Missouri River Recovery Program

Independent Science Advisory Panel

Final Report

Independent External Peer Review of the

Fort Peck Dam Test Release Draft Environmental Impact Statement

23 August 2021

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National Center for Environmental Conflict Resolution
and Missouri River Recovery Implementation Committee

Prepared by:
Independent Science Advisory Panel
and Oak Ridge Associated Universities, Third Party Science Neutral

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Independent Science Advisory Panel:

Steven Chipps, Ph.D.
U.S. Geological Survey, South Dakota State University

Melinda Daniels, Ph.D.
Stroud Water Research Center, Avondale, PA

Stephen Dinsmore, Ph.D.
Iowa State University

John Loomis, Ph.D.
Colorado State University

Dennis Murphy, Ph.D.
University of Nevada, Reno

John Norder, Ph.D.
Michigan State University

Darren Ranco, Ph.D. (ad hoc member to replace Dr. Norder)
University of Maine, Orono, ME

William Warren-Hicks, Ph.D.
EcoStat, Inc., Mebane, NC

Third Party Science Neutral:

Steven Bartell, Ph.D.
Oak Ridge Associated Universities, Oak Ridge, TN

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Goals and Objectives

The United States Army Corps of Engineers (USACE or the Corps) prepared a draft environmental impact statement for the Fort Peck Dam Test Release (FPDTR-DEIS). The FPDTR-DEIS is an effort being undertaken to comply with the *Final Biological Opinion concerning the Operation of the Missouri River Mainstem Reservoir System, the Operation and Maintenance of the Bank Stabilization and Navigation Project, the Operation of the Kansas River Reservoir System, and Implementation of the Missouri River Recovery Management Plan* (2018). The purpose of the FPDTR-DEIS is to assess the capacity of test flows released from Fort Peck Dam to promote natural reproduction by endangered pallid sturgeon (*Scaphirhynchus albus*) and enhance survival of drifting proto-larvae and first-feeding meso-larvae.

The Corps concluded that a formal Independent External Peer Review (IEPR) was not legally required for this DEIS. However, the lead agencies and The Missouri River Recovery Implementation Committee (MRRIC) considered an informal IEPR to be a "best practice" that would contribute to the technical quality of the continuing MRRP planning and assessment process. The Independent Science Advisory Panel (ISAP) was requested to provide an independent external peer review (IEPR) of the DEIS. The objective of this IEPR was to evaluate whether the analyses, interpretations, and conclusions based on the analyses as presented in the DEIS and supporting documents are technically defensible. The Panel also was requested to offer a broad evaluation of the DEIS, and the supporting documents, in addition to addressing the specific technical and scientific questions included in the Review Charge (Appendix A).

Panel Members and their Qualifications

All of the ISAP members participated in the IEPR, except one, who was not available. An *ad hoc* member was contracted to provide technical expertise in the area normally addressed by the unavailable ISAP member. All members were encouraged to review the entire DEIS. Additionally, individual Panel members focused their reviews on specific sections of the DEIS and selected supporting Appendices based on their particular areas of technical expertise.[1]

[1] Dr. Daniels focused on the section of the DEIS and appendices that described the application and results of physical modeling used as a basis for comparing the proposed management alternatives. Dr. Chipps reviewed the materials associated with the biology and ecology of the pallid sturgeon in relation to the proposed test releases from Fort Peck Dam. Dr. Dinsmore addressed parts of the DEIS that referred to the piping plover and least tern. Dr. Warren-Hicks focused on issues related to the physical and pallid population models, as well as aspects of the DEIS relevant to monitoring. Dr. Ranco provided insights

Information Considered by the Panel

The Panel members reviewed the main draft Environmental Impact Statement for the Fort Peck Test Releases. Ten appendices and technical reports were provided in addition to the main DEIS document. Additional sources of technical information (publications, reports) were consulted by individual Panel members as necessary in performing the IEPR.

Review Process

The review presented in this report generally followed the IEPR procedures described in the Department of the Army, U.S. Army Corps of Engineers, Water Resources Policies and Authorities' Civil Works Review (Engineer Circular [EC] 1165-2-214, December 15, 2012). The ISAP was guided in its review by specific charge questions provided separately by the USACE and MRRIC. The review process included a kickoff meeting, wherein the USACE presented an overview of the contents of the DEIS and supporting technical information (in Appendices). Following several weeks for the Panel to become familiar with the documents and initiate the IEPR process, a webinar involving the lead agencies and the ISAP was facilitated by NCECR to discuss the DEIS, address questions, and provide clarifications (Appendix B). The Panel then continued the IEPR process towards completion of an initial draft report (June 30, 2021) and this final report. This activity included informal discussions among panelists concerning specific technical issues that arose during the review, as well as several organizational calls involving the Panel and TPSN.

The Panel members prepared their comments using a four-part format, requested by the USACE, that included: 1) a clear statement of the comment; 2) the technical basis for the comment; 3) the significance of the comment; and 4) recommendations on how to resolve the comment (including additional research or analysis that may influence conclusions).

Summary of IEPR Four-Part Comments

The IEPR process generated 33 four-part review comments that encompass the charge questions presented to the Panel by the USACE and the MRRIC. The order, organization, and topics addressed in the review comments largely follow the chapter structure of the DEIS. The review comments have been classified according to general topics, including the needs and intent of the DEIS, the structure and operation of the Missouri River system, ecological and management-relevant issues regarding the listed species, comments pertaining to human considerations and tribal issues, and comments on several documents provided in support of the DEIS. For each

gleaned from discussions regarding cultural issues with tribal constituents of MRRIC. Dr. Loomis reviewed the DEIS from the perspective of human use considerations in relation to the proposed flow releases. Dr. Murphy provided review and insights related to the Endangered Species Act and more strategic aspects of the management actions proposed in the DEIS.

review comment, the level of significance, ranging from low to high, was judged by the IEPR Panel.

The Missouri River Physical System

Four of the 33 review comments focused on issues related to the physical structure, hydrology, sediments, and operation of the Missouri River. Topics of concern identified and discussed by the Panel include descriptions of proposed managed flows, meaning of channel incision, the period of record used to support the evaluation of the proposed alternatives, and the accuracy and reliability of physical models used to assess the potential effects and impacts of the proposed Fort Peck test releases. Panel comments also addressed the frequency and opportunity for flow management. The levels of significance identified by the Panel for these comments ranged from high to medium/low.

Plovers and Terns

The Panel has been involved in substantial discussions with USACE, FWS, and MRRIC concerning the management of piping plovers and least terns throughout the history of this MRRIC project. Only two of the 33 comments pertained directly to management of the two listed birds, although reviews of various aspects of the physical system are directly or indirectly related to the two species. The primary Panel concerns in the IEPR are the assumed equivalence of plover and tern response to the proposed test releases and the meaning of quasi-extinction risks reported for those species. The Panel assigned a high and medium level of significance to the two comments directly related to bird management.

Pallid Sturgeon

Seven IEPR review comments pertained directly to the proposed management of pallid sturgeon. Principal areas of concern included correct specification of pallid early life stages, accuracy and reliability of the existing demographic and larval drift models for pallid sturgeon, specification and description of the proposed test releases, and the effectiveness of proposed releases in achieving species objectives, and periodicity of spawning. The levels of significance assigned to the IEPR comments regarding pallid sturgeon management ranged from high to low. High significance is associated with the larger-scale issues concerning the expected effectiveness of test releases in achieving pallid management objectives in the Upper Missouri River. Specifically, one comment asked that the DEIS evaluate whether there is sufficient leeway for designing and implementing effective test flows for the pallid sturgeon in the upper Missouri River within a decision-space constrained by the current level of human uses. This constrained opportunity for flow management should be acknowledged as a potential limitation to attaining a self-sustaining population of pallid sturgeon in the upper Missouri River with current levels of human uses of this system.

Human Considerations and Cultural Resources

Panel concerns related to human use considerations and tribal issues generated 12 review comments in the IEPR. Human consideration comments generally fell into the following categories: a) unexplained or insufficiently explained assumptions, b) lack of detailed description of models used in the assessment, c) inconsistencies in years chosen for analysis or omitted years (inconsistencies within a given HC analysis, such as recreation or omission of certain years in the Period of Record), d) inconsistencies in analyses among similar HC topic areas (for example, hydropower and thermal power), and e) limited and outdated literature sources used to evaluate impacts to cultural resources. The topics of concern also included inadequate description of potential impacts of proposed test releases on cultural resources and the technical quality of impact assessments for irrigation, hydropower, and thermal power. The Panel also identified concerns with the assessment of potential impacts on water supply, recreation, and environmental justice, as presented in the DEIS. Conducting the IEPR raised issues concerning the adequacy of DEIS coverage of tribal interests and determined that the DEIS incompletely discussed specific identified tribal interests.

DEIS Supporting Documents

Ten appendices accompanied the Fort Peck DEIS. These supporting documents provided detailed descriptions of key topics included in the DEIS. The hydrologic and hydraulic (H&H) modeling technical report and Appendix D, which describes the analysis of the 82-year period of record (POR), were of particular interest in the IEPR. The key topics of interest in this H&H review include calibration, verification, and evaluation of the ResSim and HecRAS models, as well as, methods used to statistically incorporate the flow characteristics of the POR using subsets of the POR. The two corresponding four-part comments offered in the review of the appendices were assigned high and medium-high levels of significance, respectively.

Introduction, Background and Review Process

The United States Army Corps of Engineers (USACE or the Corps) prepared a draft environmental impact statement (DEIS) for the Fort Peck Dam Test Release (FPDTR-DEIS). The FPDTR-DEIS is an effort being undertaken to comply with the *Final Biological Opinion concerning the Operation of the Missouri River Mainstem Reservoir System, the Operation and Maintenance of the Bank Stabilization and Navigation Project, the Operation of the Kansas River Reservoir System, and Implementation of the Missouri River Recovery Management Plan* (2018). The purpose of the FPDTR-DEIS was to assess the capacity of test flows released from Fort Peck Dam to promote natural reproduction by endangered pallid sturgeon (*Scaphirhynchus albus*) and enhance survival of drifting proto-larvae and first-feeding meso-larvae.

The USACE has responsibility for the operation and maintenance of the Missouri River Mainstem Reservoir System. The system supports eight congressionally authorized purposes -- flood control, navigation, irrigation, hydropower, water supply, water quality, recreation, and fish and wildlife. Compliance with the Endangered Species Act is required in order to operate and maintain the Mainstem Reservoir System. Operation of the System affects the imperiled pallid sturgeon by altering the hydrologic, fluvial-geomorphic, and temperature regimes of the river, among other aspects of the fish's habitat. The pallid sturgeon is listed as endangered under the Endangered Species Act of 1973 (ESA) and is the flagship species for the precedent-setting Missouri River Recovery Program. The Corps recognized the limited impact of proposed management actions on the Missouri River ecosystem, the potential benefits to the imperiled pallid sturgeon and its habitat, and the minimal deleterious impacts to any of the authorized purposes and accordingly determined that a formal Independent External Peer Review (IEPR) was not required for this DEIS. However, the lead agencies – US Army Corps of Engineers and US Fish and Wildlife Service and the Missouri River Recovery Implementation Committee (MRRIC) considered an informal IEPR to meet "best practice" criteria and that such a review would contribute to the technical competence and information quality to the ongoing MRRP planning and assessment process. The Panel was requested to offer a broad evaluation of the DEIS, and the supporting documents, in addition to addressing the specific technical and scientific questions included in the Review Charge. The Panel also had the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those detailed areas outlined in the Review Charge included in the Final IEPR Work Plan (Appendix A of this final report).

This review generally followed the IEPR procedures described in the Department of the Army, U.S. Army Corps of Engineers, Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, December 15, 2012), as outlined in the review Work Plan in Appendix A of this report. Some modifications to standard procedures were made to accommodate review questions offered by MRRIC and an additional review report draft and

engagement with MRRIC before finalization of the IEPR panel report. The IEPR charge guidance, including questions received from USACE and MRRIC, is included in Appendix A. The IEPR was coordinated by a Third Party Science Neutral (TPSN), who was assisted by a panel chair and two panel co-chairs to manage the review process according to the plan and schedule presented in the Work Plan (Appendix A).

Panel members generally became familiar with all sections of the DEIS to understand the structure of the materials and placement of each component of the DEIS and supporting materials. All Panelists reviewed the Executive Summary. Based on their disciplinary expertise, Panelists reviewed relevant sections of the DEIS and supporting Appendices. The specific questions, areas of interest, and issues of concern stated in the charge to the review panel by USACE and the MRRIC have been considered by the Panel in formulating review comments. However, the charge questions were not addressed one-by-one. Rather, review comments regarding specific topic areas of the DEIS highlighted particular questions specified in the charge.

On May 19, 2021, after the Panel had begun reviewing the DEIS and charge questions, the ISAP and Corps PDT held one clarification teleconference, facilitated by the National Center for Environmental Conflict Resolution (NCECR). The purpose of the call was for the Corps PDT to answer the Panel's questions and provide clarifications concerning the DEIS prior to the Panel completing its review and subsequently providing the written four-part review comments. Appendix B to this final report contains the minutes from that call as provided by the NCECR.

The Panel review focused on scientific and technical matters, leaving policy determinations for the USACE. Correspondingly, the Panel has not made recommendations on whether any of the proposed alternatives should be implemented. This final report contains the findings of the Independent Science Advisory Panel (ISAP) in response to the charge to review the FPDTR-DEIS. Results of the Panel review are reported in two sections. The first section provides overarching general observations by the Panel on the DEIS. The second section presents observations describing specific technical concerns using a specified four-part IEPR comment format. This final report includes subsequent USACE responses to each four-part comment, and the Panel's responses to each of the USACE's responses (that is, back-check comments).

The IEPR process has proven valuable in enabling the Panel to articulate technical issues in need of further consideration or reconsideration by the USACE, or that require clarification in the FEIS. The Panel recognizes the USACE has generally been responsive to the Panel's concerns conveyed in reviews of numerous draft determinations and documents in the past, and has made incorporated clarifications, corrections, and editorial changes suggested by the Panel. The Panel submitted this review with similar expectations.

Attributes of the DEIS

The Panel recognized the substantial efforts undertaken by the USACE and participating agencies, and contributing Technical Teams in developing this DEIS, the appendices and other technical documents supporting the DEIS. These documents provide detailed descriptions of the data and models used in constructing the DEIS.

Overall, the DEIS and appendices appear consistent with NEPA requirements. The documents together identified key technical points important to managing the federally protected pallid sturgeon, presented the proposed management alternatives in some detail, and described risks and benefits of proposed test releases in the context of diverse human uses and Tribal considerations. The reviewed documents identified sources of scientific information that informed the DEIS and that appropriately referenced adaptive management practices aimed at achieving the conservation goals for the listed species.

Summary Observations

This IEPR produced several interrelated considerations and potential concerns regarding the technical merit of the DEIS and supporting appendices that are communicated in this final report using the four-part template. A number of the concerns expressed in the comments centered on issues regarding the integration of adaptive management and the necessary supporting (best available) science required to achieve the management objectives for the listed species.

The DEIS attempted to assess the capability of test flows from the Fort Peck Dam to promote natural reproduction by pallid sturgeon (*Scaphirhynchus albus*) and enhance survival of very young fish that include the drifting (proto-larvae) and first-feeding (meso-larvae) life stages. The DEIS also described the risks and benefits of the proposed test releases across diverse human uses and Tribal considerations. The two proposed management alternatives (along with two variations of the alternatives) are presented in the DEIS. The DEIS further addressed the stated need and intent for the test flow release relative to best available scientific and technical information. However, the severity of endangerment of the pallid sturgeon and consequent need for experimental management actions aimed at recovering the species need to be more emphatically stated in revising and finalizing the EIS.

Several comments that rated high in significance remain particularly important. One comment questions whether relying on a pre-2012 Period of Record (POR) is appropriate for estimating the number of times the hydrologic conditions will be suitable for implementation of future test releases. The comment recommends use of an updated POR along with climate driven models of expected future flow regimes. The concerns regarding use of pre-2012 POR without climate driven models of future flows influences the economic analysis as well. Specifically, economic forecasts presented in the DEIS rely on “with- and without-project” estimates using back-casting

of an historical flow regime rather than forecasting using projected future flow regimes. The ISAP is correspondingly concerned about the adequacy of this approach to economic analysis presented in the DEIS. Another key Panel comment focused on assessing whether the chosen physical models and pallid sturgeon population models used in the analysis are sufficiently accurate and reliable to determine whether the anticipated results of the alternatives will be measurably different from each other and from the no-action alternative. Similar concerns arose regarding the adequacy of the methods and models for integrating risk and uncertainty in assessing the likely effectiveness of the test releases in contributing to the species management objectives and in characterizing their impacts on human-use considerations.

Another important comment emphasized the need to provide critical details on estimating the quasi-extinction risks to piping plovers and least terns in relation to the test flows and subsequently to discuss the meaning of these risks in relation to the specific management objectives defined for these species. A critical concern regarding potential implementation of the preferred alternative conveyed in the four-part comments was the absence of reference in the DEIS to an effective monitoring program for pallid sturgeon or to ongoing development of monitoring adequate to "pick up a signal" of the performance of the test releases that define the preferred alternative. The Fort Peck test releases, or relatedly "[information] *gleaned from opportunistic and passive monitoring*" (Appendix H, 3.3.1, page 27), cannot be implemented in an adaptive management framework without a programmatic status and trends monitoring scheme that provides an accurate quantification of pallid sturgeon distribution and abundance in the Upper Missouri River. The requisite monitoring program should permit sufficiently reliable effectiveness monitoring in relation to the test releases and management objectives, particularly in a challenging irregular, unpredictable, and sporadic schedule for implementing test releases, as described in the DEIS. Supporting references to pallid sturgeon monitoring in the provided appendices do not describe the monitoring protocols that will be necessary to meet the programmatic data needs required to assess the performance of test-release actions.

Human considerations (HC) comments generally addressed the following topics of concern: a) insufficient explanation of how only a loss of the side channel irrigation intakes can cause a loss of nearly all the net farm income and farm employment in the study area, b) inconsistent manner in how the water supply NED impacts and RED recreation impacts are displayed relative to other HC impacts, and c) inconsistencies in the analyses of seemingly similar HC topic areas (for example, hydropower and thermal power). The approach to addressing cultural issues in the DEIS suffered from insufficient justification and support for the conclusions concerning the impacts on those resources. In addition, there was a lack of clarity concerning the sources of the Corps's cultural resources data and decision-making frameworks, which as a result, made it difficult for tribes to comment on the DEIS. There is a need to broaden the geographic scope of tribes consulted beyond the closest tribe to the listed resource and to make important distinctions between impacts of flooding and erosion on cultural sites in the analysis. Finally, the analysis of

Environmental Justice provided no clear justification of the findings of no significant impacts on potentially affected communities.

Apart from the preceding technical, HC, and cultural concerns, the DEIS as a whole suffered from its quality of writing. There was a general absence of explanatory context; incomplete description of programmatic elements, actions, and authorities; and insufficient description of the regulatory requirements for the proposed action. The regulatory requirements were described in detail in previous U.S. Fish and Wildlife determinations and MRRP program documents; however, the requirements should also be fully described in the DEIS. The Executive Summary repeated verbatim much of the Introduction. The summary directly recapitulated technical materials from the main report rather than summarizing them and presenting their relevance to the DEIS findings. The introductory section was difficult to understand and did not adequately explain the purpose and needs for the test-release management actions. The draft document suffered from an insufficient deliberation on included/excluded content; how material was selected for inclusion/omission was unclear. For example, important pallid sturgeon life-stage biology that is necessary to justify the proposed test releases was lacking. The draft appeared not to have been edited by technical experts nor proofread to typical agency-document standards. The IEPR was made difficult because the DEIS featured hard-to-track paragraph organization below the section headers, puzzling sentence structure, incomplete sentences, missing figure legends, and unexplained content in tables. Maps from other Corps documents were included in the DEIS without adjustment to fit the DEIS formatting. Curiously, one map that appeared in the Executive Summary was not found in the body of the document.

