Date: January 12, 2021

To: Joe Bonneau, Threatened and Endangered Species Chief, US Army Corps of Engineers and Pallid Sturgeon Technical Team

From: Independent Scientific Advisory Panel Subcommittee on Pallid Sturgeon Monitoring

Re: Exchanges on the PSPAP sampling design for pallid sturgeon monitoring under the Missouri River Recovery Plan

The ISAP subcommittee on pallid sturgeon monitoring thanks the Corps and the Pallid Sturgeon Technical (Tech) Team for the opportunity to continue the discussion of issues in sampling design that were initiated on the back end of the ISAP PSPAP Monitoring Plan Review webinar on November 12, 2020.

On December 17, 2020, the ISAP and Pallid Sturgeon Technical Team joined in a virtual meeting, extending their previous discussion on issues concerning sampling design relevant to the ongoing development of the Pallid Sturgeon Population Assessment Program (Version 2.0) and adaptive management of pallid sturgeon. The key topics of that exchange included discussion of issues that 1) link sampling design and data collection to programmatic information needs, 2) link sampling design to methods of data analysis and interpretation, and 3) contribute to the design of sampling surveys for the rare pallid sturgeon. A pre-meeting memo (dated December 14) that set the stage for the December 17 meeting offered thoughts on a fourth issue -- linking survey design and monitoring to potential management decisions -- but time did not allow that issue to be explored in-depth during the call.

In the December meeting, ISAP subcommittee and Tech Team members worked from talking points presented in that pre-meeting memo in a relatively free-form exchange, mainly encouraged by ISAP participants. The subcommittee recognizes that after just two brief remote sessions those general issues have enjoyed some productive attention and discussion; however, they remain unresolved. The technical issues that surfaced remain on the table for more detailed consideration as the Corps and the Tech Team advance toward a field-ready sampling scheme that will serve reliably the information needs of the MRRP – both for assessing pallid sturgeon population status and supporting programmatic effectiveness monitoring.

The ISAP subcommittee and several Tech Team members agree that there are a number of technical issues that should be resolved before the PSPAP settles on a sampling design that can effectively address data-collection challenges posed by pallid sturgeon, a very "rare," or at least a very rarely encountered species. Warranting further exploration by the Tech Team, perhaps in continuing consultation with the ISAP, are technically challenging design issues that include at least --

- Reconsidering whether occupancy and mark-recapture are the most appropriate estimation methods for status and trend monitoring of age-0 and older sturgeon, respectively

- Selecting efficient and management-focused designs for both occupancy and mark-recapture survey efforts

- Considering the usefulness of unequal probability sampling or modifications to the sampling frame to minimize sampling at chronically unoccupied areas

- Addressing unmodeled heterogeneity in detection in occupancy surveys

- Planning design considerations to limit misidentification of zero values

- Addressing the basic sampling unit size and issues accompanying the sampling effort

- Exploring the implications of the population closure assumption

- Ensuring ahead of time that the data to be collected are sufficient for the intended uses and prospective analyses

- Pairing the survey design and resulting data such that they will evaluate the key questions of interest to the MRRP

To more fully address foundational sampling design issues, the ISAP subcommittee values future working sessions, or other "scientist-to-scientist" meetings with the Corps' staff and consultants, focused on pallid sturgeon monitoring. It is understood that the ISAP is offering advice, not prescriptions, and the Corps has considered and will be responding to guidance and advice from other sources, taking advantage of and responding to the unique opportunities and constraints in its staffing and budgets. That noted, the ISAP sees value in working with the Tech Team in this challenging natural-resource-planning arena as advisor colleagues, rather than as reviewers, as the ISAP has been historically engaged.

The Tech Team can judge the expertise it needs in order to establish monitoring designs that will serve MRRP's program information needs. The field biologists with pallid sturgeon experience currently engaged are first rate and offer exactly the understanding of the species necessary to inform a sampling design. The Corps' consultants include a world-class mathematical statistician. In between those two seats, there is the need for a quantitative ecologist with experience in some combination of adaptive resource management, monitoring design, and data gathering in experimental frameworks. It is unclear whether this important area of expertise is currently represented on the Pallid Sturgeon Tech Team. Perhaps the ISAP can help the Corps in identifying a candidate to fill that important expert role – from within the Corps organization, or from Department of the Interior agencies, or as an addition to the Corps consultants, which remain central to MRRP program development.