

ISAP Evaluation of PSPAP Monitoring Plan

ISAP Presentation for MRRIC

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Introduction

- ISAP task and its immediate importance
- Monitoring as the primary scientific enterprise under the MRRP
- Appreciation to the Corps for its efforts to draw relevant elements into a single document
- What the review does and doesn't do
- Implications for pallid sturgeon effectiveness monitoring and piping plover monitoring
- Anticipating “adaptive monitoring” this review should initiate frequent/consistent future interactions between the ISAP the Corps team developing and implementing programmatic monitoring

Q 1. A component of PSPAP is age-0 sturgeon monitoring as well as monitoring of recent recruits (age-1 to age-3 pallid sturgeon). The primary purpose of this component is to gain reliable estimates of pallid sturgeon reproductive success and recruitment and track changes over time which can then be related to river conditions (e.g., natural annual flow variations).

Q 1-a. Will the spatial extent, temporal scale, and intensity of age-0 sampling in the currently proposed sampling scheme provide sufficient and reliable data that can be used to assess reproductive success, parameterize population models, evaluate effect of natural flows events, and contribute to assessing performance of targeted management actions?

- A primary challenge lies in the intensity of sampling for an exceptionally rare life-stage throughout a large, complex river system
- High spatial and temporal variance in CPUE and occupancy estimates mean that it is unlikely that the above objectives will be met
- Precise target values are needed for each monitoring metric to better support adaptive management and decision-making
- Because occupancy is not an estimate of abundance, its relationship to the abundance of age-0 pallid sturgeon needs to be estimated

Q 1-b. Similarly, catch rates of age-1 to age-3 pallid sturgeon are used to assess recruitment and relate to annual flow variation. Will the spatial extent, temporal scale, and intensity of the proposed age-1 to age-3 sampling allow resource managers to assess recruitment, parameterize population models, relate recruitment to annual flow variations, and contribute to assessing performance of targeted management actions?

- Concerns with catch of age-1 to 3 fish are similar to those outlined for age-0 fish. Due to high uncertainty in the value of the monitoring state variables, large effects are needed to detect change in status or trend
- Given the variability in target metrics, PSPAP will be challenged to provide data of sufficient accuracy and precision to meet objectives of the AM program

Q 1-c. Can the proposed monitoring scheme separate the effect of flow variations on catchability and reproductive success/recruitment?

- Catchability metrics are potentially biased because of size-dependent capture probabilities
- Variable catchability leads to uncertainty in CPUE, that in turn, can hamper efforts to quantify effects of flow variation on recruitment
- The catch rate model outlined in PSPAP holds promise in identifying catch covariates for pallid sturgeon but will require larger sample sizes

Q 2. Recognizing the pressing need for information on the distribution and survival of age-0 pallid sturgeon, several activities have been proposed to compensate for low capture rates, including evaluating use of shovelnose sturgeon as a surrogate species for evaluating reproduction and/or recruitment, increasing stocking of very young pallid sturgeon, improving identification and characterization of high catch areas to increase ability to stratify sampling effectively (e.g., our targeted sampling in June, 2020 in the LMOR produced about 16,000 age-0 sturgeon), and extending sampling into the middle Mississippi River.

Q 2-a. Are these additions or amendments to the current sampling design(s) likely to enhance the ability to achieve the goals of the monitoring plan?

- The design of the monitoring program must address three sources of variation: process variation, sampling variation, and observation error
- Design options can only address sampling variation and observation error
- Further evaluation and justification of shovelnose sturgeon as surrogate for pallid sturgeon are needed
- Additional spatial analysis of data is needed to further describe the spatial distribution and degree of co-occurrence of age-0 shovelnose sturgeon and pallid sturgeon

Q 2-b. Does the ISAP have other recommendations for handling the challenges of low sample size?

- Combined stocking of age-0 shovelnose sturgeon and pallid sturgeon regarding catchability and drift dynamics
- Increase targeted sampling to increase catch of age-0 pallid sturgeon; emphasize stratified-random design
- Adopt a stratified-random design where stratification is based on expected abundance (variance-mean relationship)
- Base timing of sampling on temperature in relation to pallid sturgeon life history

Q 3. Another component of PSPAP is population estimation of juvenile and adult pallid sturgeon.

Q 3-a. Parameterizing the population model requires abundance, survival, and growth for the demographic matrix model and when employed as an individual based model additional information on spatial distribution, size distribution, growth, origin (hatchery, wild/unknown, hybrid), and movement. Is the monitoring plan set up to estimate values needed to characterize abundance, survival, spatial distribution, origin, and movement?