The Panel recognized that the final EIS need not meet publication-quality standards of writing and content. However, management actions proposed for the Missouri River remain controversial. The final EIS will be referenced by proponents and critics of the proposed action (and the MRRP in general). Therefore, the final EIS should clearly and concisely describe the regulatory obligations of the Corps, adequately present the substance and expected species outcomes of the preferred alternative, and reliably estimate the associated impacts on the Missouri River ecosystem, river operations, and stakeholder concerns. Thus, the sections of the Executive Summary and Sections 1 and 2 noted in the comments will require substantial revision. This revision might be best facilitated by soliciting help from authors of the *Science and Adaptive Management Plan* and authors of other previous documents pertaining to operations of Fort Peck Dam and the proposed test-releases.

Comments in Assigned Four-Part Format

The remainder of this final report provides the Panel comments on the DEIS and supporting technical documents. The four-part format of the IEPR comments presented below provided a statement of the issue, its significance, and Panel suggestions for resolution. The Corps Product Delivery Team (PDT, or DEIS authors) have subsequently provided responses to each Panel comment. The Panel has provided back-check comments in response.

The four-part comments are presented sequentially and generally followed the order of chapter/sections as presented in the DEIS. Importantly, the review comments focused on the technical merit of the proposed alternatives, the presumed efficacy of the preferred alternative in achieving species management objectives, and the merit of the science underlying the development and analysis of the proposed management actions. Interdependencies among the chapters of the DEIS produced review comments that cut across two or more chapters. These comments were organized and placed in the comments section where they seemed to best fit.

The specific questions, areas of interest, and issues of concern stated in the charge to the review panel by USACE and the MRRIC (see Appendix A) have been considered by the Panel in formulating review comments. However, the charge questions were not addressed one-by-one. Rather, review comments regarding specific topic areas of the DEIS highlighted particular questions specified in the charge.

The IEPR process generated 33 four-part review comments that encompass the charge questions presented to the Panel. The review comments were classified according to general topics, including needs and intent of the DEIS, the structure and operation of the upper Missouri River system, ecological and management-relevant issues pertaining to pallid sturgeon, comments pertaining to human considerations and cultural resources, and comments on several documents provided in support of the DEIS. As determined by the Panel, the level of significance, ranging from low to high, was specified for each review comment.

Panel Comment 1 - DEIS-wide comment

The DEIS does not adequately forecast the likelihood of alternative implementation, nor the likely frequency of implementation, thereby limiting the utility of estimates of likely impacts.

Basis for Comment

Normally NEPA analyses compare the future without the proposed alternatives to the future with the proposed alternatives, where the future without may be different than just continuation of

past levels. In the DEIS, the likelihood of alternative implementation and associated impacts are evaluated based on running the pre-2012 Period of Record (POR) hydrologic regime (back-casting) rather than running a modeled likely future flow regime derived from a combination of an updated POR and downscaled climate models. The use of pre-2012 POR back-casting impact analysis does permit impact comparisons between actual flow years and alternative test flow years, yet it limits our understanding of whether or how often the necessary conditions for a test flow are likely to occur in the future. Nor does that method of analysis provide useful multi-year cumulative context within which to assess the cumulative multi-year impact of alternative implementation. For example, consecutive high flow years or drought years may be more likely with future climate than in the past[1]. The cumulative impacts on pallid sturgeon and Human Considerations may be different if the impacts are three consecutive years in a decade versus three years spread over a decade.

[1] Wise, E.K. and 4 coauthors. 2018. Hydroclimatology of the Missouri River basin. Journal of Hydrometeorology 19:161-182.

Significance

High. The impact assessment and likelihood of implementation of the preferred alternative could potentially be quite different under future climate conditions than under what has occurred in the past. Inadequate consideration of this distinction could lead to inaccurate estimates of impacts and frequency of implementation of the preferred alternative.

Recommendation for Resolution

Climate-driven modeled future flow regimes that use the full POR (including the most recent and most relevant decade of flow regime) should be used as inputs as the hydrologic basis for the impact analysis and likelihood of implementation of the test flows over a given period of time.

USACE/PDT Response

Non-Concur with Recommendation for Resolution.

The USACE generally concurs with the basis for the comment and the longer-term value of climate-driven flow models and an updated POR. However, we concluded the pre-2012 POR was acceptable for assessing impacts and comparing alternatives for the Fort Peck test release EIS. The pre-2012 POR exhibits high runoff variability, including several extended droughts and large flood events. We evaluated runoff and storage for 2013-2021 and determined that we may have been able to run a full test in two years (2016 and 2021) and a partial test may have been possible in one year (2020). The opportunity for running a test flow in the 2013-2021 time period (P=0.222) is similar to the pre-2012 POR (P=0.145). If a test flow is implemented, the USACE

would monitor effects from the test flows as described in the Draft EIS and assess whether to run a test flow in back-to-back years based on the test flow monitoring results.

Climate change can play a critical role in future Fort Peck flow regimes, which could influence the frequency of flow releases for pallid sturgeon recruitment. However, the action considered in this EIS is a test flow regime that is anticipated to be run a few times over a short period in the relatively near future (e.g., during the next 10-15 years). If it is determined that the test flow regime is beneficial to the pallid sturgeon, another study would be conducted to determine benefits and impacts for a longer-term or permanent flow regime change. That study would involve a more detailed climate assessment and use an updated POR as suggested.

IEPR Panel Back-Check Response

Concur/Non-Concur (both apply).

The ISAP appreciates the provision of recent historical flow analysis results and the clarification of the frequency and number of test flows likely to be conducted in the next 1-2 decades. Clear communication of the likely frequency and number of test flows is critical to effective evaluation of impacts as well as to effective communication with ecosystem scientists, managers and the public. The current draft fails to communicate these likelihoods effectively, and the ISAP looks forward to revisions that address this deficiency.

While ISAP is encouraged to hear of the USACE's intention to complete a full flow climate change-informed modeling exercise in the future if it is determined that the test flow regime is beneficial to the pallid sturgeon, concerns remain with the historical approach. In this draft DEIS, this historical approach essentially results in a worst-case scenario that does not reflect regional estimates of increased future precipitation in the Missouri River basin. While the flow regime of the Missouri River has and will always be highly variable, the forecast changes in magnitude associated with climate change already are and will continue to play a critical role in future Ft. Peck flow regimes.

To assess cumulative multi-year impacts in a DEIS, the flow model should consider not only whether USCAE *could* run a test flow but *would* a test flow be likely (or necessary) given the flow context in preceding years. For example, while 2020 met criteria for a partial test flow, given the magnitude and duration of flooding in 2019, a 2020 test release would be unlikely given the damage to river control structures and the economic impacts from 2019. Climate models are projecting increased magnitudes (weather amplification) that simply cannot be accounted for using historical analysis. In summary, while the ISAP concurs that prospective climate analysis is not required given the small number of test flows anticipated and covered by this DEIS, the ISAP does not concur that the analysis would not have benefited from inclusion of climate change-driven prospective modeling. The current approach is adequate, but not the best, most-reasonable approach to flow regime analysis in the context of this DEIS. ISAP encourages

the USACE to, as standard practice, incorporate prospective climate change-driven flow analysis in future DEIS/adaptive management/planning analyses.

Panel Comment 2 – Executive Summary requires revision

The standing Executive Summary does not serve its intended purpose and needs to be rewritten into generally accepted form.

Basis for Comment

The Executive Summary in the DEIR is 35 pages in length (document pages i-xxxiii, plus two pages without pagination). At that length the Executive Summary does not serve its generally recognized purpose. It neither abstracts nor summarizes the explanatory text and extensive technical material in the DEIS document and appendices. Given the length of the DEIS documents and referenced and cited supporting information, a thorough but concise executive summary will be absolutely essential to the completed EIS.

The current Executive Summary is largely text extracted from Section One of the document and tabularized "alternatives and variations," including flow and other environmental data, and "environmental consequences" descriptions and attending mostly unexplained quantitative and quasi-quantitative metrics and percentages of baseline and modeled conditions. The tables are not numbered or cited in the text. That detailed information, even if referenced in the text and completed to be understandable, mostly does not belong in an executive summary. The text under the header on Page xv starts to describe the Human Considerations component of the MMRP effort, then the modeling tools used to assess the action alternatives, but doesn't explain or introduce the purpose or content of what follows under 15 issues that are considered in appraising the action alternatives. The current text supporting those issues – from "River Infrastructure and Hydrologic Processes (Page xvii) to "Comparison of Environmental Consequences of Alternatives" (Page xxvi) ranges from relevant and incomplete to irrelevant and incomplete. The text should be developed in parallel for each of the issues. The texts in those sections should not be over about 250 words each. They should describe the salience of each issue to the DEIS, the planning context, and how projected outcomes from the action alternatives vary and the significance of any differences in outcomes. The pallid sturgeon subsection (Page xvii) for the target species of this programmatic DEIS, is not very informative and contains unnecessary detail – what possibly could the date of its listing be doing in this section of the executive summary? And, then there is the subsection on piping plover and least tern, which without explanation presents "modeled extinction probabilities" as the metric used to differentiate between alternatives (apparently for just one of the two species), without explaining what the values possibly could mean and indicating that no statistical differences exist. The

metric is likely unreliable in comparing action alternatives, but a reader cannot know that from the text.

The opening pages to the Executive Summary – Introduction, Background, Need for the Fort Peck Test Releases, Purpose of the Fort Peck Test Releases, Objectives are mostly lifted directly from Section one of the DEIS. They suffer from the material problems and shortcomings of the DEIS's 1.0 Purpose and Need, which are described in this report in Comment 5.

Significance

Medium High. A recrafted executive summary should be a priority for the final EIS. The summary needs to describe clearly the regulatory context, the justification for the action, the expected ecological outcomes for the pallid sturgeon and its habitat, and the consequences for other resources and stakeholder interests on the upper Missouri River.

Recommendation for Resolution

1. Additional authors with familiarity with the Science and Adaptive Management Plan and MRRP and experience/expertise in writing executive summaries, should contribute a 5-7 page executive summary to the next draft of the DEIS.
2. All the text and materials in the tables below the header "Alternatives" from Page number "x" to Page "xv" should be substantially reduced. The narrative descriptions of the "Action Alternatives Carried Forward for Detailed Evaluation" should be free of quantitative detail and their differences highlighted in descriptive prose.
3. The subsection "Summary of Key Uses / Resources and Impacts Assessment Methods" – from Page xv to xxxiii – should be reduced by at least 80%.
4. Some of the tables are best removed; any salient information in them should be described in text.
5. Use the guidance in comment number 5 to rewrite for clarity and reduce the text on current pages i through The Background subsection (Page i) down to the Scope section (Page ix). These pages should explain the ecological why for the DEIS, how the action alternatives were pre-vetted, how the preferred alternative serves the purpose and needs, and, importantly, the associated small impacts on the Missouri River system, its operations, environmental factors, and stakeholder concerns.

USACE/PDT Response

Concur.

The Executive Summary will be modified to focus more clearly on the regulatory context, the justification for the action, the expected ecological outcomes for the pallid sturgeon, and the consequences of implementing the actions. Additional authors that were involved with the

Science and Adaptive Management Plan and Fort Peck Adaptive Management Framework have been engaged for the Executive Summary revision.

IEPR Panel Back-Check Response

Concur.

The ISAP is encouraged by the response above; it wants to clarify that the adjustments to the executive summary should focus on describing the salient components of the action and its likely outcomes, and shortening that section of the report. The author team promised in the USACE/PDT response will recognize that many readers of an executive summary seek a high-level summary of the document, meaning the summary text can be shortened by as much as 80%.

Panel Comment 3 – Executive Summary, Usefulness of the 82-year Period of Record

The use of average impacts over the 82-year Period of Record (POR) in the Executive Summary consequences table and the summary Table 2-3 understate the impacts that would occur in the 3-5 years when the test flows are actually conducted.

Basis for Comment

A comparison of the average of the 82-year impacts to hydropower, recreation, thermal power, and water supply in the Executive Summary (see page xxxi) and summary Table 2-3 to the same impacts during the 3-5 years expected to be run or even the 9-16 potential full test flows shows that the test flow impacts are projected to be much higher than the 82-year averages report (see comparisons on pages 2-31 to 2-33 and Tables 3-49 and 3-50 for hydropower for example). The economic impacts on affected stakeholders, utilities, or companies are more related to the impacts that occur each time the test flow is run rather than an 82-year average.

Significance

Medium. The use of 82-year averages in the Executive Summary Tables, in the DEIS summary Table 2-3 and other similar resource-by-resource tables (for example Table 3-47) appear to provide incomplete information to decision-makers. Average impacts to HCs may inadvertently appear smaller in the years when the proposed test flows would be implemented.

Recommendation for Resolution

Either supplement or replace in the Executive Summary and main DEIS Table 2-31 the 82-year average impacts with the projected impacts expected to occur when the 3--5 test flows would be implemented or the 9-16 years when the full test flows could be conducted.

USACE/PDT Response

Concur.

The Executive Summary Table and Table 2-31 will be supplemented or replaced with a summary of impacts that would potentially occur during years when full test flows could be conducted.

IEPR Panel Back-Check Response

Concur.

This revision will be helpful as some HC impacts, such as hydropower are expressed as averages over the period of record, while (as the agency explains in response to Panel Comment 19) irrigation impacts are presented in the year the test flow is run and water supply impacts were presented originally as an impact for a single typical intake (rather than the 26 intakes that were sampled). It is important that NED dollars and RED jobs be calculated and presented using the same time frame (ideally a test-flow year) in order that HC impacts on various resources in the alternatives can be accurately compared in the Executive Summary.

Panel Comment 4 - Inadequate Explanation of Figures in the Executive Summary, Chapter 1, and Chapter 2

Inadequate explanation of figures in Executive Summary, and Figure 1-3 and Figure 2-2.

Basis for Comment

The same Figure 1-3 and Figure 2-2 as well as on page vii in the Executive Summary is used to illustrate the regulated and unregulated flows at Fort Peck Dam. The hydrograph also provides labels on pallid sturgeon reproductive functions at each stage of the historic hydrograph. Above the figure in the Executive Summary on page vii there is the statement "*the objectives of the Fort Peck Dam test flows DEIS are to investigate the capacity of Fort Peck Dam flow releases to test hypotheses…*" and below the figure on page 2-9 is "*The general approach to developing example conceptual hydrographs was to define hypothesized biological functions of the parts of the conceptual hydrographs that would drive flow-release strategies*." Unravelling the latter statement is a challenge, but both statements suggest that the test releases will be designed to evaluate discrete hypotheses regarding the relationship between pallid sturgeon ecology and behavior and flow volume and timing. This is the justification for the test-releases. The current four fragmentary bullets are not adequate. The current text and graphic addressing this is an essential issue in three sections of the DEIS and are unexplained, unlinked, and not clear.

Significance

Medium. The repeat of a figure apparently essential to understanding the utility of the preferred action alternative and important enough to appear as a figure in the Executive Summary and as Figures 1-3 and 2-2 -- is functionally unexplained. This makes it difficult for the reader to understand the importance of the logic behind the objectives of the Fort Peck Dam test flows and the Preferred Alternative.

Recommendation for Resolution

1. The relevance of the figure should be explained each time it appears in relation to the objectives of the test flows and the evaluation of the hypotheses associated with the test flows.
2. The explicit hypotheses associated with the test flow should be stated in full at one of the three points where the figure occurs in the document, preferably in Chapter 1.

USACE/PDT Response

Concur.

Clarifying text will be included to link components of the figure with the objectives and hypotheses, and to further demonstrate the logic for the test flow hydrographs.

The hypotheses driving the DEIS test flows and the process and rational for their development are presented in the SAMP as Level 1 and Level 2 AM components (see Table 4 in the SAMP for a summary). While we must balance the value of added technical detail with to the need to maintain readability for the public audience, we will revise the section to list the relevant hypotheses from the SAMP and will provide a reference to the SAMP for more detail. The Attract, Retain, Aggregate and Spawn components of the test flow are driven by BQ1-H2, "Attractant flow releases at Fort Peck will result in increased reproductive success through increased aggregation and spawning success of adults." The Drift component of the test flow is driven by BQ5-H3, "Reduction of mainstem Missouri flows from Fort Peck Dam during free-embryo dispersal will decrease mainstem velocities and drift distance thereby decreasing mortality by decreasing numbers of free embryos transported into headwater of Lake Sakakawea."

IEPR Panel Back-Check Response

Concur.

Clarifying text associated with the figures will improve the readability and flow of this section. As to recommendation point 2 above, stating hypotheses in Chapter 1 will improve the link between the figures and relevant text.

Panel Comment 5 – Purpose and Needs Section requires substantial revision

The section that describes the purpose and needs of the DEIS requires substantial revision.

Basis for Comment

The introduction (1.1) to the 1.0 Purpose and Needs section of the DEIS provides background describing the program and process that generated/required the action, but as it is presented it doesn't introduce the document well. The final paragraph of subsection 1.1 should be moved to the front and expanded to actually introduce and explain what follows in the DEIS. To maximize reader understanding, the "background" (currently nearly five pages, Page 1-1 to 1-5) would best follow the purpose and needs subsections, providing necessary "how-did-we-get-here" context, allowing the actual project description and rationale to be presented up front. That should include advancing the text on Page 1-4, describing the state of the pallid sturgeon population and the presumed impediments to recruitment, forward and editing/rewriting it to better link to and inform the proposed action. That biological information needs better articulation; the number of pallid sturgeon in the upper river system made relevant to the DEIS.

The Purpose (1.2), Needs (1.3), and Objectives and Constraints (1.4) subsections should be made explicit, clearer, and more fully explained. If the purpose of the test releases is to "test" several hypotheses regarding flows triggering essential aspects of pallid sturgeon ecology and behavior, then this text on page 1-7 is inadequate to the task of explaining that purpose, the biological premise for the action, how pallid sturgeon ecology and river hydrodynamics interface, and what the desired outcome of a test-release action might be. From page 1-7 –

The hypotheses identified in the AM Framework were formed around pallid sturgeon reproductive behavior and separated into four biologically relevant phases of the hydrograph to address reproduction and recruitment. The below figure provides information on historical flows and their relationship to pallid sturgeon reproduction.

Reproductively mature pallid sturgeon migrate upstream during spring attracted by increasing flows. Once attracted upstream, appropriate flows should be designed to retain (or hold) the fish near the spawning area before a second flow cues the aggregation of mature males and females to facilitate spawning. Finally, fertilized eggs undergo a period of downstream drift migration with lower flows on the receding limb of the hydrograph to minimize flow velocities and

maximize drift time as they develop and grow into larvae. Therefore, the objectives of the Fort Peck Dam test flows DEIS are to investigate the capacity of Fort Peck Dam flow releases to test hypotheses that flows will:

- ***Attract**: trigger upstream spawning migration and attract pallid sturgeon up the Missouri River,*

- ***Retain**: hold pallid sturgeon upstream near spawning areas,*

- ***Aggregate and Spawn**: signal aggregation and spawning of reproductively ready pallid sturgeon,*

- ***Drift**: provide conditions for survival of drifting larval pallid sturgeon.*

That explanatory text does not adequately describe the phenomenon of primary concern and the accompanying figure (absent descriptive legend) sets temporal context, but doesn't help explain how the proposed action will result in desired outcomes. For that matter, what flow data inform the standing Figure 1-3 – flow in a representative calendar? Or mean flow volumes for several years? The Constraints subsection (1.4.2) presents a lot of information but no effective synthesis. How do Intake Diversion Dam, Flood Targets, Flow Rate of Change, and Minimum Flow Releases separately and in combination constrain action alternatives? Text under those sub-headers describe the issue, but not in adequate detail. The draft document states "*The constraints for the Fort Peck Dam test release flows were focused around avoiding or minimizing biological and Human Consideration impacts and were informed by stakeholder input during several meetings (1.4.2).*" How were the constraining issues engaged with stakeholders, were the action alternatives adjusted to stakeholder input, and after adjustments addressing that input are the actions capable of providing benefits to the target species?

