fish still out there and they will find each other and spawn if given a window. Generally we believe that for every SMB we catch by electrofishing that fish represents at least 10 fish we did not catch. The low catchability rate is because SMB are often hanging out in places we can not sample effectively, therefore even considering the data

last week that NPS presented to the TWG where two bass were caught below the Paria, conservatively there are at least 20 out there that were not caught in that downstream section.

- 4) If fish do recruit into 2025, will we be able to identify post-flow spawned fish as having spawned after flows stopped?

We would be unlikely to identify post-flow spawned fish. Growth rates will be low over the winter and from a length-frequency perspective they would be unlikely to be identified relative to bass spawned the next spring.

- 5) What action does the panel recommend until we see temps come out of the dam at 15.5C?

I recommend continuing with bypass flows until Lake Powell turns over and releases from the Penstocks are less than 15.5 C. It would be a shame to stop just a few weeks too early and lose everything we have gained because we stopped just a little too early. As stated above, I believe the risk is very high that fish would spawn in the Lee's Ferry reach if bypass were stopped under current conditions. We know that SMB spawn related strictly to temperature triggers and not related to seasonal light triggers. We know there are bass in the Lee's Ferry reach. We know the highest likelihood for adult bass presence is in Lee's Ferry reach, close to the dam. We know that lake elevations in Lake Powell are still low enough to entrain adult SMB and we know that SMB can survive entrainment. I believe the risk is very high that any spawned fish could survive the winter temperatures in Arizona and recruit into the population next year.

- 6) Please list any additional questions, comments and concerns.

Honestly, I had reservations about the efficacy of bypass flows. I worried Smallmouth bass would still find a way to find warm areas and spawn within the Lees Ferry Reach. Smallmouth bass in general are just really good at finding ways to expand their populations into new areas under a range of conditions. I am pleasantly surprised that it looks like I was wrong. It looks like the bypass flows did work but I do think that if we stop early the risk of spawning is high.

Second comment - Although it looks like bypass worked for Smallmouth – some of the recent length frequency data for green sunfish indicates it did not work to prevent reproduction of Green Sunfish. The shoulders on those length frequency histograms have really filled out. Although spawning has likely been less because of bypass ---the Green sunfish population looks well established and unfortunately we will likely be dealing with adverse impacts from that species for years to come.

The purpose and need for the SEIS was (in sum) to prevent spawning through experimental flows. The Cool Mix flow experiment as analyzed in the SEIS was designed to cool the river **up to** River Mile 61 and was analyzed for impacts and costs at several locations, including River Mile 61 and River Mile 15. Continuing to cool the river at River Mile 15 while temperatures are consistent with supporting and triggering small mouth bass spawning is consistent with the purpose and need of the SEIS and cooling to River Mile 15 was fully analyzed.