- The mark-recapture design should provide estimates of the key demographic parameter values
- Conduct research to estimate the functional relationships between management actions and key demographic parameters
- Need to demonstrate the value-added by the pallid sturgeon IBM and PSPAP

Q 3-b. Is the monitoring plan capable of providing reasonable estimates of progress toward population objectives?

- With the inclusion of methods to estimate temporal trends and changes suggested by the ISAP, the monitoring design described in Appendix D, and effectiveness monitoring, may be useful in informing progress towards population objectives
- Main issue concerns the accuracy and precision of the estimates of the monitoring state variables (occupancy and abundance) on PSPAP monitoring
- Need to develop a robust statistical approach for characterizing trends
- Require improved understanding of process variation, sampling variation, and observation error
- Observation error not addressed for CPUE

Q 3-c. Will data generated from PSPAP and associated analyses and modeling contribute to determining progress toward meeting pallid sturgeon recovery criteria?

- Evaluating progress towards recovery requires identification of numeric targets (capture/recapture data) and geographic distribution (occupancy data)
- Realized population size will need to be significantly greater than N_e to meet recovery criteria
- Revised N_e/N ratios of 100/1000 more realistic
- Linking age-0 recruitment to population dynamics of pallid sturgeon remains to be completed

Q 3-d. Will this approach, collaboratively integrated with the 2020 Evaluation Plan for the Conservation Propagation and Stocking Program, allow resource managers to evaluate the effectiveness of the artificial propagation program?

- Methods outlined appear useful in evaluating the stocking program effectiveness, particularly if co-variates are considered (fin-curl, origin, size, family lot, location)
- Approach used successfully in upper basin and likely useful in the lower basin
- Should permit identification of crosses for genetic optimization in stocking
- Need to identify methods for robust trend assessment for abundance of hatchery pallid sturgeon

Q 4-a. With respect to the telemetry component as described in Appendix D of the SAMP: Will the telemetry component be capable of contributing to population estimates, informing movement probabilities, aid in testing population closure assumptions, and increase understanding of the population as it utilizes areas outside MRRP purview?

- Proposed telemetry can describe movement, assess closure assumptions, and identify areas outside the MRRP domain (note: population estimates can be obtained without telemetry)
- Specific, telemetry-derived metrics that support modeling efforts are not described in detail
- Telemetry can be useful in tracking spawning periodicity and age at first reproduction for population model parameters, but these metrics may not be needed annually

Q 4-b. Does the ISAP have additional thoughts on approaches to increase effectiveness and efficiency of telemetry efforts?

- Tracking effectiveness could be improved by evaluating factors that affect detection distance for acoustic and radio tags
- With the exception on ongoing tracking efforts of adult females, telemetry might best be used to address specific research questions (e.g., spawning locations, overwinter locations, movement of young fish, comparisons of shovelnose and pallid, etc.) that are not part of the PSPAP

Q 5. The PSPAP is designed to be scalable so that resource constraints can be accommodated to some extent. Nonetheless, resource limitations (staffing, budget, etc.) will necessitate prioritization of PSPAP components at times if all components can't be accomplished to a sufficient degree. What are the ISAP's thoughts on relative priorities of the different monitoring components of PSPAP in serving the information needs of adaptive management?

- Reduce telemetry efforts as part of the PSPAP
- Discontinue efforts to crosswalk PSPAP 2.0 with PSPAP 1.0
- Discontinue random sites and use a stratified-random sampling design with strata based on historical catch rates
- Reduce sampling on river segments below Gavins Point Dam
- Increase sampling within year by not sampling every year

ISAP Recommendations

- Include substantive discussion of trend analysis
- More detail on size-dependent heterogeneity
- Clearly identify spatial scale for the sample unit
- Describe statistical approaches used to relate monitoring results to sub-objectives
- Add occupancy as a sub-objective
- Focus on targeted sites using a stratified-random design
- Calibrating results from historic surveys should be a low priority
- Conduct power analysis

ISAP Recommendations

- Ensure data analyses and summary metrics clearly match sub-objectives
- Consider ways to minimize variance in CPUE and occupancy
- Continue stocking of age-0 sturgeon to create a more efficient sampling program and learn more about drift dynamics between sturgeon species
- Use sensitivity and elasticity analyses to determine if annual estimates of parameters are needed
- Discontinue telemetry as part of the PSPAP, if funding is limited
- Preliminary monitoring results should be moved to an appendix

Concluding thoughts

“In its current form, function, and associated statistical power, it is unclear whether even a refined PSPAP will be able to unequivocally relate monitored changes in pallid sturgeon status or trends to management actions imposed under the MRRP. However, in combination with effectiveness monitoring and population modeling, the PSPAP monitoring might help to provide sufficiently compelling lines-of-evidence support for decision-making in relation to pallid sturgeon management in the Missouri River.”