Subsections 1.1 through 1.4 seem unfinished. The text under all of the headers is truncated, not fully explanatory, and not linked to the previous subsections to make a continuous narrative. The headers should add clarity and separate the key elements addressed in the Purpose and Needs section. In the standing document, it seems as if the headers define the presentation and some general and minimalist text was placed under each header. The result is that introductory material that does little to support important subsections 1.5 and 1.6. Subsections 1.7 and 1.8 just dangle at the end of Section 1.

Section 1 needs to better describe the ecological phenomenon that the preferred alternative is intended to address, how the action is being used to evaluate important hypotheses about how pallid sturgeon performance relates to the dynamic flow regime in the upper Missouri River, how test releases can contribute to better understanding species-flows relationship, and how, after vetting in stakeholder forums, the action alternatives have been pre-designed to minimize any

deleterious effects on other environmental states and conditions, and an array of human considerations.

Significance

Medium High. The DEIS is assessing action alternatives in support of a model and precedent-setting adaptive resource management program.

Recommendation for Resolution

1. Enhance and complete the introductory "purpose and needs" section as described above to better set the stage for the extended technical text and data and analyses that follow. Adding an author to this section from those responsible for the well-written Science and Adaptive Management Plan, from which much of this section can draw, seems like a ready prescription toward a final EIS document that is technically robust and readable.
3. The hypotheses need to be formally stated, not just referenced from another document.
4. The absence of fully descriptive figure and table legends throughout the document needs correction.
5. Section 1 needs heavy editing throughout to meet the needs of an introductory chapter to the DEIS. Nothing in Section 1 needs to be disposed of, but every subsection needs to be re-crafted and finished, with context and purpose statements front and back that link the issues with each other and programmatic intent.

USACE/PDT Response

Concur.

Hypotheses will be formally stated in the text with references to the SAMP and Fort Peck AM Framework. Descriptive text will be added to better link the figures with the Purpose and Need and ultimately completing the logic to the hypotheses. Additional authors that were involved with the Science and Adaptive Management Plan and Fort Peck Adaptive Management Framework have been engaged to assist in needed revisions.

IEPR Panel Back-Check Response

Concur.

The USACE response is heartening. To clarify, a major re-write of the document section is necessary to describe clearly and in full the purpose and needs for the resource management action(s), the substantive basis in "scientific" information that justifies it, and the robust approach to implementing the action in an adaptive management framework.

Panel Comment 6 - Section 1.1 Purpose and Need, Introduction have confusing descriptions of pallid sturgeon early life stages

Regarding page 1-4 of DEIS. The terminology used to describe the early life-history stages of pallid sturgeon has been and continues to be unnecessarily confusing. Snyder (2002) provides a descriptive overview of the early life history stages for pallid and shovelnose sturgeon that should replace the jargon currently used.

Basis for Comment

Below are a few examples in the DEIS that refer to proto-larvae, that is, the drifting phase of pallid sturgeon (~9-20 mm; Snyder 2002).

"*developing embryonic pallid sturgeon require… downstream drift…*" (page 1-4)
"*drifting larval pallid sturgeon rely…*" (page 1-4)
"*free swimming juvenile stage*" (page 1-5)
"*fertilized eggs undergo a period of downstream drift migration*" (page 1-7)
"*larval sturgeon development…*"
"*hatched, free embryos* (page 2-12)

"*The larval life stage is a developing fish without a yolk, feeding exogenously* (page 3-96)*"* which is then followed on page 3-100 with this statement *"…the greatest proportion of drifting, larval pallid sturgeon…*"

Significance

Low. Sturgeon life stages should be discussed using appropriate terminology from the ichthyology literature. This is especially true for proto-larvae, the life stage that is the focus of significant time and resources toward recovering the species. It is incumbent on fisheries scientists to be consistent in this regard to better communicate with constituents and the scientific community.

Recommendation for Resolution

Use terminology from Snyder (2002):

Egg	female gamete (1N)
Embryo	fertilized egg (2N)
Proto-larvae	(~9-20 mm, drifting phase)
Meso-larvae	(~20-80 mm, settled phase)

Meta-larvae	(~80-200 mm)
Juveniles	(immature fish > 200 mm)
Adults	(sexually mature fish)

USACE/PDT Response

Concur.

The suggested definitions from Snyder (2002) are a useful classification of larval stages. The terminology employed in the DEIS, while not entirely consistent, reflects the common utilization of those terms by the agency personnel and the scientific community involved with the MRRP. Rather than changing terminology throughout the DEIS and appendices, a table will be added that relates terms from Snyder (2002) with other terms used and, where Snyder's terminology provides needed clarity, the Snyder (2002) classification will be substituted for the terms used in the draft. The table will describe which life stages are grouped/generalized in the EIS, and what terms are used for the groupings. We will revise the conflicting statements identified on pages 3-96 and 3-100.

IEPR Panel Back-Check Response

Concur.

While the present terminology (nomenclature) is widely used by agency personnel, it is important to be consistent with terms that describe specific life-stages of sturgeon. Including a table that links Snyder's (2002) classification system to current terminology would be helpful going forward, as it provides the basis for communicating ontogenetic development and the autecology of different life-stages.

Panel Comment 7 - Section 1.4.2 Constraints and evaluation of partial flows on spawning

Constraints, Flood Targets and Drift Phase. Page 1-9. "*For example, it would be possible to shut off flow releases during the attraction, retention, and/or spawning phase due to exceeding a flood target yet still implement the drift phase of the flow releases, resulting in a partial test flow release that provides opportunity to evaluate the drift phase of the hydrograph to address the drift objective*"

It is not clear from the statement above how a partial test flow for the drift phase would be evaluated after shutting down a test flow for spawning. Is it assumed that pallid sturgeon will spawn and produce progeny that could then be evaluated during the drift phase of the

hydrograph? If spawning did not occur because flow releases were shut off, what targets/endpoints would be used to evaluate the drift phase of the hydrograph?

Basis for Comment

There seems to be a disconnect between effects of test flows on spawning and age-0 fish production. Perhaps flows, water temperatures, oxygen concentration, etc… could be evaluated from a partial test flow – that could lead to alternative release schedules that benefit proto-larvae -- but this is not clearly stated.

Significance

Low-Medium. Clarification is needed to understand the benefits of a partial test flow, as described.

Recommendation for Resolution

Additional clarification is needed regarding how a shut off release during attraction, retention or spawning phases could lead to an opportunity to evaluate the drift phase.

USACE/PDT Response

Concur.

A section will be added describing learning opportunities from the drift phase if test flows were to be shut off during the Attract, Retain, or Spawn & Aggregate Phase. These include experimental actions such as a Drift Study (experimental release of particles/larvae/dye) similar to the event during 2019, as well as monitoring/sampling of abiotic variables such as water velocity and temperature to populate drift and growth modeling efforts, and catch of age-0, age-1, or age-t+x pallid sturgeon in the following year(s).

Clarifying text will also be added describing potential experimental release of particles (e.g., negatively buoyant beads, hatchery reared larvae, etc.) or dye in the case a test flow is shut off prior to drift phase; similar to the experimental release done during 2018-19.

IEPR Panel Back-Check Response

Concur.

The shutdown of a flow test prior to (or during) spawning would likely change in-river conditions below Fort Peck. Greater flows, increased nutrient inputs, changes in water temperature, preceding a shut-off could influence survival of protolarvae and mesolarvae in ways that are different than results from a typical drift study. In this case, a learning opportunity

would be better served by a drift study similar to that that was carried out in 2019. The collection of age-0 and age-1 fish associated with that study represent important data that could be compared to data collected during a partial flow test, underscoring the importance of having a robust monitoring program in place for age-0 and age-1 fish. At the very least, Pat Braaten's success in collecting age-1 fish in 2020 should be replicated following a future drift study related to a partial flow release. The challenges in being 'ready' to implement a drift study during a partial test flow lie in ensuring that the timing and availability of young (1-3 dph) protolarvae are matched to the timing of a flow shut-off. Thus, the logistics of a drift study associated with a partial flow test should be discussed when revising this section.

Panel Comment 8 - Section 1.5 Scope of Environmental Impact Statement and discussion of adaptive management require greater clarity

The discussion of adaptive management (AM) and its implications to future management actions is needed; claims that AM leads to improvement in management decisions and outcomes need a clearer and compelling presentation.

Basis for Comment

Page 1-11. The plan says, *"Adaptive management copes with uncertainty through implementation while acknowledging concerns about the effectiveness of the course of action. Progress can be expected through iterative application of learning and adjustment. Adaptive management leads to a better understanding of the resource or system, which in turn leads to improvements in management decisions and their results over time."* The first part makes good sense, but management decisions aren't necessarily improved if (1) the action fails to produce a desired result or (2) the action is so constrained by other system uses (particularly Human Considerations) that it has no real chance of success. How is this addressed in the DEIS?

Significance

Medium. The hope is that AM will lead to future improvements in management actions. However, other constraints to the system (e.g., Human Considerations can limit high test flows) may greatly limit our ability to learn, which in turn may not provide needed management benefits.

Recommendation for Resolution

Add text describing how other competing actions and human uses may limit future AM actions and how this can constrain future management actions for the pallid sturgeon.

USACE/PDT Response

Concur.

Text will be added acknowledging that competing actions and uses may limit the availability of future management actions for the pallid sturgeon. Although other competing actions and human uses may limit future actions for the pallid sturgeon, the agencies believe that adaptive management continues to be the best path forward for endangered species management on the Missouri River – hence the high level of effort the agencies (and MRRIC) have expended in designing a progressive Science and Adaptive Management Plan and the Fort Peck Adaptive Management Framework. Limited implementation, monitoring, and assessment of flow management actions on a test basis under an adaptive management framework provides a useful mechanism to address concerns that may become constraints. The structure of the Adaptive Management Plan and Fort Peck Adaptive Management Framework allows for revisions of actions, and new actions if those specified are insufficient after they are implemented.

IEPR Panel Back-Check Response

Concur.

The added text should be specific to address the two numbered concerns in the initial comment. We agree that adaptive management is the best path forward, but only if it is truly adaptive and structured in a manner that facilitates learning. Revisions to current actions are indeed important, but should only occur after there has been sufficient opportunity to learn from the current action(s). The new text needs to do a better job of emphasizing how a structured approach is critical to a successful AM framework.

Panel Comment 9 - Section 2.2 Concerns regarding the accuracy and reliability of models supporting the development and analysis of the proposed alternatives

USACE extensively used the HEC-ResSim and HEC-RAS models to test and evaluate alternative test flow releases from Fort Peck Dam for the purpose of estimating pallid sturgeon population effects. However, alternative models and/or calculations for testing and comparing the competing alternatives were not described or considered.

Basis for Comment

Section 2.2: Complex hydrologic and hydraulic modeling tools do not lend themselves to standard uncertainty analysis approaches. Generally, the outputs from the models are deterministic. However, there are good practice approaches for generating a semi-quantitative

assessment of model prediction uncertainty, including the degree of belief that can be associated with the model-based conclusions. One of these approaches is a sensitivity analysis (see Section 3.1.1 for a brief description of DSM sensitivity testing), and the other is by comparing the chosen project model results to alternative models (say, models provided by the US EPA), and contrasting the model outputs. In Section 2, the concept of model prediction uncertainty is not adequately addressed.

Significance

High. Establishing the degree and consequences of model believability is a high concern, especially since the provided alternative flow approaches are directly related to the accuracy of the hydrologic and hydraulic model outputs. Without an adequate defense of the selected models, including at least a rough estimate of model prediction uncertainty, the believability of the DEIS findings is in jeopardy. And, more importantly, without model uncertainty analysis the difference between alternatives is unclear. How different is the chosen alternative from other options?

Recommendation for Resolution

A rationale and defense of model choice, a clear description of model prediction uncertainty, and an explanation of the degree of believability in model predictions should be included in this document. A simple reference to prior work with the HEC-ResSim and HEC-RAS models, possibly even referencing model accuracy predictions, is insufficient to allow reviewers to assess model accuracy. The uncertainty approaches need to be directly linked to the questions of interest and model outputs for the assessment of alternatives as contained in the DEIS.

USACE/PDT Response

Concur.

A more-robust rationale and defense of model choice will be added to the EIS. The EIS employs two general classes of models; hydrologic, reservoir operations, hydraulics, water quality, and some economic analyses are conducted using industry-standard models developed by the Hydrologic Engineering Center, and the remaining models were purpose-built by technical experts using data from the Missouri River system. The USACE requires that all models used for planning be certified, which requires robust documentation, testing, and independent review. All of the models used in the EIS have been certified.

The Missouri River Mainstem ResSim and RAS models have gone through extensive review and scrutiny through both a formal USACE review process and independent and public review. The models were approved for modeling operations of the Missouri River Mainstem Reservoir System (ResSim) and routing flows and calculating corresponding stages (RAS). For ResSim, the criteria laid out in the Master Manual has not changed since implementation of the Missouri

River Recovery Management Plan EIS selected alternative. For RAS, the calibration was updated for the Fort Peck test release EIS, but the underlying model components of the models did not change since implementation of the Missouri River Recovery Management Plan EIS selected alternative.

The Hydrologic Engineering Center (HEC) hydrologic software program suite was chosen based on: capability to model the large, complex river system, widespread use and acceptance both within and outside of the Corps of Engineers (transparency), compatibility with other HEC economic and ecological analysis software, thorough documentation, and availability of long-term technical support. HEC models are considered the industry standard and have widespread global use. All selected HEC models are also on the software list of models that have undergone extensive testing and are approved for use within USACE.

Other models used during this study were developed specifically for use on the Missouri River and parameterized using data from the Missouri River. All of these models have documentation that describes limitations and uncertainties. We are not able to fully quantify the uncertainty associated with all of the models. However, our assessment is that the limitations and uncertainties apply equally across the alternatives, permitting a reasonable comparison of the relative performance of alternatives, including the No Action alternative.

IEPR Panel Back-Check Response

Concur.

A key issue with establishing model uncertainty and accuracy is the ability to detect differences in the effects of the various flow alternatives. The DEIS should provide insight into the magnitude of differences that can be detected, given the uncertainty in the model predictions. Information should be provided describing when and how data collected in the Missouri were used in model testing and evaluation.

Panel Comment 10 - Section 2.2.3 Concerns regarding the accuracy and reliability of pallid sturgeon population modeling

Pallid sturgeon population modeling provides the basis for evaluating the effects of flow alternatives on recruitment to age 1 and population size. Linking available data to the Demographic Population Model (DPM) inputs and assessing the DPM's accuracy using data generated with the existing sampling programs is not described.

Basis for Comment

In the DEIS (e.g., Section 2.2.3) little information is provided as to the source of information for parameterization of the population growth model, or sensitivity testing of the model predictions. However, after an intermediate presentation of initial ISAP questions to the technical working group, the ISAP received additional information on the source of information for parameterizing the deterministic model (Leslie Matrix). Much of this information was apparently taken from published papers, or other unpublished sources (for example, age-specific fecundity is cited to Rob Holm as unpublished data). The ISAP agrees it is not incorrect to use published data or in some cases unpublished information for this type of analysis. However, the question remains as to how applicable the other source studies are to pallid sturgeon in the Missouri River. It is unclear whether any sensitivity testing of the model outputs occurred. A slide was sent to the ISAP implying that such testing was implemented, and that uncertainties in age-0 survival given retention effect will not impact the choice of Fort Peck alternative flow comparisons (see Reynolds, Fall Science Meeting presentation, November 4, 2020). A stochastic demographic population model is shown on another slide in the same presentation, with the addition of year-specific temperature and hydrology data. Outputs from long-term deterministic models on population decline and growth were presented as well.

Significance

Medium-High. Without a defense of model parameterization and sources of data inputs to both the population and hydrologic models, the model predictions lack the necessary high degree of believability.

Recommendation for Resolution

The ISAP recommends that the process of addressing both within-year and long-term uncertainty in pallid sturgeon population dynamics be discussed in the DEIS or a Technical Report in detail. Outputs from the sensitivity or stochastic modeling should be included in the Technical Report. A discussion of how the sensitivity and uncertainty analyses influenced the choice of flow alternatives should be discussed. A discussion of which key model parameters can be parameterized from the ongoing sampling programs should be included. A discussion of data

insufficiency and the effect of model results should be included. In all cases, uncertainty and sensitivity studies of the population models should focus on the decision under consideration. Effectively, does model prediction uncertainty change the upcoming flow study and is there a clear difference, based on good modeling protocol, between the expected flow alternatives?

USACE/PDT Response

Concur.

The full population model description was not included with the DEIS but will be included as an appendix to the Final EIS. It includes details about model parameterization and sensitivity analyses, as well as a description of the deterministic population model results, stochastic analyses, and *preliminary* stochastic results. Uncertainty and its implications will be discussed in the report.

IEPR Panel Back-Check Response

Concur.

It is essential that the final DEIS include all of the requested details outlined in this comment. The complexity of population models requires that such details be included in a manner that allows the model(s) to be replicated by others. Missing discussion points include the sources of data included in the models, specific details about the sensitivity analysis, a description of whether deterministic, stochastic, or both models are being used for pallid sturgeon. There is a need to articulate clearer links between the sensitivity analyses and the decisions under consideration.

Panel Comment 11 - Section 2.2.3 Pallid sturgeon modeling of the dynamics of settling of proto-larvae should consider the Mrnak et al. (2020) model

Regarding Page 2-6 of the DEIS, flows and water temperature variations have an important effect on the settling dynamics of pallid sturgeon protolarvae. The DEIS includes two larval development models discussed in Bratten et al. (2012) and DeLonay et al. (2016). A recent model developed by Mrnak et al. (2020) should also be considered.

Basis for Comment

The larval development rate used by Braaten et al (2012) was based on work by Kynard et al. (2007) where proto-larvae were considered to transition to meso-larvae (i.e., settled) after meeting two criteria -- (1) expulsion of the yolk-plug, and (2) presence of food (*Artemia*) in their gut. Meeting both criteria resulted in average cumulative temperature units (CTU) of ~200. In a

recent study, Mrnak et al. (2020) used behavioral criteria to evaluate temperature-dependent development in proto-larvae where age (i.e., days post hatch, dph) at settling can be predicted using average water temperature (T), as dph = 24.3-0.85(T) ($F_{1,16}$ = 76.24, $P < 0.001$, r^2 = 0.83).

Unlike other models that use extrinsic factors to determine temperature thresholds to define settling, the model by Mrnak et al. relied on behavioral observations that documented the transition from negative to positive-rheotaxis. Proto-larvae development reported by Mrnak et al. (2020) should be included as an alternate drift model in the DSM modeling.

Significance

Medium/High. Including additional development rate models in the DSM will provide a range

of expected outcomes (i.e., settling distributions) that could be compared among proposed flow and temperature scenarios.

Recommendation for Resolution

Include alternative, larval development rates in DSM modeling.

USACE/PDT Response

Concur.

The Mrnak et al. (2020) relation will be included as an alternate drift model in the DSM modeling and discussed in the EIS.

IEPR Panel Back-Check Response

Concur.

The pallid sturgeon drift models described in Kynard et al (2007) and Mrnak et al (2020) are based on different criteria and result in different estimates of drift duration (that is, days post hatch, Table 1). At water velocities ranging from 26 to 78 km/d, application of the two drift models show that the Mrnak model is more conservative, resulting in mesolarvae settling to the river bottom more quickly than estimates derived by Kynard et al. 2007. Simulated settling locations derived by each model are presented below (Table 2).

Table 1. Time to initiation of mesolarvae stage (settling) based on physical (Kynard et al. 2007) or behavioral (Mrnak 2019) attributes of Pallid Sturgeon larvae.

	Time to initiation of fry stage (dph)	
Water temperature (T, °C)	Kynard et al. (2007)	Mrnak (2019)[a]
18.7	10.7	8.6
20.4	9.8	7.2
23.3	8.6	4.7

[a] dph = 24.3-0.85(T); (linear regression; $F_{1,16} = 76.24$, $P < 0.001$, $r^2 = 0.83$)

Table 2. Mean, July water temperature below Fort Peck Dam from RKM 2814 to 2424 . Colored values (RKMs) represent predicted settling locations of age-0 Pallid Sturgeon based on drift models reported in Mrnak 2019 (green) or Kynard et al. 2007 (blue) at drift velocities of 26 to 78 km/d. Note that at 51 and 78 km/d, Pallid sturgeon larvae do not obtain 200 CTU's based on the Kynard et al. 2007 model, and thus, must drift further downstream into the headwaters of Lake Sakakawea (temperature data adapted from Fuller and Braaten 2012).

	Drift velocity of Pallid Sturgeon protolarvae					
	26 km/d		51 km/d		78 km/d	
Days post hatch	RKM	°C	RKM	°C	RKM	°C
1	2814	16.3	2814	16.3	2814	16.3
2	2788	17.0	2763	17.6	2736	18.3
3	2762	17.7	2712	19.0	2658	20.4
4	2736	18.3	2661	20.3	2580	22.5
5	2710	19.0	2610	21.7	2502	24.5
6	2684	19.7	2559	23.0	2424	25
7	2658	20.4	2508	24.4		
8	2632	21.1				
9	2606	21.8				
10	2580	22.5				
11	2554	23.1				

Panel Comment 12 - Section 2.4 Preliminary Alternatives Formulation and Pallid Spawning depicts spawning on descending limb of hydrograph

Page 2-12 of DEIS. The conceptual hydrographs presented in Figures 2-3 and 2-4 are well explained and linked to important spawning-related activities given what is currently known about pallid spawning behavior in the upper Missouri River. Compared to Figure 2-2, Figures 2-3, 2-4 show a later attractant flow (April) and a return to low flow as quickly as possible based on hypothesized responses. Although not present in Figure 2-2, we note that Figures 2-3, 2-4 depict spawning to occur on the descending limb of water flows. It is not clear whether this was another hypothesized departure from the natural flow regime, but it would seem feasible.

Basis for Comment

The relationship between increasing, peak or decreasing flows – and pallid spawning activity is not well documented. Figures 2-3, 2-4 show spawning to occur on the descending limb of water flows –but it is not clear in the text why. This would seem to be a reasonable, hypothesized response based on spawning behavior of other sturgeons (e.g., lake sturgeon).

Significance

Medium. Clarifying differences in spawning time for the proposed alternatives is important.

Recommendation for Resolution

Add clarification explaining spawning activity shown in Figures 2-3, 2-4.

USACE/PDT Response

Concur.

The following clarifying language will be added: “Data for 12 documented spawning events on the Yellowstone River and UMR have shown that PS spawned on the descending limb of the runoff hydrograph 11 times. For the EIS, spawning is assumed to occur when a set of hydrologic and temperature criteria are met. This results in spawning on the descending limb in all but a few instances where spawning occurs during a sustained peak.” Figures 2-3 and 2-4 are being edited to improve consistency with Figures 1-3 and 2-2. We will add text clarifying the figures are not a departure from natural flow hypothesis, instead they are based on empirical data from the Missouri and Yellowstone Rivers. Description of an expert elicitation process that provided additional context for spawning will be included in the modeling report.

IEPR Panel Back-Check Response

Concur.

Including the empirical information that pallid sturgeon spawn on the descending limb of the hydrograph (12 observations) will resolve this issue.

Panel Comment 13 - Section 2.6 Comparison of alternatives and the meaning of flow years not clear

What is meant by "flow years" is not clear. An unclear sentence prevents evaluation of impact assessment findings.

Basis for Comment

Page 2-30 *"Taken together, and averaged over the 82 years of the period of record, Alternative 1 and its variants have an average annual retention rate of 2.4%; averaged over **flow years** only, this rises to an average of 6% per year."*

Page 2-33. *"Taken together, and averaged over the 82 years of the period of record, Alternative 2 and its variants have an average annual retention rate of 2.8%; averaged over **flow years** only, this rises to an average of 6.9% per year."*

In these two quotes, what is meant by "flow years"? High, low, test, full, partial, etc.

Significance

Low-Medium. Clarity is needed in order to evaluate the likely retention benefit in these two statements.

Recommendation for Resolution

Clarify the years and types of flow years are being referenced.

USACE/PDT Response

Concur.

The referenced text is describing full test flow years. Updated text will be added making this clear.

IEPR Panel Back-Check Response

Concur.

The updated text will address this concern.

Panel Comment 14 -- Section 2 and Section 4. Preferred Alternative implementation and ability to detect effects

The No Action Alternative is essentially the baseline against which the alternatives are compared/judged. At issue is whether or not any changes in population metrics due to the implementation of the selected Alternative 1 approach can be distinguished from implementation of any other approach, or the no action alternative. This comment concerns the approach for selecting Alternative 1, as well as methods and procedures for implementing Alternative 1 (Section 4).

Basis for Comment

This comment reflects the general lack of data-based analyses or model-based uncertainty analyses in the DEIS. For example, what is the ability to distinguish between larval retention resulting from any of the alternatives? Section 2.6 states that averaged over 82 years, the no action alternative results in a retention of 1.1% (page 2-29). For the same period, Alternative 1 results in an average retention of 2.4%. (page 2-30). Is a difference of 1.3% biologically relevant, and will this difference result in a measurable improvement in the biological populations of interest? Section 4 discusses procedures and approaches for implementing Alternative 1 but does not discuss whether the planned monitoring methods are precise enough to distinguish a change in retention of 1.3%. The underlying issue is whether or not any alternative is better than the no action alternative. And, how different will the population metrics need to be before a statistically different population will occur due to implementing Alternative 1?

Significance

Medium/High. The credibility of the proposed approach depends on the generation of precise data, including correlations between flow and population response. If the ability to distinguish among flow alternatives or between changes in population response to flow is low, then the project loses credibility.

Recommendation for Resolution

The ISAP recommends that the procedures and methods for selecting an alternative be revised to include a formalized approach for including model and data uncertainty. Additional analyses are required to defend the Alternative 1 selection, including a formal comparison between competing alternatives that incorporates the current known uncertainty in the modeling approaches.

USACE/PDT Response

Concur.

The No Action Alternative is the baseline against which the other alternatives are compared. The action alternatives outperform the No Action Alternative in terms of the frequency of pallid sturgeon spawning events on the UMR, the expected number of larvae settling upriver of the Lake Sakakawea anoxic zone, long-term population growth rates, and the expected time to quasi-extinction. Differences in flow alternative outcomes and how they compare to the No Action Alternative will be discussed in terms of biological relevance. Report revisions will include a description of ongoing scenario exercises with experts to determine monitoring and assessment strategies for evaluating the effectiveness of test flows.

IEPR Panel Back-Check Response

Concur.

A table showing model predictions for each flow alternative (including confidence intervals on the predictions) could be a useful approach to addressing this issue. The expected growth rates, time to quasi-extinction, etc. for each flow alternative, along with uncertainty bounds, could be provided as well.

Panel Comment 15 - Section 3 Affected Environment and Environmental Consequences, River Incision, meaning of incision is not clear

Section 3.2.1.4.10 -- 2020 Site-stability Observations (Page 3-38). River incision is qualitatively assessed near irrigation pump intakes, yet no criteria are presented as to determination of "incision" as assessed.

Basis for Comment

Incision is a vertical degradation process measurable by channel deepening typically evidenced by falling stage-Q relationships at fixed gaging stations and/or by documented altered channel geometry. Casual observation of steep banks are not necessarily reflective of channel incision processes, as they are the result of lateral as well as vertical erosion processes. The observed increased abundance of sand bars in fact suggests a primarily lateral adjustment process (channel widening due to mass failures of banks with local resorting and storage of the additional sediment). Both vertical and lateral erosion likely occurred during and following the recent sustained high flows, yet, without quantitative data, attribution of the primary erosion process should remain speculative.

Significance

Medium-High: Misinterpretation of in-channel processes may result in inappropriate causal attribution and inaccurate impact assessment.

Recommendation for Resolution

Alter language to reflect observations of increased instability, eliminating unsubstantiated sole attribution to incision processes.

USACE/PDT Response

Concur.

We agree that the term incision can be misleading as used in the text. The term incision will be replaced with qualitative text referring to bank condition at the intake vicinity within the report stability section.

IEPR Panel Back-Check Response

Concur.

More-detailed site-specific descriptions should clarify the intended meaning.

Panel Comment 16 – Section 3.3.1.2 Reproduction and Recruitment and the spawning cycle

Section 3.3.1.2, Reproduction and Recruitment, Page 3-94 deals with adult life stage, states: "*Pallid sturgeon do not spawn on a 12-month cycle. DeLonay et al. (2016) tracked one male that had a 2-year spawning cycle and six males that had a cycle of longer than 1 year, but total cycle length could not be determined. Of 20 female pallid sturgeon tracked, most had spawning cycles longer than 2 years*"

The excerpt above implies that pallid sturgeon spawn at fixed cycles of varying time (years). Replace "spawning cycle," which implies something that is predictable, with the more commonly used "spawning periodicity" to avoid confusion.

Basis for Comment

It is well-known that male and female sturgeon differ with regard to age-at-maturity and spawning periodicity. In lake sturgeon, for example, females mature at 20–25 years of age and

have a longer spawning periodicity of 4–9 years than males, which mature earlier at 8–12 years of age and have a shorter spawning periodicity at 1-5 years. Spawning periodicity can also vary within an individual; a female that spawns in a given year, for example, may spawn again in 4 years or wait and spawn again in 7 years depending on conditions.

Significance

Low. This comment requires only minor clarification.

Recommendation for Resolution

Additional clarification by changing spawning cycle to spawning periodicity.

USACE/PDT Response

Concur.

Will change "cycle" to "periodicity."

IEPR Panel Back-Check Response

Concur.

Edits to the wording, as proposed, will resolve this question.

Panel Comment 17 - Section 3.3.2.1 Impacts Assessment Method and basis for presumed hypoxia

Regarding Page 3-99 "*Lake Sakakawea headwaters, which are presumed to be lethal to pallid sturgeon*…" it is not clear why this is presumed. Are there no near-bottom, oxygen concentration data from upper Lake Sakakawea that can be provided to demonstrate hypoxic (or anoxic) conditions in the transition zone? The citation provided -- Jacobson et al. 2016 -- does not provide any measured dissolved oxygen concentrations or references to any.

Basis for Comment

The assumption that pallid sturgeon larvae experience 100% mortality if they settle in the headwaters of Lake Sakakawea headwaters needs to be supported with actual data. The Fort Peck study by Guy et al. (2015) reported anoxic conditions in the lower 5% of the water column of the transition zone in the upper Fort Peck reach, but this study should not be extended to Lake Sakakawea. There are notable differences in the riverine, transition, and lacustrine zones of Fort Peck, Sakakawea, and Oahe (see Bolgrien et al. 2009. Trophic status of three large Missouri River reservoirs. Lake and Reservoir Management 25:176-190).

Significance

Medium/High. The assumption that all drifting/settling larvae perish, if they drift into upper Sakakawea, has important implications for the drift hypothesis and DSM/population modeling. No doubt near-bottom, dissolved oxygen data exist for upper Lake Sakakawea, yet references or data to support the italicized statement on page 3-99 are not presented.

Recommendation for Resolution

Additional clarification and data supporting that near-bottom, dissolved oxygen concentration in upper Lake Sakakawea is hypoxic-to-anoxic in June/July would resolve this question.

USACE/PDT Response

Concur.

Added text will include reference and results from Lake Sakakawea headwaters hypoxia zone study. The following will be added to Literature Cited: Bramblett, R.G. and E.A. Scholl. 2015. Annual Report 2015: The spatial and temporal extent of the suspected hypoxic zone in the headwaters of Lake Sakakawea. Department of Ecology, Montana State University, Bozeman, MT.

IEPR Panel Back-Check Response

Non-Concur.

Providing a reference that documents hypoxia in the riverine zone of Lake Sakakawea will address the question. However, the reference document that is mentioned is a gray literature report and the Panel was unable to find or access it on-line. Please provide a PDF of the document and a link in the text to resolve this question.

Subsequent to the back-check response, the USACE provided the requested report. The Panel has further discussed concerns regarding the measurement of near-bottom dissolved oxygen and its implications for inferring pallid sturgeon mortality on alleged anoxia in Lake Sakakawea (Appendix D to this Final Report).

Panel Comment 18 - Section 3.5 Hydropower Analysis and Use of Capacity Value

The hydropower National Economic Development (NED) and Regional Economic Development (RED) analysis includes a Capacity Value that seems unlikely to be relevant in analyzing the replacement cost of hydropower of a management action, which is expected to be rarely implemented.

Basis for Comment

The cost of replacing dependable capacity should be included in analysis of alternatives involving permanent changes in hydropower production. In the case of the Fort Peck DEIS alternatives, the suitable flow conditions are expected to occur at most 9-16 times in the 82-year period of record. Even then only 3-5 test flows would be performed under either action alternative (see page xv of Executive Summary and Figures 4 and 10 in the Hydropower Technical Report). Given the infrequency that a test flow would occur, including the cost of replacing the capacity with thermal plants in order to maintain the capacity that would be lost for a few weeks in the summer season (the other peak demand period, winter, is unaffected) seems uneconomic and unrealistic. The likely minimum cost response in the 3-5 test flow seasons would seem to increase purchase of replacement power. This is the approach taken for Thermal power (page 3-437). The Thermal Power analysis indicated there were no impacts to capacity or capacity values (page 3-438). The percentage changes in hydropower and thermal are generally of similar very small percentage changes -- 0.1%-0.2% when averaged over the POR, although larger in absolute dollar magnitude for hydropower).

Significance

Medium. For Alternative #1 (Table 3-58, page 3-166) the Difference in Average Annual Capacity Value is more than six times higher than the Difference in Average Annual Generation Value for full or partial flow years. Given the large magnitudes of hydropower relative to some of the other authorized purposes this cost difference between generation and capacity can be a substantial factor in the NED analysis.

Recommendation for Resolution

Recalculate replacement cost of the hydropower lost during the test-flow years relying on Generation Value only rather than including Capacity Value.

USACE/PDT Response

Non-Concur with Recommendation for Resolution.

The average availability calculation method used to estimate dependable capacity is meant to mimic how Independent System Operators (ISO's) like Midcontinent Independent System Operator (MISO) calculate capacity for hydropower facilities. These requirements are generally

based on average ability for a power plant to meet specific load during peak summer-time periods. These requirements are different than the requirements for thermal plants which are much less hydrological dependent.

In addition, the average availability method already incorporates the infrequency of test flows by averaging over the period of record. These reported changes in dependable capacity reflect both the infrequency of the event and its possible consequence.

IEPR Panel Back-Check Response

Concur.

The explanation that the USACE's calculation method is intended to mimic how ISO's calculate capacity of hydropower facilities is helpful. The USACE's response should be added to the Technical Report if a revision to that document will be made. If no revision to the Technical Report is planned, some additional explanation is needed in the FEIS. However, USACE's explanation seems to be somewhat different than what the Hydropower Technical Report (Pages 19-20) indicates "Typically, when WAPA cannot generate enough hydropower to fulfill its contractually obligated agreements, they must go on the open market and purchase electricity, typically at higher costs. The NED modeling is attempting to estimate the national economic impact of these potential alternatives." It seems that WAPA is expected to purchase power to meet any shortfalls, which likely reflects Locational Marginal Pricing as discussed on pages 13-14 of the Technical Report. Economists describe marginal pricing as reflecting changes in variable costs of production, but not the fixed costs, such as capacity. However, from the discussion after the ISAP/USACE's webinar presentations on July 26, it appears the actual workings of the electricity market in the region requires purchasers of wholesale electricity from producers to first pay a capacity value and then the cost of the "market price" of electricity related to the day and time they want the power. Presumably the USACE's Capacity Value calculation in the HBC model is attempting to include that Capacity Value along with the Generation Value in the total NED value of any hydropower that is lost due to any of the proposed Fort Peck alternatives. It is important in the revised Technical Report or FEIS to reconcile whether and how agencies such as WAPA and USACE and the private ISO's incorporate Capacity Values due to any potential reduction in hydropower from the Preferred Alternative.

Elaborating on how the "average availability method" referred to on page 18 of the Technical Report accounts for the "infrequency of test flows by averaging over the period of record" is helpful. Adding that text to the Technical Report would be helpful as it is not clear in the document. Few readers will search for the reference that the agency provided to the 1985

Hydropower Engineering and Design report in order to obtain an understanding of the "average availability method."

Panel Comment 19 - Section 3.6 Irrigation and Estimated Farm Income Loss

Loss in net farm income for Alternatives 1 and 2 under high flows to the side channel irrigation intakes is larger than No Action high flow analysis is in the side channels and is almost as large as average annual net farm income in the entire study area.

Basis for Comment

Table 3-76 in the DEIS indicate that average annual net farm income in the four counties in Montana and one county in North Dakota is $9.889 million. With low flows in Alternative 1 (Table 3-81) average annual net farm income in the four Montana counties and one North Dakota county is $9.6 million (see similar figures in Tables 5-3 and 5-4 in the Technical Report). The side channels irrigation intakes reflect just 21.6% of the irrigation intakes in the study area (page 3-187). Specifically, 31 of the 142 irrigation intakes (the other 111 intakes are on the main channel and are expected to be far less affected). Despite the side channel intakes representing only a fraction of total irrigation intakes, the loss of these intakes in the high flow analysis in Table 3-75 for Alternatives 1 and 2 (and its variants) in the main DEIS, indicates that net farm income falls by $7.5 million in the side channel. This loss in net farm income (-$7.5 million) is nearly equal to the entire $9.6 million in net farm income in the study area. Even if all these 31 side channel intakes are inoperable, it seems unlikely that it could result in a loss in net farm income nearly equal to the entire five county area. The explanation in the DEIS is unclear or there is something incorrect in the analysis.

Further, Table 3-75 for Alternative 1 says the average loss is $245,000 per side channel intake. Given the increased O&M cost per intake is stated earlier to be $10,000, this leaves $235,000 per intake in higher costs with Alternative 1. Since each side channel intake is said to irrigate 414

acres based on survey results (page 3-187), the loss in net farm crop income is on the order of $567 an acre. This loss per acre seems high given the crop mix in the area (using data from Table 5-3 of the Technical Report an average value of $111 of net income per acre can be calculated using Average Annual Net Farm Income and Total Acres Irrigated by the Missouri River water). The basic calculation procedures in the Technical Report (page 24) are correct, so errors may be due to the input values.

In addition, the bottom of page 63 of the Technical Report states "*Because Variation 1A has 16 potential test flow years, the most out of any alternative, it shows the largest change in net farm income for side channel irrigation intakes compared to the No Action Alternative.*" The number

of full and partial test flows varies considerably across alternatives (see page xv in the Executive Summary). However, Table 3-75 in the main DEIS shows average annual impacts to the side channels under high flows are the same (all at -$7.5 million) for Alternatives 1,1A,1B,2,2A and 2B. Based on the text from the Technical Report, and page xv in the Executive Summary, one would expect the average annual impacts for Alternative 1A to be larger than 1B and 2B, which only have nine full test flow years. The main DEIS Table 3-75 shows losses of -$7.5 million for the side channel intakes in the alternatives, which seems incorrect.

Perhaps all these issues originate from inadequate explanation of how the methods are applied in the NED side channel irrigation intake analysis and what the NED Impacts are in Table 3-75, for Alternatives 1,1A,1B,2,2A and 2B. It seems unlikely that nearly all the farm income in the study area could be lost during high flows, even if all the side channel intakes were out of commission, since the side channel intakes only represent 21.6% of all irrigation intakes.

Significance

Medium/High. Most of the NED impacts of the test flows to irrigated agriculture arise due to the impacts of high flows on the side channel irrigation intakes. In the overall NED analysis, the impacts to side channel irrigation intakes is by far the largest category of economic impacts. Thus it is important that these side channel irrigation intake NED economic impact estimates are accurate or better explained so that the decision makers, public officials, stakeholders and other readers can understand the rather large losses in irrigated agriculture net farm income which are an order of magnitude larger than any other NED impacts.

Recommendation for Resolution

1. Explain how the side channel irrigation intakes, which make up only 21.6% of all irrigation intakes, appear to generate losses in net farm income that are nearly equal to the total irrigation net farm income in the study area.

2. Provide more detail in the Technical Report on the calculations used to reach the $7.5 million overall impacts and the $245,000 per side channel intake in full flow years in Table 6-1 of the Technical Report. In particular provide a table showing the estimates of the differences in yields per acre in Montana between dryland and irrigated agricultural, such that a reader can walk through the calculation of how the $7.5 million was calculated.

3. Augment the text associated with Table 3-85 of the main DEIS to show: (a) results of interviews with farmers indicating that the timing of the test flows occurs during the prime irrigation season, (b) the hydrograph shown to irrigators, and (c) the difficulty farmers would have with post-high flow clearing of the wet side channels to utilize those side channel irrigation intakes.

4. Consider using a Digital Elevation Model (from GIS) to inform which of the 31 intakes are more likely to be impacted by high flows, rather than assuming all 31 are equally impacted by the given increase in high flows.

5. Explain why the side channel impacts in the high flow years for NED impacts in Table 3-75, for Alternatives 1,1A,1B,2,2A and 2B are all the same -$7.5 million despite large variation in the number of potential test flow years with each alternative.

USACE/PDT Response

Concur.

Note that average annual net farm income in the four counties in Montana and one county in North Dakota is $9.889 million for the No Action Alternative for the low flow intakes only. This is an estimate of net farm income only for farms supplied with water using intakes along the Missouri River and only for the count of intakes in the low flow analysis using the assumptions laid out in the Irrigation Technical Report.

Responses to individual recommendations are listed below:

1. The side channel irrigation intakes make up 21.6% of all irrigation intakes assumed to exist for the high flow analysis. Note that we included language in the technical report that the high flows and low flows analysis use separate input data and should not be compared with one-another (see sections 4.2.1 and 4.2.2 of the Irrigation Technical Report). Net farm income is the difference between farm revenues and farm costs. When an intake is out of service we assume all costs are incurred for the irrigated acres that the intake supplies and that revenues would decline due to a reduction in crop productivity (depending on the crop). These are both conservative assumptions put in place to show the reader the maximum potential damages that could occur because of a side channel intake going offline for a season after planting occurs and other costs are incurred. Therefore, given the relatively small or negative net income margins for certain crops it is reasonable to conclude that a total decline in production for a small number of intakes could eliminate most of the net income across all intakes. Note that our selling price per unit and costs per acre are not inclusive of potential subsidies or similar government financial support methods that offset losses in crop production for certain crops.

2. A table of dryland and irrigated acreage yields along with revenue by crop by unit of sale and cost per acre of production can be provided for the state of Montana in the technical report. In addition, we can provide a table of the estimated intakes for high flows and

average acres irrigated per intake per county in Montana so that you can calculate the change in yield.

3. Feedback provided by interviewees on the timing of the test flows during the irrigation season and the difficulty farmers would have with post-high flow clearing of the wet side channels will be provided. We will provide a copy of the hydrograph shown to farmers in the irrigation technical report.

4. It is not recommended to attempt to evaluate the impact on side channel intakes from Ft Peck test flow releases with a DEM for several reasons. Foremost, any impacts to intakes will be due to a complex geomorphic response with shifting sandbars and material deposition on the receding limb of the flow hydrograph. Accurately modeling this process would be difficult and require detailed geometry and sediment data collection, multiple modeling assumptions, and results would likely be inconclusive due to many variable factors regarding the test flow (for example, Fort Peck Dam release magnitude, tributary inflows, and upstream bar and bank processes). Elevation of the side channel connection and static condition DEM mapping would not address the primary concerns due to channel dynamics. For those reasons, the analysis was based on reasonable assumptions regarding the number of side channel intakes that would likely be affected by the test flow release.

6. For the side channel analysis, average annual impacts are expressed in terms of years in which the test flow is run, not average annual over the POR or average annual over some other period. Since the net income change is the same in any test flow year the impacts are exactly the same (all side channel intakes shutdown). We will make the statement that some of the alternatives would have more impacts if the test flows were run as many times as possible and the system conditions allowed to show the reader that some of the alternatives may have greater impacts than others.

IEPR Panel Back-Check Response

Concur.

Important clarifications are in responses 1 and 6 above. Response number 1 states -- “These are both conservative assumptions put in place to show the reader the maximum potential damages that could occur…”. Given this statement, the impacts should be labelled as “maximum potential impacts” rather than “Upper Intake Thresholds” in the FEIS Executive Summary Environmental Consequences table. In addition, the quoted statement above on “maximum potential damages” should be included as the second sentence when introducing Table 3-75 in the DEIS “Summary of Environmental Consequences” and in the detailed tables of each alternative that follow in the

irrigation section. The term "Upper Intake Thresholds" used in the Executive Summary Table does not convey to the reader "maximum impacts."

Response number 1 indicating that the high flow and low flow analysis should not be compared, suggests that clarifications that should be made in the FEIS and revisions to the Technical Report to make the distinction more evident to readers. Specifically, the ISAP recommends adding the following overview table in the Methodology Section (note the very heavy dark line separating the High Flows and Low flows to add emphasis to this demarcation):

Table -- Illustrating the Economic Analysis Approach Taken for Irrigation

	Mainstem	Side Channels	
High Flows	Higher O&M costs only	Higher O&M, loss of intakes, yield difference from irrigated to dryland	
Low Flows*	Change in yield due to number of consecutive days intakes would not have access to water.		

*Low Flow analysis **cannot be compared** to High Flow analysis (see text)

The ISAP recommends that the alignment in Table 3-75 in the main DEIS match up "High Flow analysis mainstem" results in the NED and RED columns. As USACE notes, the RED is derived from the NED. However, the current alignment in the RED column places the RED "Low Flow analysis" adjacent to the NED "High flow analysis-mainstem" for the No Action and all Alternatives. This inadvertently gives the appearance to the reader that the High Flow and Low Flow analyses are in fact related to the other, but the Technical Report and response number 1 above indicate that the two are not related.

Table 3-75 shows only the maximum damage NED estimate of Alternatives 1 and 2 that has a loss in net farm income of -$7.5 million when a full test flow is run, compared to average no action income of $1.8 million in the side channels (both High Flows) and likewise a loss of 80 jobs of out of 121 in the side channel intakes both with High Flows. ISAP suggests that Table 3-75 show a reasonable range of impacts drawn from Table 3-85. Alternatively, move Table 3-85 the Summary of Sensitivity Results for the High Flows-Side Channels up much closer to Table 3-75. This would make evident to the reader that calculations have been performed by the USACE that provide alternative percentage losses that are less than 100% of side channel intakes with High Flows, and therefore result in losses much lower than -$7.5 million. It is at this point in the text that the case can be made using the USACE's quote below to justify the assumed

100% loss from side channel intakes at High Flows. The USACE's specific quote in response number 1 is: "*Therefore, given the relatively small or negative net income margins for certain crops it is reasonable to conclude that a total decline in production for a small number of intakes could eliminate most of the net income across all intakes*."

Panel Comment 20 - Section 3.6 Irrigation and regional economic development

Given that the Regional Economic Development (RED) analysis of irrigation is derived from the NED analysis, the RED analysis correspondingly needs to be re-examined.

Basis for Comment

The job and income losses associated with high flows in the side channel irrigation intakes need to be recalculated once the NED analysis is revised. In particular: (a) job losses should reflect the fact that only a fraction of the irrigation intakes are side channel intakes, thus it seems unlikely that 80 out of 121 "No Action" jobs would be lost if just a fraction of the irrigation intakes are lost and (b) job losses remain a constant 80 despite the number of high flow tests varying from a high of 16 in Alternative 1A to as few as nine in Alternatives 1B and 2B.

Significance

Medium/High. The RED results in terms of jobs are more readily understood and may be more relevant to decision makers, public officials and stakeholders than the NED values.

Recommendation for Resolution

Once the NED analysis is revised, the RED analysis should also be revised and results displayed in the Executive Summary. Revisions of any inaccuracies in the NED analysis should also be reflected in the revised RED analysis.

USACE/PDT Response

Concur.

We concur with the conclusion that RED results should be updated if NED results are updated or if there are inaccuracies in the RED analysis. However, RED results use the same inputs as the NED results and an analysis of the RED results did not find any inaccuracies in this work. Furthermore, there were no changes to the NED results and the RED results do not requiring updating for this reason.

With regard to some of the questions in the comment: the 80 of 121 jobs that were modeled to be lost compared to No Action are for side channel intakes only. These figures are not representing

the total jobs of all intakes that are lost because of side channels intakes failing to operate. Note that dryland yield and revenues would still be expected of farms that lose their intakes for the season and these farms would still have revenue, albeit reduced revenue as a result of reduced yields due to dryland farming practices that would be undertaken. The figures for income and employment are based on changes in revenue at farms with side channel intakes and not from a change in employment at all farms with intakes in the Missouri River. We will add language to clarify this point in the Final EIS.

Note that RED losses are expressed in terms of years in which flow events occur; therefore, they are the same for each action alternative or variation. We will make the statement that some of the alternatives would have more impacts if the test flows were run as many times as possible and the system conditions allowed in order to show the reader that some of the alternatives may have greater impacts than others.

IEPR Panel Back-Check Response

Concur.

It is worthwhile for the USACE to reconsider the typical application of their regional economic model (RECONS). While revenue may be the typical approach used as the "driver" in RECONS (page 24 of the Technical Report), the agency's assumption in the NED analysis is that all costs are incurred (e.g., preparing the field, planting, harvesting). This assumption suggests that employment will likely not change to the degree that a revenue driven approach might suggest. Specifically, direct jobs/employment in this case are determined not as much by revenue, but by the number of workers required to perform all steps in an agricultural operation. Since the USACE assumed all costs are incurred, then all initial direct jobs are required as before. On many farms there is hired labor, and for some crops "custom" harvesting is contracted for; many farms do not own the large and expensive machinery used in modern harvest operations. Such cost data would likely be embedded in the same crop budget data used by the agency to calculate cost of the NED change in net farm income. Given the agency's assumption that all costs are incurred by farmers, the change in jobs is unlikely to change in strict linear proportion to revenue as might be assumed in RECONS. The multiplier effects could be smaller due to reduced revenue. It may be that the change in revenue could be used to scale the change in indirect and induced jobs. The current approach to calculating direct jobs should be re-examined and revised if deemed appropriate by the agency in completing the FEIS.

Panel Comment 21 - Section 3.7 Water Supply and time dimension of cost estimates

The NED Water Supply cost impacts in the Executive Summary do not appear to be comparable to irrigation, hydropower, and recreation data, which report total annual impacts for their respective sectors rather, than on some smaller unit or time period.

Basis for Comment

The Executive Summary for the NED values for hydropower, irrigation and recreation show differences in the total annual benefits with each alternative. However, for water supply the differences across alternatives do not appear to be differences in totals but annual average costs. Tables 3-111, 3-114, 3-117, 3-121, 3-124, and 3-127 in the DEIS and Table 3 in the Water Supply Technical Report both show the difference in Total Costs from No Action to be on the order of several thousand dollars across most alternatives. It is also not clear how many intakes this total represents. Is it just the 26 intakes for which data was adequate for analysis? Page 3-254 indicates that these 26 water supply intakes "…are representative of the impacts that may occur to other intakes." Should the results be generalized to the 69 municipal, commercial and industrial intakes shown in Table 3-108?

These differences in Total Cost NED values seem to be on a comparable-unit basis as hydropower, irrigation and recreation use summed over all the years in the Period of Record (ISAP noted in a prior comment that all impacts in the Executive Summary be based on or at least include the partial or full flow release years, not an average over the 82-year POR). However, the same basic principle of using comparable units would apply to such a revamped Executive Summary. Currently the Executive Summary is showing Annual Average Costs in the range of $20 to $100 ($64 for Alternative 1 in Table 3-111). It is not clear what the "average" is in the Annual Average Costs. Is it an average cost per day the replacement submersible pumps are needed? Given that the Technical Report indicates each of these submersible pumps are at least 50-60 horsepower using 37 kilowatts an hour serving a population of 281,000 people as well as industry, a difference of $64 or $2 per intake seems difficult to rationalize. When Water Supply NED impacts are not put in a consistent dollar basis with the time or total cost dimensions of the hydropower, irrigation, or recreation (which use a sum over all the years), valid comparisons across authorized purposes are difficult for decision makers, public officials and stakeholders.

Significance

Medium/Low. The units in which the NED values reported in the Executive Summary do not appear to be on the same annual total basis that would allow accurate comparison with NED impacts to other authorized purposes such as irrigation, hydropower and recreation in the Executive Summary. Thus, there is a risk that the information on NED impacts to water supply

in the Executive Summary may be misleading or at least confusing to decision makers, public officials, and stakeholders.

Recommendation for Resolution

1. The Water Supply NED impacts in the Executive Summary and body of the DEIS need to be scaled up to at least the 26 intakes used to calculate costs, perhaps to all 69 Municipal and Commercial/Industrial intakes in the study area.
2. The Water Supply NED impacts reported in the Executive Summary need to be put on an annual total cost basis, so to be on a comparable with hydropower, irrigation and recreation.

USACE/PDT Response

Concur.

Average costs are the combination of variable and fixed costs averaged over the period described in the table (either POR, partial or full release flow years or years after full or partial flow releases). Costs to water supply operations include actions to adapt to changing river and reservoir conditions. These costs represent the average annual costs for utilizing submersible pumps, permitting costs, and the energy cost to run the submersible pumps at 26 intake sites due to low river flows. Additionally, we focus on these 26 intakes because they are located along the stretch of the Missouri River that could be impacted by this project. We noted that these intakes are representative of impacts that may occur to other intakes, including domestic and public water supply intakes, and that our analysis focus on intakes with sufficient information to evaluate potential impacts. We therefore do not attempt to generalize the results up to the 69 municipal, commercial and industrial intakes shown in Table 3-108 or include public water and domestic intakes, as we either do not have sufficient information to evaluate potential impacts to these intakes or they are not located within the corridor of the Missouri River where impacts are expected to occur as a result of this project (e.g. Lake Oahe).

1. We agree that the values in the executive summary should be expanded to the 26 intakes in order to provide a better comparison against the other resource topics. Note that impacts will still be described in terms of costs, so reduction of costs, or negative values, are beneficial compared to the No Action Alternative.
2. We agree that costs need to be shown on an annual basis in order to be comparable with other resource topics in this table. However, costs are already annualized over the period of record in the current table which is the way in which they were annualized for irrigation, hydropower, and recreation.

IEPR Panel Back-Check Response

Concur.

It is important to include this generalization to the 26 intakes in the Water Supply section of the DEIS in the text and tables, such as Tables 3-109, 3-120, and 3-130, to provide the reader with changes in total cost for these 26 intakes. When the additions are made to the Executive Summary, they should include impacts specifically in the years of the test flows (ISAP has requested the USACE make this change for all HC impacts in the Executive Summary—see ISAP Panel Comment 3 and USACE concurrence). It would also be useful to emphasize that these changes in costs do not include impacts to the other water supply intakes that are not modelled. At present, the entire DEIS NED analysis has a mix of "worst case" scenarios (for example, for irrigation where they do appear to generalize the sampled intakes to all irrigation intakes). The water supply analysis is an underestimate because it focuses just on a subset of the water intakes for which there are data.

Panel Comment 22 - Section 3.9 Recreation impacts, effects of partial and full test flows are not well distinguished

The Regional Economic Development (RED) analysis of recreation does not show the effects of years with partial or full test flows as does the NED. The RED just shows an average over the entire Period of Record hence does not show the impacts to income and employment in the years when there will be a test flow.

Basis for Comment

Table 3-157 shows the NED impact analysis in full or partial release years for Alternatives 1, 1A, and 1B while the RED impact analysis does not provide an equivalent table. Instead the RED Table 3-158, shows only the changes over the POR and a sensitivity analysis to highest and lowest visitation years. The lowest visitation years might be, for example due to drought, which would be largely unrelated to the test flows. Likewise, the NED impact analysis of Alternatives 2, 2A, and 2B in full or partial release years is shown in Table 3-171 without a parallel RED table.

Significance

Medium. Fort Peck Reservoir represents 55% of tourism jobs in the gateway communities surrounding Fort Peck. The RED analysis of jobs affected is widely understood by many stakeholders and local county officials. It is important to show the impacts by years of the test flows on tourism jobs rather than an average over the 82-year Period of Record.

Recommendation for Resolution

Develop an RED table showing impact results during full or partial test flow years for Alternative 1 and its variants and Alternative 2 and its variants as is done in the NED analysis.

USACE/PDT Response

Concur.

A table will be provided for the Regional Economic Development subsections of the Recreation section of the EIS that shows the greatest changes in RED benefits compared to No Action for full and partial release years; for the years after a release; and the years with the greatest change across the period of record. In addition, a summary table of the RED effects for the test release flow years will be provided for Fort Peck Lake, Lake Sakakawea, and Lake Oahe in the EIS.

IEPR Panel Back-Check Response

Concur.

The proposed changes should adequately address the comment.

Panel Comment 23 - Section 3.9 Recreation and questions concerning fishing success dummy variable

The Fishing Success Dummy variable in the recreation use estimating model is not defined or given a rationale compared to other measures of fishing success that are typically used, i.e., continuous measures such as catch per hour or estimates of total seasonal catch.

Basis for Comment

The fishing success variable in the recreation visitation model is not clearly defined in the main DEIS -- page 3-300 is the first time it is mentioned, and without definition. Page 16 in the Recreation Technical Report provides a discussion of the criteria that were used to measure the fishing success dummy variable, as rising spring reservoir elevations and then later falling reservoir elevations, but the reader has to surmise from this description when the fishing success dummy takes on a value of 1 versus 0.

Significance

Low. It is important that the fishing success dummy variable in the recreation visitation model be clearly defined; it is a determinant of both the NED and RED impact results.

Recommendation for Resolution

Clearly define in the DEIS and Recreation Technical Report the fishing success dummy variable and under what conditions does it take on a value of 1 versus 0.

USACE/PDT Response

Concur.

Additional details will be added to the EIS and the Recreation Technical Report to describe the fishing success variable. This includes additional description of the fishing success variable in the EIS when the term is first mentioned, including that the variable is a dummy variable that takes on 0-1 values in the recreation regression model. The technical report will detail the specific conditions under which the fishing success criteria are met (rising spring pool and initial onset of drought) through the use of an Excel-based model of lake elevations. The EIS section and Technical Report will describe the criteria needed to return a value of "1" (0-1 options) in the recreation regression model for a given year over the 82-year period of record.

IEPR Panel Back-Check Response

Concur.

The proposed changes provide an adequate definition of the Fishing Success variable. Text describing why this measure of fishing quality was chosen over more traditional measures of fishing quality used in typical recreation fishing demand models (for example, aggregate angler or individual angler fish catch variables) is warranted.

Panel Comment 24 - Section 3.10 Fish and Wildlife. Piping plover and least tern and the meaning of quasi-extinction risks

Section 3.10.2.6. Impacts of the alternatives on Piping Plover and Least Tern. The discussion of quasi-extinction risk to both bird species and associated data are brief, not well justified or explained, don't appear to support any of the planned actions, and contain apparent inconsistencies.

Basis for Comment

Page 3-379. Section 3.10.2.6 is a critical component of the assessment of test flows on the two target bird species (Piping Plover and Least Tern). The section is too brief, missing key information, and appears to have errors in some of the summaries that are presented. There should be at least a discussion of how the quasi-extinction risk is calculated. The text should make it clear that this is being calculated separately for each species, if this was done. If this is

for each species, can we assume that the model assumptions were identical for both species? Is this valid? The section interchanges the use of percentages and probabilities, which is confusing. Why not just use probabilities? The text on page 3-380 and in Table 3-177 is inconsistent. The text says, "*As shown in Table 3-177, the no-action alternative quasi-extinction probability for the Northern Region was 0.138 (15%).*" However, the table shows that the No Action probability was 0.131 and it is unclear to what the 15% in parentheses is referring. The statement, "*These results suggest that there is no statistical difference between alternatives, nor is there a meaningful biological difference*" cannot be evaluated because no standard errors or confidence intervals are presented on the extinction probabilities. Why is there no mention that all of these scenarios exceed the 5% extinction risk specified by USFWS and stated on page 3-379? The report references a 5% extinction risk, yet in the Fundamental Objective (Sub-objective 2) on page 3-361 the reference is to a 95% persistence probability. For consistently consider sticking to either persistence or extinction risk.

Significance

High. Risks of the proposed actions to the two target bird species are an important consideration in the proposed actions. This section needs to be clear, well justified, and identify the data needed to clearly support the proposed actions.

Recommendation for Resolution

1. Provide additional detail on how quasi-extinction risk was calculated and whether it was calculated separately for each species.

2. Present the statistical aspects of the quasi-extinction probabilities in such a manner that a logical conclusion can be made about the implications of each test flow to these two birds.

3. Fix the inconsistency between the text on Page 3-380 and Table 3-177 for the No Action Alternative.

4. Consistent use of probabilities throughout would make this section clearer.

USACE/PDT Response

Concur.

1. The Fort Peck alternatives were evaluated for birds by comparing the 50-year quasi-extinction risk between alternatives. The quasi-extinction risk refers to the likelihood of falling below 50 adults at any time during the 50-year timeframe for the northern and southern region separately. The USFWS set the 50-year quasi-extinction risk at <5%; with a 95% probability of persistence which represented a tolerable risk of security and uncertainty. A 5% probability of extinction is

widely applied in academic population viability analyses and other recovery plans to guide measurable criteria. The 50-year timeframe was selected by the USFWS to balance security (lower risk) and the potential for an altered environmental regime. Because plover habitat, and thus the plover population, is largely driven by long-term wet and dry climatic cycles, the USFWS determined the 50-year timeframe was long enough to cover an entire cycle.

This metric is the plover objective criteria used to calculate the ESH target numbers, by determining how much ESH is necessary (created by flow or construction) to meet that target. Because of the greater ESH acreage needs for piping plovers which defend territories for nesting and foraging, compared to colonially-nesting least terns, USFWS has determined that meeting the plover habitat targets will also fulfill habitat needs for least terns on the Missouri River. Therefore, habitat targets for least terns have not been specified at this time.

2. Quasi-extinction probabilities will be presented and explained in a manner that allows for clearer understanding of implications for the two bird species.

3. The inconsistency noted will be fixed by changing 0.138 to 0.131 on page 3-380 to match Table 3-177.

4. Probabilities will be made consistent throughout.

IEPR Panel Back-Check Response

Concur.

The revisions requested here are essential to understanding the long-term ecological risk to the two bird species (Piping Plover and Least Tern). The response should include 1) a statistical description of the quasi-extinction risk calculations, 2) clarification of whether it was calculated separately for each species, 3) a list of specific model assumptions that attended those calculations, and 4) a discussion of the meaning of quasi-extinction risk.

Panel Comment 25 - Section 3.10 Fish and Wildlife. Least terns and piping plovers, concerns regarding assumed identical impacts for the two species

Regarding Section 3.10.2.6 (pages 3-379 to 3-380), short-term ecological consequences to the two target bird species appear to be characterized as identical when in fact the two species have very different nesting cycles, hence may respond differently to the proposed test flows. Those differences should at least be discussed and possibly factored into the justification for test flows.

Basis for Comment

Test flow implications to piping plover and least tern are presented as equivalent throughout the report, despite the two species have important ecological differences that might lead to different responses. In general, plovers nest earlier and have a longer nesting cycle than terns. For plovers, it is 6 days for egg-laying, 28 days for incubation, and ~30 days to fledging for a total length of ~64 days. For the tern the numbers are 4 days, ~21 days, and 20 days for a total length of ~45 days. This is a big difference and allows terns to re-nest more often and also to nest later in the season and still be successful. This ecological context is missing from the report. One example where this discussion might be useful is in Table 2-1. It is worth noting that high flows extending into June will probably eliminate Piping Plover nesting opportunities for the year; Least Terns have a shorter (and later) reproductive cycle and might do well. The timing illustrated in Figure 2-3 and 2-4 makes it clear that Emergent Sandbar Habitat (ESH) will be underwater well into July.

Significance

Medium. The proposed test flows need to be presented in a manner that is consistent with the basic ecological context, particularly reproductive biology, of the two bird species.

Recommendation for Resolution

Add a discussion of these basic differences in nesting cycles and then provide an appropriate characterization of each species' response to the proposed test flows. This should include a discussion of greater risk to piping plovers than to least terns.

USACE/PDT Response

Concur.

A discussion of basic differences between the two species will be added along with characterization of each species' response to potential test flows.

IEPR Panel Back-Check Response

Concur.

It is essential that the DEIS include accurate and detailed descriptions of the life history attributes of the two potentially impacted bird species -- Piping Plover and Least Tern. In particular, a detailed description of the nesting phenology and length of the nesting cycle should form the basis for discussions concerning how high flows will impact each species. As

mentioned in the comment above, those impacts appear to differ for plovers and terns, and those differences should form the basis for assessing potential impacts of the timing and severity of high flows on the nesting ecology of both species.

Panel Comment 26 - Section 3.11 Cultural Resources, questions regarding suitability of data

It is unclear how the "recorded cultural resources sites" within the Missouri River System are identified and where they are recorded, although there is some reference to a USACE database of such sites.

Basis for Comment

Table 3-178 is the key example of the "recorded cultural resources sites." While the National Register of Historic Places is critical to these sites, the number and location of sites is far beyond the Register. A clearer identification of the database of these sites and its sources would help with a review for accuracy. The DEIS references use of the most current site data (2019) received from SHPOs and THPOs but does not identify the exact location and sources of the database. While page 3-384 indicates more details can be found in the Cultural Resources Technical Report (Appendix F), the ISAP found this to be insufficient.

Significance

Medium/High. While this is not a core analytic issue to the DEIS, it is foundational to creating the possibility for more constructive Tribal comments by showing clearly where the data and information are coming from for such a critical Tribal issue.

Recommendation for Resolution

Provide clear location and sources for the database(s) used for cultural resource sites in the analysis.

USACE/PDT Response

Concur.

The cultural resources technical report discusses the sources of data for this analysis but does not currently list the specific databases for this work. We will provide names of the databases that were used to obtain data for the primary area of impact which includes the riverine stretch of the Missouri River along with the two reservoirs that bound this section of the river.

IEPR Panel Back-Check Response

Concur.

Sufficient information should be shared such that current and future Tribal input can be readily obtained, but not so much that the sites themselves are revealed and become vulnerable to looting or other disturbance. Database listing should be adequate to that task, keeping in mind that databases are not regularly updated, hence a process to ensure models that keep up with the most accurate information related to cultural sites should be established.

Panel Comment 27 - Section 3.11 Cultural Resources

The identified cultural sites and impacts presume that the closest tribe is the primary interest holder in the impacts and use of the sites. This treatment ignores the historic connections and tribal use up and down the Missouri River since time immemorial.

Basis for Comment

The DEIS reflects an overall approach that connects the key cultural sites to the closest tribes, but the historic exchanges and travels by tribal peoples up and down the Missouri River are ignored.

Significance

Medium. While not a core analytic issue, this oversight again makes it more difficult for tribes to comment on the impacts, especially those tribes further from the test releases.

Recommendation for Resolution

Consider more outreach to downstream tribal communities for upstream impacts to ensure the greatest understanding possible of the impacts to cultural resources.

USACE/PDT Response

Concur.

USACE acknowledges the need to be inclusive of tribes and potential impacts to historic and current tribal cultural resource sites for tribes that may no longer be located within the project area. All Tribes geographically located within the Missouri River basin or that have historical ties within the basin have been identified as potential consulting Tribes. Letters were sent to all

potential consulting parties in February 2019 as part of the EIS scoping effort, and again in March of 2021 requesting comment on the Draft EIS.

In the EIS, we note that "State Historic Preservation Offices (SHPOs) within the basin provided inventory data for sites in riverine settings" which includes sites for any tribe, not just those closest to the project area. In the cultural resources technical report we acknowledge that "the Missouri River floodplain contains a wide variety of cultural resource types that span from the earliest recorded Native American inhabitants dating to the Paleo-Indian period (approximately 11,000 years ago or earlier) through modern historic times. Prehistoric cultural resource sites differ somewhat depending on the culture inhabiting a specific segment of the Missouri River." SHPO and THPO databases used for this project include information on these resources.

IEPR Panel Back-Check Response

Concur.

The databases themselves are not always up to date on the current status of cultural sites, from both recent and older historical periods, as some sites are destroyed and other revealed. Some ground-truthing of the databases by the USACE is recommended.

Panel Comment 28 - Section 3.11 Cultural Resources, questionable data source

The DEIS assessment of the impacts of flooding and erosion on cultural sites is extremely narrow, relying on one older source -- Lenihan et al. 1981 -- as its primary source of insights. A Google Scholar search reveals a large literature from the Missouri River, with more nuanced analysis, including Ritchie 2004 (The Failure of National Historic Preservation Act in the Missouri River Basin and a Proposed Solution, *Great Plains Natural Resources Journal*) and a number of other sources. There is a literature that has accumulated since 1981 on the impacts of erosion and flooding on cultural resources.

Basis for Comment

Lenihan et al. 1981 is referenced twice at 3-387 and twice at 3-389, each time as the only scientific source. There is little differentiation between types of sites. Habitation and burial sites, for example, may be impacted differently by flooding and erosion.

Significance

Medium/High. Sole reliance on older literature and inadequate distinction between habitation and burial sites is an insufficient analysis on the effects of the alternatives on cultural resource.

Recommendation for Resolution

A full literature review on the impacts of flooding and erosion on different kinds of cultural sites and an application to the Missouri River basin is necessary in the FEIS.

USACE/PDT Response

Concur.

We will perform a literature review and add any new literature discussing the impacts of water erosion or declining water levels impacts on cultural resources sites. Additionally, we note that our modeling isn't precise enough to distinguish the difference in impacts between habitation and burial sites and in the technical report we noted that "some sites will be more/less resistant to damage from waves and erosion, and some sites will be more/less accessible and desirable targets for looters/vandals," and "Cultural resource sites are considered equally in the estimation of the overall risk. In reality, the cultural value placed on the protection of all sites might not be equal". The model is a regional analysis that includes, but does not distinguish between, habitation and burial sites, among other types of cultural resource Sites. The model is meant to generally distinguish the impacts to cultural resource sites between the two test flow alternatives. However, we will qualitatively describe the differences in the types impacts that could occur due to water disturbing or exposing these types of sites in the final EIS.

IEPR Panel Back-Check Response

Concur.

A qualitative description relating the types of impacts to the types of cultural sites should be adequate, in addition to the literature review.

Panel Comment 29 - Section 3.12 Environmental Justice, questionable conclusions

The basis for the assessment that all alternatives "will not fall disproportionately on potential environmental justice populations that live within the floodplain" needs to be articulated. Merely pointing out that other populations (such as farmers) will be impacted is not enough for this assessment.

Basis for Comment

The clearest expression of this shortcoming can be found at Table 3-196, page 3-418 of the DEIS. The overall analysis alludes to impacts to both environmental justice and non-environmental justice populations but provides no basis or analysis for comparing those impacts.

Significance

Medium. A lack of full justification for the finding of no Environmental Justice related impacts is inadequate, especially considering the findings that there appear to be impacts to Environmental Justice communities.

Recommendation for Resolution

A clear rationale and/or rubric for how the impacts to environmental justice populations are measured compared to non-environmental justice populations is needed for an adequate analysis.

USACE/PDT Response

Concur.

USACE will update the environmental justice analysis to better indicate how and why environmental justice populations may be impacted for each resource topic.

IEPR Panel Back-Check Response

Concur.

The updated environmental justice analysis should include both qualitative and quantitative analyses/rubrics to compare impacts to environmental and non-environmental justice populations.

Panel Comment 30 - Section 3.14 Unavoidable Adverse Impacts, confusing terminology

The description of the Unavoidable Adverse Impacts to River Infrastructure and Hydrologic Processes contains sentences that indicate the impacts are "small and temporary and long term" as well as small and large.

Basis for Comment

Page 3-463 and Table 3-215 generally provides adequate and credible specific discussion of Unavoidable Adverse Impacts. The one exception is to River Infrastructure and Hydrologic Processes. For this subject, the second bullet point starts with "*Small, temporary, and long term impacts on…*" and also says "*Some site-specific impacts could be large*." It seems confusing to say that the impacts are "*temporary and long term*" as well as to say the impacts are "*small and large*" without being more specific as to what infrastructure or hydrologic processes are being referred to.

Significance

Medium High. This bullet in the River Infrastructure and Hydrologic Process may be confusing to readers as to what specific impacts are temporary and what impacts are long term, and likewise what impacts are small and what are large. If the 3.14 subsection is intended to meaningfully describe unavoidable impacts more explanation is needed for the reader to understand the Unavoidable Adverse Impacts.

Recommendation for Resolution

Rewrite the middle bullet in this portion of Table 3-215 to identify which of the River Infrastructure and Hydrological Processes are temporary and which are long term, as well as which are small and which are large. Explain what the adverse impacts actually are, rather than just acknowledging or asserting that they might exist.

USACE/PDT Response

Concur.

Table 3-215 will be rewritten to clarify which impacts are considered temporary and which are long term. The added text will also provide a clearer summary of anticipated impacts.

IEPR Panel Back-Check Response

Concur.

The proposed changes should adequately address the comment.

Panel Comment 31 - Section 3.15 Relationship between Short-term Uses and Long-term Productivity

The superficial response to the relationship issue indicates that it is not based on data, analyses, or other technical information. If this is the case, acknowledging that seems prudent.

Basis for Comment

After six sentences that attempt to explain what the (sub)section header means, this is the sum of the action-related information conveyed – "*Overall, short- term uses of environmental resources necessary to carry out the action alternatives would benefit long-term productivity. Test flow releases would benefit ecosystem productivity in the Fort Peck Dam to Lake Sakakawea reach. Although there could be short-term decreases in hydrologic and land use productivity associated*

with human considerations, environmental productivity would be enhanced under Alternatives 1 and 2."

Environmental productivity and ecosystem productivity should not be synonyms. Their use as such in the above statement confirms that the statement does not seem to have an empirical basis. There are no data in the document that make the case that "*environmental productivity*" (whatever that actually is and how it is measured) is enhanced by any of the alternative actions. If there are such data, a redo of this section might call out that information or cite applicable information from elsewhere. If there is no reliable information on which to base the above statement from the text, it would be better to state that than make an unsupported assertion. Benefits to pallid sturgeon are not necessarily benefits to the environment, if other species or resources are deleteriously impacted by the proposed action.

Significance

Low. Inadequate treatment of the issue in the draft document.

Recommendation for Resolution

Rewrite with better explanation of the intent of the subsection. Describe what information allows the required assessment. Identify that information. Acknowledge that it is unavailable, if that's the fact.

USACE/PDT Response

Concur.

The section will be modified to clarify its intent. The section will also describe information supporting conclusions and identify where information is lacking.

IEPR Panel Back-Check Response

Concur.

The ISAP has to take the DEIS authors's concurrence and promise that the necessary revision of the section will be forthcoming.

Panel Comment 32 - Section 3.16 Irreversible and Irretrievable Commitment of Resources

One might think that there is USACE boilerplate for "*use of water resources associated with flow actions*" that might be deployed in this section, providing for a more informative narrative discussion.

In addition, with a funding-constrained adaptive resource management program it can be argued that any management action that may be implemented is itself a commitment of resources that otherwise could be directed to another management action or program. Justification for the action and its prioritization in a multiple-action management program should warrant addressing in this document (sub)section.

Basis for Comment

This section should describe the distinction between irreversible and irretrievable resources associated with the test flow. The proposed management action seems is not irreversible in that the USACE has already planned to be able to stop the test flow. Further, while the Preferred Alternative envisions 3-5 test flows, if that decision is made in the Record of Decision, the number of test flows is not "locked in" like building a dam would be.

Significance

Medium. Expand the brief treatment of the issue in the DEIS.

Recommendation for Resolution

Add more explanation of the Fort Peck specific water-resources situation.

1. Add a paragraph that considers the design and implementation of the adaptive management action as a commitment of resources.

2. Clarify whether the test flow management action is irreversible.

3. Does the test flow management action result in irretrievable use of funding and personnel?

USACE/PDT Response

Concur.

The section will be modified to include design and implementation of the adaptive management action as a commitment of resources. The section will also clarify whether the flow management action is irreversible and whether it results in an irretrievable use of funding and personnel.

IEPR Panel Back-Check Response

Concur (with caveat).

The commitment to input from the authors of the SAMP and Fort Peck AM Framework to re-writes of the executive summary (Comment 1) and Purpose and Needs (Comment 5) sections really should apply here as well in order to integrate fairly adaptive management into this document section.

Panel Comment 33 - Section 4. Preferred Alternative Implementation

Alternative 1 including its variations has been identified as the preferred alternative. Table 4-1 provides a listing of monitoring activities, which are aligned with Appendix E of the SAMP. Nonetheless, monitoring details in Appendix H, 3.6 on page 46 for the preferred alternative are vague. Table 7 lists proposed monitoring activities, but it would be helpful if it included information on the temporal and spatial aspects of monitoring for the Fort Peck action, particularly for proto-larvae and meso-larvae. The objective is to contribute to an evidentiary framework for determining if Fort Peck flows are benefiting pallid sturgeon. Monitoring activities, by necessity, should be aligned and integrated with other past, on-going, and /or planned studies.

Basis for Comment

A robust monitoring plan for young pallid sturgeon is important for the Fort Peck Preferred Alternative. Given the rarity of age-0 fish and the absence of age-1 pallid sturgeon below Fort Peck, a successful signal of natural reproduction and recruitment may be difficult to detect under the current monitoring protocols. While PSPAP made significant strides in this regard, questions remain about how to integrate zero-inflated data and ‘hot spot’ sampling into the age-0 monitoring program. Comprehensive, post-year, follow up sampling for age-1 Pallid Sturgeon would also be worth considering in effectiveness monitoring associated with a flow release.

In the DEIS, little detailed information is provided as to the adequacy of any planned monitoring activities to meet the objectives of quantitatively linking flow metrics with biological and physical metrics. A project-specific monitoring and analysis plan should be generated, and possibly tested with existing historic data. Of great concern is sampling intensity, and whether or not the number of samples and spatial locations are sufficient to separate the flow-biological

relationships from background variability. Also, a bulleted discussion of sample size for physical measurements does not provide enough detail on when these measurements will be taken, and how often they will be taken. In addition, statements found after Table 4-1, like "*Ten to twenty representative locations will be selected for bank erosion…*" are insufficient. What does representative imply? Should not the bank samples (and other metrics) be taken with a specific hypothesis in mind? What analysis was performed to arrive at the 10-20 samples? The DEIS should have detailed descriptions of how the data will be collected, and how the metrics will be subsequently linked and analyzed to draw conclusions.

For a complex study like this one, great effort should be expended prior to project implementation to plan out an effective monitoring program. As written in the DEIS, there is no evidence that a thorough review of monitoring issues and solutions that meet the goals of the project has been implemented to date.

Significance

High. The ISAP acknowledges recent advances by USACE and the Tech Team in developing monitoring protocols for young Pallid Sturgeon (e.g., PSPAP). Following ISAP's review of PSPAP, productive interactions with the Tech Team and USACE biologists focused on addressing several key questions regarding age-0 fish sampling. However, a monitoring plan that addresses these important sampling challenges has yet to evolve for age-0 pallid sturgeon. Good practice requires that a well-thought-out analysis and monitoring plan be completed prior to project implementation. Without these documents, the chance of successful project completion, including the generation of accurate and precise findings, is highly reduced.

Recommendation for Resolution

The ISAP recommends that either a separate report, or the addition of an appendix to the EIS be compiled that provides a detailed level of understanding on how biological, physical, and flow metrics will be taken. The description should include sample size and location, methods for analysis and correlation, and detailed descriptions of the hypotheses of interest. This effort will reduce the chance that background uncertainty will limit the ability to determine if changes in flow can influence biological population growth and stability.

USACE/PDT Response

Concur.

The Fort Peck Test Flows EIS verifies the intent of USACE to monitor both physical and biological responses from test flow releases and describes the components that would be monitored. The Fort Peck Adaptive Management Framework and the 2020 Adaptive Management Compliance Report (section 3.3.7.1.4) also discuss effectiveness monitoring of the

Fort Peck test flow releases. USACE agrees that a more detailed monitoring plan should be developed prior to implementation of a test flow release from Fort Peck Dam. We will continue to coordinate with the USFWS on finalization of a monitoring plan and it will be made available upon completion.

IEPR Panel Back-Check Response

Concur.

The monitoring plan is critical to the success of the project. The plan should include at least some details on how essential characteristics, such as sample size and spatial location of samples, were derived. An analysis plan should be developed that is consistent with the monitoring plan. Documenting how data that are collected are appropriate for the analytical approaches and methods taken is critical to the project

Appendix A – Final Work Plan for the IEPR of the Fort Peck Dam Test Release DEIS

Final Work Plan
for the
Independent External Peer Review
of the
Fort Peck Dam Test Release
Draft Environmental Impact Statement
April 1, 2021

Background

On February 8, 2019, the United States Army Corps of Engineers (USACE) issued a Notice of Intent to prepare an environmental impact statement (EIS) for the Fort Peck Dam Test Release (FPDTR-EIS). The FPDTR-EIS is an effort being undertaken to comply with the *Final Biological Opinion concerning the Operation of the Missouri River Mainstem Reservoir System, the Operation and Maintenance of the Bank Stabilization and Navigation Project, the Operation of the Kansas River Reservoir System, and Implementation of the Missouri River Recovery Management Plan* (2018 BiOp). The purpose of the FPDTR-EIS is to assess the capacity of test flows out of Fort Peck Dam to promote growth and survival of embryonic pallid sturgeon (*Scaphirynchus albus*) to free swimming juvenile stage before settling out in the headwaters of Lake Sakakawea. Pallid sturgeon are listed as endangered under the Endangered Species Act of 1973 (ESA).

The USACE has determined that a formal Independent External Peer Review (IEPR) is not technically required for this draft EIS (DEIS), but the agencies and MRRIC desire such a review as a "best practice" to ensure the quality of this milestone in their planning and assessment process. Recognizing that the standing Independent Science Advisory Panel (ISAP) may not be strictly considered "external" to the process at this point, USACE decided that the benefits of the panelists' knowledge of the planning process to date outweigh the costs of educating new panelists concerning the complexities described in the DEIS and its supporting documents. The standing panel members originally were selected according to criteria in the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004), and each member has committed to contributing to an independent review.

Scope of Work

The IEPR generally will follow the procedures described in the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [EC] 1165-2-214, December 15, 2012) and as outlined in the work plan below. Some modifications have been made to accommodate review questions offered by MRRIC and an additional review report draft and engagement with MRRIC before finalization of the IEPR report.

The IEPR has been assigned as Subtask 10 of Task Order 2 and Subtask 9 of Task Order 3 from the National Center for Environmental Conflict Resolution (NCECR) to ORAU as the Third Party Science Neutral (TPSN) for the ISAP. The TPSN will coordinate the IEPR with assistance from three co-chairs.

IEPR Panel Members

Panelists along with their affiliations and general areas of expertise include the following:

Steven Chipps, Ph.D. **(Co-chair)**
U.S. Geological Survey, South Dakota State University
Sturgeon biology, population dynamics

Melinda Daniels, Ph.D. **(Chair)**
Stroud Water Research Center, Avondale, PA
Geomorphology, river hydrology, sediment dynamics

Stephen Dinsmore, Ph.D.
Iowa State University
Piping plover and least tern biology, population dynamics, conservation biology

John Loomis, Ph.D. **(Co-chair)**
Colorado State University
Resource economics, assessment

Dennis Murphy, Ph.D.
University of Nevada, Reno
Conservation biology, Endangered Species Act, adaptive management

John Norder, Ph.D. (See Darren Ranco below)
Michigan State University
Tribal indigenous knowledge

William Warren-Hicks, Ph.D.
EcoStat, Inc., Mebane, NC
Quantitative ecology, biostatistical methods, mathematical modeling

Darren Ranco, Ph.D. (ad hoc member in place of Dr. Norder)
Tribal indigenous knowledge
University of Maine, Orono, ME

Additional information describing the TPSN, ISAP, and Panel members can be accessed using the following link: http://projects.ecr.gov/moriversciencepanel/default.aspx.

Review Documents

Links to the DEIS and supporting documents are available on the USACE planning website: https://www.nwo.usace.army.mil/Missions/Civil-Works/Planning/Project-Reports/.

Documents included in the scope of the IEPR and approximate page counts are:

ABSTRACT (1 page)
Executive Summary (30 pages)
1. **Purpose and Need (20 pages)**
2. **Alternatives (36 pages)**
3. **Affected Environment and Environmental Consequences**
   - 3.1. Introduction (10 pages)
   - 3.2. River Infrastructure and Hydrologic Processes (78 pages)
   - 3.3. Pallid Sturgeon (28 pages)
   - 3.4. Flood Risk Management (27 pages)
   - 3.5. Hydropower (37)
   - 3.6. Irrigation (69)
   - 3.7. Water Supply (30)
   - 3.8. Water Quality (13)
   - 3.9. Recreation (57)
   - 3.10. Fish and Wildlife (33)
   - 3.11. Cultural Resources (29)
   - 3.12. Environmental Justice (22)
   - 3.13. Thermal Power (29)
   - 3.14. Unavoidable Adverse Impacts (2)
   - 3.15. Relationship between Short-Term Uses and Long-Term Productivity (1)
   - 3.16. Irreversible and Irretrievable Commitment of Resources. (2)
4. **Preferred Alternative Implementation (5)**

5. **Tribal, Agency, and Public Involvement (5)**
6. **Compliance with Other Laws and Regulations (8)**
7. **References (12)**
8. **Glossary (13)**
9. **List of Preparers (1)**

APPENDICES

Appendix A: Agency Correspondence (10)
Appendix B: Tribal Correspondence (97)
Appendix C: Cumulative Actions Descriptions (5)
Appendix D: Hydrology and Hydraulics Tech Report (810)
Appendix E: Pallid Sturgeon Modeling Tech Report (195)
Appendix F: Environmental Consequences (424)
Appendix G: Scoping Summary Report (176)
Appendix H: Fort Peck AM Framework (96, but it's already been reviewed by ISAP)
Appendix I: Special Status Species (22)
Appendix J: MRRIC Correspondence (61)

Total for Main Body – approximately 617 pages
Total for Appendices – approximately 1,896 pages

Charge to the IEPR Panel and Review Process

The IEPR charge guidance along with questions received from USACE and MRRIC are included below. Panel members will sufficiently familiarize themselves with all parts of the DEIS documentation to understand the structure of the materials and where each component of the DEIS and related supporting materials are located.

Ft. Peck DEIS Independent External Peer Review Questions
(From file entitled "Ft. Peck DEIS Review Questions FINAL" and dated 9 March 2020)

Standard IEPR Charge Questions (from Lead Agencies):

1. Does the decision document adequately address the stated need and intent relative to scientific and technical information?
2. Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:
    - Project evaluation data used in the study analyses
    - Economic, environmental, and engineering assumptions that underlie the study analyses
    - Economic, environmental, and engineering methodologies, analyses, and projections
    - Models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives
3. Assess the adequacy of the methods for integrating risk and uncertainty

4. Does the decision document provide a sound rationale for the formulation of alternative plans and the range of alternative plans considered (including the preferred alternative)?

Additional questions from MRRIC:

5. Does the DEIS adequately describe the process for annually assessing impacts of Ft. Peck actions on actions to benefit the pallid sturgeon that might be taking place concurrently on the Yellowstone (and vice versa)? Why or why not?
6. Does the DEIS use the most recent 'best available science' in the age-0 sturgeon retention model including integrating temperature and drift in its evaluation of Ft Peck EIS alternatives? Examples of recent science include: (e.g., Chojnacki and DeLonay, 2019 FSM, Ontogenesis of pallid sturgeon free embryos and results of the 2019 pallid sturgeon drift and dispersal experiment in the Upper Missouri River)

Participating panelists will review Chapters 1, 2, 4, 5, and 6 of the DEIS. Panelists will additionally review sections of Chapter 3 and supporting documentation including appendices and technical reports which are relevant to their particular areas of technical expertise. The IEPR chair, co-chairs, and TPSN will ensure that all sections of the DEIS are reviewed by at least one Panel member.

During the review of the DEIS, panelists will identify and describe areas of technical concern and pay particular attention to the charge questions and topic areas specified for evaluation of adequacy or acceptability for the DEIS. For sections for which they are individually responsible, panelists will document their concerns using the specified 4-part IEPR comment format. For sections with multiple reviewers, panelists will share their written concerns with the other panelists. The co-chairs and TPSN will review areas of common concern and assign lead- or co-authorship to appropriate panelists to develop as necessary those shared concerns into single 4-part comments. Some comments that do not rise to the import of a 4-part comment (and not requiring a direct response from USACE) may be listed as additional comments that could be helpful to the USACE in revising the DEIS.

The Panel will not provide question-by-question "answers" to the charge, but the co-chairs and TPSN will ensure that all key elements of the charge questions have been considered and addressed during the review process. Some comments may reference specific charge questions as appropriate, to help MRRIC see where their questions were addressed.

Prior to producing a draft report, all panelists will review all written 4-part comments and suggest revisions to the lead authors. Co-chairs and TPSN will coordinate this process via electronic correspondence and teleconference. Topic areas of disagreement between or among panelists will also be noted, as required by the overall IEPR process.

Communication with USACE

Communications between the IEPR review panel and USACE will be coordinated by the TPSN through the NCECR. Scheduled teleconferences, to be facilitated by the NCECR, include:

- Kick-off call to review the schedule, discuss the IEPR process, and harmonize expectations regarding scope, charge questions, etc.;
- Mid-review check-in call for clarification of questions from the Panel; and
- Briefing call regarding USACE response to the Panel's draft IEPR review comments.

Additional calls will be scheduled as needed, and coordinated by the TPSN through the NCECR. Ad hoc communications between USACE technical staff and IEPR panel members may be arranged through the TPSN to address questions or to request additional supporting or clarifying information. All such communications (e.g., calls/meetings, including ad hoc contacts) will be documented in the final IEPR report.

Communication with MRRIC

Panelists participated remotely with MRRIC on a March 27, 2020 webinar by USACE that provided an overview of the Fort Peck DEIS and Preferred Alternative along with the timeline for the IEPR. They and MRRIC members had opportunity to ask questions or comment during the webinar and via the chat room. A recording of that webinar is available at http://resolv.adobeconnect.com/pi1rnt1evevc/ and the presentation and other materials associated with that webinar are available on APAN.

The panel will produce a draft report of its four-part comments for delivery to USACE on 30 June 2021 and present an overview of the draft report to MRRIC at the July 2021 plenary meeting, at which time MRRIC will have the opportunity to ask clarifying questions or make comments for the Panel to consider, before the panel finalizes its IEPR report on 23 August 2021. The Corps is still working on the details for activities and engagements after the final ISAP IEPR Report.

Any additional communications or interactions between the Panel and MRRIC would be coordinated through NCECR and the TPSN.

Schedule for the IEPR

2020

- Develop MRRIC questions for the Review: **15 January 2020-20 March 2020**
- USACE presents overview of Ft. Peck DEIS and Preferred Alternative and timeline for an IEPR to MRRIC on webinar: **27 March 2020**
- USACE presents update on Ft. Peck DEIS plans to MRRIC on webinar: **15 December 2020**

2021

- USACE shares Ft. Peck DEIS: **26 March 2021**
- Begin IEPR: **15 April 2021**
- Kick-off Call (TPSN, ISAP, NCECR, and USACE): **22 April 2021**
    - NCECR to take notes (will be shared with MRRIC and included in Appendix of Final IEPR)
    - Three invited MRRIC members (Vice-chair; AMGP Co-POCs) to observe
- Mid-Review Call (TPSN, ISAP, NCECR, and USACE): **19 May 2021**
    - NCECR to take notes (will be shared with MRRIC and included in Appendix of Final IEPR)
    - Three invited MRRIC members (Vice-chair; AMGP Co-POCs) to observe
- ISAP submits IEPR Comments on the DEIS to Agency: **30 June 2021**
    - Share with MRRIC by email as FYI
- USACE shares response to IEPR Comments with ISAP: **19 July 2021**
- Overview of IEPR Comments presented to MRRIC at July Plenary: **27-28 July 2021**
- ISAP delivers back checks of USACE response to the ISAP's IEPR Comments: **6 August 2021**
- ISAP Final IEPR Report completed by: **23 August 2021**
    - The final IEPR Report will include all comments and responses and will describe those adjustments the USACE intends to make to the Draft EIS
    - Share with MRRIC by email as FYI

Quality Control and Quality Assurance

The TPSN will monitor the IEPR process for conflicts of interest that might develop and for any inappropriate communications that might compromise the integrity of the review.

It is ORAU policy and practice to ensure that every review it performs is technically sound, well-communicated, and meets or exceeds customer expectations. The TPSN will work with NCECR, the MRRIC Leadership and Facilitation Team, the IEPR panelists, and appropriate other ORAU staff to ensure that the IEPR process and its deliverables are monitored, technically reviewed, and edited for quality suitable for draft or final products prior to delivery.

Compilation and Dissemination of Panel Reports

The TPSN will coordinate compilation of draft and final panel reports with the chair, co-chairs, and other panelists, and engage others to assist with editing and QA as needed. Email, teleconferences, and a secure ORAU collaboration SharePoint site will be used to assist this process.

The TPSN will provide all reports in Word and PDF formatted files to NCECR for dissemination to others as appropriate. The TPSN will include others in report distribution as directed by NCECR.

Appendix B – NCECR Summary of IEPR Mid-Review Call

Fort Peck DEIS / IEPR Mid-Review Call

Wednesday, May 19, 2021, 12:00pm – 2:00pm CDT

Opening Remarks

Facilitator Marci DuPraw (John S. McCain III Center for Environmental Conflict Resolution, or "NCECR") welcomed participants to the Mid-Review call for the Independent External Peer Review (IEPR) of the Fort Peck Dam Test Release Draft Environmental Impact Statement (DEIS).[2] She reviewed the agenda, explaining that the objective of this call was to enable the US Army Corps of Engineers (USACE) and its study team to answer any questions the ISAP had about the review documents and / or ISAP's charge. The attendee list can be found in Appendix B-1 of this Summary.

Third Party Science Neutral (TPSN) Dr. Steve Bartell provided an update on the progress of the review, which got underway April 15, 2021. Plans for the review process were initiated during the tenure of the former TPSN, Dr. Robb Turner, and finalized during the tenure of Dr. Bartell, which began December 20, 2020. Dr. Bartell explained that for this review, he had invited comments from all ISAP members on any section of the DEIS and will ensure that each section is reviewed by at least one panel member. It takes panel members approximately 30 minutes per page to formulate comments as part of the review; Dr. Bartell thanked panelists for their hard work and commitment. He also thanked participants for joining the Mid-Review Call today and looks forward to ISAP members sharing some of the questions that have arisen during the review process to date.

Review Chair Dr. Melinda Daniels provided an overview of the sorts of questions the ISAP wished to discuss on the call, noting that they focused on deepening the ISAP's understanding of the DEIS by surfacing things that are not explicitly in the review documents (more detail, rationale, etc.). The ISAP had provided a list of specific questions prior to the call, and one was added at the end of the call. During the call, the group worked these questions, with Dr. Daniels asking a particular ISAP member to present a question, and Mr. Aaron Quinn (USACE) answering or re-directing the question to a particular colleague.

[2] USACE seeks to conduct this test release as part of complying with the 2018 Final Biological Opinion concerning the Operation of the Missouri River Mainstem Reservoir System, the Operation and Maintenance of the Bank Stabilization and Navigation Project, the Operation of the Kansas River Reservoir System, and Implementation of the Missouri River Recovery Management Plan. The DEIS assesses the capacity of test flows released from Fort Peck Dam to foster the growth and survival of the endangered pallid sturgeon from the embryo stage to the free-swimming juvenile stage. The IEPR is being conducted by the Independent Science Advisory Panel (ISAP) associated with the Missouri River Recovery Implementation Committee (MRRIC). Dr. Melinda Daniels, Dr. John Loomis, and Dr. Steve Chipps are co-chairing the review.

ISAP Questions and USACE / Study Team Responses

Question 1: It is difficult to estimate water temperature increases below Ft. Peck, based on different release scenarios as it depends on a myriad of conditions. But I would like to hear an educated guess as to what we might think is a reasonable range. Any increase in water temperature would have a critical influence on development rate and resulting drift distance for protolarvae – especially because fish metabolism is related non-linearly to water temperature. Dr. Steve Chipps (ISAP) explained that the gist of this question is that it is unclear how warm surface water releases occur at the Ft. Peck Dam.

- Answer:
  - Mr. Joe Bonneau (USACE) explained that:
    - Although the temperature of the water released depends on nature, water is generally warmer when it reaches a high enough level in the reservoir to release over the spillway.
    - There is lots of good temperature modeling available, but it is hard to predict what nature will actually do; what happens in the last two weeks prior to a test flow could help or hinder the results. For this reason, it is good to be flexible about the exact timing of a test flow; USACE should be able to delay a week if necessary.
    - USACE can provide additional information and relevant graphs on this point to the ISAP if it would be helpful.
  - Mr. Quinn added that:
    - It would be valuable to include additional information concerning water temperature in the DEIS.
    - USACE will monitor the effects of water temperature as soon as the test flow is up and running.

- Action Item: USACE will provide the ISAP with additional information and graphs pertaining to water temperature increases at Ft. Peck.

Question 2: What evidence is there to support the assumption that the proposed flow alternatives are sufficient to produce a biological response?

- Answer:
  - Mr. Quinn indicated that this assumption is based on field observation. There have been several observed instances where fish have traveled up the Missouri River, rather than the Yellowstone River.
  - Mr. Bonneau mentioned that:
    - He had been involved with a team that produced hydrographs of natural flows over the Ft. Peck spillway in 2018. Those flows were similar to the proposed test flows that these assumptions were based on.
    - Regarding the biological response, there are two relevant parts to consider – 1) what is required to get young fish to survive when spawning occurs at Ft. Peck (considering temperature, flow, models, and empirical evidence, we

have good predictive ability for this); and 2) whether fish will spawn at Ft. Peck (the bigger uncertainty).
    - Pallid sturgeon usually spawn on the Yellowstone River, rather than on the Missouri, and there has not been much variation in fish spawning location in the past year. The only example of fish spawning at Ft. Peck was in 2011, under extreme conditions. However, the 2018 flow over the spillway was similar to the current proposal and several fish moved up the spillway (although at the last minute, they returned to the Yellowstone River to spawn).
    - That, along with expert elicitation, was used to draft hydrographs for what might attract young fish to spawn in the Missouri River. We will get answers real-time as we watch the test flows.
- Graham Long (Compass) added that a Tech Team report written when the hydrographs were developed indicates that we will look at what is needed and what is possible. I can locate those graphs and forward the technical report to the ISAP if desired.

➢ Action Item: Graham will locate the 2018 technical report and associated graphs to send to the ISAP.

Question 3: What is the rationale for excluding 2012-present from the historical period of record?

➢ Answer:
- Mr. Quinn explained that USACE had 82 years of data ready for analysis, while it would have taken inordinate time and effort to do the modeling and impact analysis on these additional 8 years. It did not appear to be necessary in order to tell the difference between the impacts of the various alternatives.
- Ms. Tiffany Vanosdall (USACE) also explained that Mr. Ryan Larsen (USACE) looked at the years 2012-2020 and none were conducive to running a test flow. This data suggested that the impact from running test flows would not have substantially changed during that time frame.
- Dr. Daniels indicated that recent years are still important to consider in the context of climate change, since the recent decade is the most closely related to future conditions in the basin. It appears that there would have been few opportunities to run the test flow in recent years.
- Dr. John Loomis (ISAP) added that understanding flow data from 2019 might reduce uncertainty about what could happen with the Ft. Peck test flow, specifically regarding the timing element of how the test flow coincides with critical water demands for crops in the basin.

➢ Action Item: USACE will follow up on this question with Ryan Larsen and request that he provide written answers to the ISAP.

<u>Question 4</u>: The assumption that all side-channel irrigation intakes would be removed during test flows seems extreme. Does this occur during natural flow of similar magnitudes? How does the timing of high test flows correspond with irrigation water demand/crop production cycles?

- <u>Answer</u>:
  - Mr. Quinn explained that, in the main body of the DEIS, USACE shows a range of possible impacts on irrigation (25-100%) so that irrigators can plan for all possibilities.
  - Ms. Lisa McDonald (USACE) explained that USACE did a field survey over the summer of 2020 in which it analyzed side channels differently from main channels to account for different flow impacts. In January and February, USACE spoke to stakeholders on the side channels and asked questions based on stakeholders' most recent experience with high flows in 2018 and 2019. Approximately 90% of those interviewed reported that they have experienced high water impacts in the past and will likely experience impacts under test flow conditions. Those interviewed also agreed to allow intakes to be monitored for sediment impacts and other impacts during a test flow. Because the greatest impact to side channel intakes occurs after high flows recede quickly and leave sediment across the channel, advance warning of a test flow will be critical to all irrigators so that they can adjust their irrigation patterns accordingly. This warning will help irrigators mitigate the impacts following high flow periods when they may not have water due to sediment buildup.
  - Dr. Daniels inquired as to whether USACE had asked irrigators if they had had to pull their booms during the high 2019 flows, which were very similar to the proposed test flow. Ms. McDonald indicated that:
    - USACE had done so but found it difficult to draw a 1:1 comparison between high flow impacts in 2018 and 2019 and projected impacts from a test flow since they occur at different times during the year. For example, 2019 saw a high flow early in the season (around April) whereas the 2018 high flows were relatively consistent. By contrast, the test flows would occur right in the middle of high demand for irrigation water.
    - The intakes had not been put into the river at the time of the high 2019 flows because irrigators were still clearing away sediment.
    - The sediment build-up associated with high flows in the middle of the irrigation season probably would take 2-3 weeks to clear away and restore function, resulting in crop impacts. It is quickly receding water that causes the impact as sand bars are deposited (rather than the high flows themselves); sand bars can impact intakes as far away as half a mile from the main channel. Mr. Quinn added that USACE has a general cost estimate for such impacts but would need to flesh that out before running a test flow.
  - Dr. Loomis asked if all irrigation intakes were impacted. Ms. McDonald indicated that 80-90% of them were impacted in 2018 and 2019.
  - Dr. Loomis asked if advance warning helps. Ms. McDonald said yes, it might help some irrigators, who might pull out intakes. Irrigators might also increase irrigation in advance to increase soil moisture in hopes of tiding the crops over.

- Dr. Daniels suggested that a breakdown between the high flow impacts from 2018 and 2019 might be helpful. Lisa agreed to get the difference between the two years to Dr. Daniels.

➢ Action Item: Lisa will deliver a breakdown between high flow impacts from 2018 and 2019 to Dr. Daniels.

Question 5: How many test flows are likely to occur during the next 50 years? Why is the impact analysis performed via back-casting using the pre-2012 period of record rather than forecasting?

➢ Answer: The DEIS shows the frequency of flows similar to the proposed test flow during the 82-year period of record. Tiffany shared that USACE is currently looking at short term test flows to gauge effectiveness, rather than looking to run test flows over the next 50 years.

Dr. Daniels noted that the DEIS is not clear as to the period covered by the impact analysis, and that it should include forecasted impacts in addition to "back-casted" impacts over the last 82 years. Dr. Loomis said that as he understands it, USACE is contemplating 3-5 test flows, but it also says there could be 11-25 occasions when a test flow could be run; the DEIS needs to state explicitly how many test flows were assumed in analyzing impacts and also whether the analysis is cumulative. The reason the ISAP is concerned about this is because the economic impacts vary widely depending on how these aspects of the analysis are handled.

Mr. Quinn responded that:

- Impacts differ each time a test flow is run (with different background conditions in different years), so USACE used the term "overall impact" and discussed impacts to specific resources over the average of years the test flow is run. Table 33 in the DEIS illustrates how many times a test flow could be run, by alternative, with given constraints, based on historic conditions on the Missouri River within the 82-year period of record.
- He offered to provide clarifying language to add to the DEIS's executive summary and at the beginning of Chapter 3 where methods for impact analysis are introduced and it is explained how impacts will be represented.
- He will need to speak with Ryan Larsen about how the water management team would model the impact analysis over a 50-year forecast.

Graham Long (Compass) added that flow conditions are "lumpy" – i.e., good conditions for a test flow come in clusters of years. In the last 82 years, the Missouri River system has seen 5-6 drought periods. Twenty years could pass without appropriate conditions, followed by 3-5 years suitable for test flows. Dr. Daniels agreed and pointed out that it does not come across clearly in the DEIS that in the next 10 years there could be a cluster of 3, 4, or 5 years where conditions would allow a test flow to happen, or those conditions might not occur at all.

Action Items: Mr. Quinn will touch base with Ryan Larsen on how to model the impact analysis over a 50-year forecast.

- USACE will clarify language in the executive summary and at the beginning of Chapter 3 to more explicitly describe methods used in the impact analysis.

Question 6: The Executive Summary states: for piping plover, the extinction probability for the no action case ranges from 12.9% – 14.3% for the northern region; and 20.7% - 22.1% for the southern region. What is an acceptable extinction probability? Afterall, this is only a probability based on models. What is the biological relevance of this result (which is not addressed in the Executive Summary)? Can you assign a statistically-derived variance to these outcomes? Not for the purpose of asking whether the scenarios generate different results, but more of what is the minimum and maximum values (within reason) that might occur under no action. If no action, will the plovers go extinct? See p. 21/621. Dr. Bill Warren-Hicks added that it is not clear to the ISAP how carefully USACE considered the no-action alternative. On the face of it, it is not clear why that alternative is not seen as more viable than it seems to have been deemed. The extinction probabilities are low. This alternative does not seem to have been modeled. Was it rejected for policy reasons? Was it rejected too soon? We did not see a science-based rationale.

- Answer: Mr. Quinn responded that:
  - The main reason the no-action alternative was not chosen is because it does not meet the purpose and need of the study – i.e., to comply with the 2018 BioOp. Thus, it would not allow USACE to meet its obligations under the Endangered Species Act.
  - Under a typical NEPA analysis, the no-action alternative refers to what would occur if USACE did nothing. In this case, the no-action alternative refers to a situation in which there is no test flow, and the river system is operated according to the Master Manual (as it is currently). We obtained the extinction probability for the no-action alternative from biological datasets; no modeling is necessary.
  - The Problem Definition, Objectives, Alternatives, Consequences, and Tradeoffs (PrOACT) analysis compares the impacts of alternatives 1 and 2 (with test flows) against the no-action alternative. The goal of the analysis was to see if hydrological options would increase the likelihood of pallid sturgeon spawning options. In a no-action alternative, a reasonable amount of interception occurred, and those numbers rose considerably. The report discusses implications of each alternative, but it may be helpful to add clarifying language on this subject to the executive summary.

- Action Item: USACE will add language in the executive summary to clarify why the no-action alternative was rejected, including differences in impact.

Question 7: USACE used HEC-ResSim and HEC-RAS. Are there any outputs that are similar among the models, and if so, do you find the answers to be the same? Why these models? Were similar scenarios run on both models, did they get the same answer, are other models available for a one-to-one comparison? How do you know these models are appropriate, or the best for this exercise? Note that the same question can be asked of the DSM model, demographic population model, and HC models. Same question holds for the fledgling production model for plovers and terns. Dr. Bill Warren-Hicks said he enjoyed the

DEIS discussion of the population model and equations but is wondering if USACE collected the right data. He wonders how the model is calibrated to the sampling design. Free embryo retention is key to the model; does USACE have data on that?

- Answer: USACE will need to provide additional description and justification for each of the model types used in the DEIS. Each model is the industry standard; the Reservoir System Simulation (ResSim) model represents how reservoirs run, and the Hydrologic Engineering Center – River Analysis System (HEC-RAS) model shows how water plays out over floodplains and in channels down the river. The models are very expensive to build, and it is difficult to find a model that is as accurate as these that will work with the size of the Missouri River system. Mr. Quinn will confer with Ryan Larsen to provide the ISAP with a written response to this question and will try and locate language that conveys the accuracy and credibility of these models. USACE and the industry have confidence in the models, but he acknowledged that it would be helpful to explain that at the outset.

  Dr. Warren-Hicks suggested that his book could be helpful in this regard and pointed Mr. Quinn to the section on modeling and uncertainty where it discusses modeling outputs compared against actuals.

- Action Item: USACE will provide additional descriptions and justification for the use of the ResSim and HEC-RAS models in the DEIS.

Question 8: The pallid sturgeon upper river demographic population model is deterministic, terms in the model are listed on p. 20/195 (pdf) of Appendix E. Are any of these terms available from our survey information? For example, do we have information on the probability a female fish matures between i-1 and age i? Are there data on free-embryo retention, and if not, should we be addressing this issue? In the same vein, how is this model calibrated or linked to the current sampling designs?

- Answer: Mr. Joe Bonneau indicated that USACE has a table a couple of paragraphs of detailed text that speaks to this, and he will get it to the ISAP soon. Dr. Chipps thanked Joe and added that while it can be difficult to trust any model (whether deterministic or mechanistic) to provide exact estimates of future conditions based on currently available data, his sense is that the population model is pretty solid and that USACE is doing a good job navigating any uncertainties posed by the models. Still, it is important to acknowledge that uncertainty in the text of the DEIS. He suggested that in most cases a qualitative comparison is sufficient.

- Action Item: Mr. Bonneau will provide the table to the ISAP along with supplementary language for context.

Question 9: Dr. Darren Ranco indicated that the environmental justice analysis that was woven into the DEIS relied on 2020 census blocks to identify target communities for this analysis. He sees that as a good method to identify where minority and low-income populations live and work. He notes that the conclusion was that test flows would have no

disproportionate impact on such communities. What method was used to determine impact/lack of impact on those communities?

- Answer: Ms. Lisa McDonald (Pinyon Environmental) explained that USACE's analysis followed the sequence below:
  - Where will potential impacts occur? Answer: Montana, below the Fort Peck Dam.
  - What are the potential impacts? Answer: potential flooding and impacts to hydropower and irrigation.
  - Where possible, USACE broke out impacts to Tribes, looking at the impacts on Tribal irrigators and comparing those to impacts on other irrigators.

  USACE has strengthened that discussion in the final EIS. Dr. Ranco was glad to hear that and will look forward to seeing the new discussion.

Question 10: Dr. Darren Ranco asked about USACE's cultural resources analysis and how USACE linked critical infrastructure to cultural resources by using the HEC-RAS flood impact analysis. He thought that Appendix F was supposed to describe this but didn't see it there.

- Answer: Mr. Quinn clarified that:
  - Appendix F of the DEIS is divided into sections, one of which focuses on cultural resources. That is where the ISAP can find USACE' rationale for its cultural resource analysis in Appendix F.
  - Critical infrastructure is discussed in the subsection on cultural resources and non-market impacts. The write-up of flood management impacts and methods of cultural site monitoring was completed by modeling known locations of cultural sites along the Missouri River. (The actual location of cultural resource sites is protected information.) The sites used in the analysis were intended to be a representative sample to give an idea for how the risk of looting would vary at such cultural sites depending on water level (e.g., more risk is associated with low water due to exposure of cultural resources). However, even under existing operations, site risk levels fluctuate.

Wrap-Up & Next Steps

Participants reviewed the list of IEPR milestones; remaining milestones are shown below.

Remaining Milestones in 2021 IEPR Timeline	
ISAP Comments Submitted to USACE	June 30
USACE Responses Provided to ISAP	July 19
ISAP Presents Overview of Comments to MRRIC	July 27
ISAP Back-Check Responses Due to USACE	August 6
ISAP Submits Final IEPR Report to USACE	August 23

Marci mentioned the emerging draft charge for Dr. Ranco to engage with MRRIC Tribes and invite them to share with Dr. Ranco indigenous knowledge pertinent to this review if they wish, which can then inform Dr. Ranco's advice to the ISAP. She explained that the charge does not direct him to engage in formal consultation, but rather, seeks to operationalize a recommendation from Dr. Norder that the indigenous knowledge(s) panelist should serve as a conduit for MRRIC Tribes to make available indigenous knowledge pertinent to ISAP reviews.

The deadline for MRRIC feedback on the draft charge for Dr. Ranco is Monday, May 24. As soon as the charge is finalized, Dr. Ranco will be able to proceed with his work. He and Mr. Quinn will partner on a presentation to the Tribal Interest Work Group (TIWG) to help MRRIC Tribal representatives absorb key elements of the DEIS and consider providing relevant indigenous knowledge. Dr. Ranco will provide his views on the Fort Peck DEIS to other ISAP members in the form of a memo (in addition to normal verbal participation in ISAP deliberations), in which he might support his opinion as appropriate with information provided by MRRIC Tribes. The ISAP then will consider Dr. Ranco's opinions as they formulate and present comments to the Lead Agencies and MRRIC regarding the Fort Peck DEIS.
If a contributor requests the information be treated as confidential, Dr. Ranco will honor that request. Contributors' identities will be confidential, both in the memo and in conversation about this topic. Mr. Quinn offered to provide the ISAP with the slides he plans to present to the TIWG and looks forward to helping advance the process in any way he can.

Dr. Loomis reminded Dr. Ranco and Mr. Quinn to schedule their meeting with the TIWG as early in June as possible, to give the ISAP adequate time to review and integrate Tribal comments and questions into its report to USACE by the end of June. The Co-Chairs expect to have all contributions in hand from individual ISAP members by June 1st, at which point the Co-Chairs will organize it into a complete package. They anticipate having a complete draft of all pieces of the report by June 16th. An additional week will then be spent reviewing the package to ensure it translates clearly to outside readers.

Marci thanked participants for their time and productive conversation. Dr. Daniels will follow up with individuals offline with the Action Items identified during the call (see below). Mr. Quinn encouraged the ISAP to follow up with any further questions, going through the TPSN.

Action Items

Task	Who
Provide the ISAP with additional information and graphs relating to water temperature increases at Ft. Peck.	USACE
Send the 2018 technical report and associated graphs to the ISAP.	Graham Long
Confer on an answer to Question 3; arrange for Ryan to send answer to the ISAP in writing.	USACE (Tiffany Vanosdall & Ryan Larsen)
Deliver a breakdown between high flow impacts from 2018 and 2019 to Dr. Daniels.	Lisa McDonald
Touch base with Ryan on how to model the impact analysis over a 50-year forecast.	Aaron Quinn
Provide clear language in the executive summary and beginning of Chapter 3 to clarify methods used in the impact analysis.	USACE
Clarify language in the executive summary about why the no-action alternative was rejected, including differences in impacts of the alternatives.	USACE
Provide additional descriptions and justification for the models used in the DEIS (ResSim and HEC-RAS).	USACE
Provide to the ISAP a table and text that speak to Question 8 (how the model is linked to the sampling design).	Joe Bonneau
Share the slides for the TIWG presentation with the ISAP	Aaron Quinn
Follow up with individuals off-line regarding these action items	Melinda Daniels

Appendix B1 - Attendees

Christina Austin-Smith	U.S. Army Corps of Engineers (USACE)
Brian Barels	MRRIC Member
Steve Bartell	Third Party Science Neutral (TPSN)
Joe Bonneau	USACE
Gail Bingham	MRRC Chair
Alyssa Bonini	John S. McCain III National Center for Environmental Conflict Resolution (NCECR)
Steve Chipps	Independent Science Advisory Panel (ISAP)
Melinda Daniels	ISAP
Steve Dinsmore	ISAP
Marci DuPraw	NCECR
Doug Hardy	MRRIC Vice-Chair
Kendra Laffe	USACE
Graham Long	Compass
John Loomis	ISAP
Lisa McDonald	Pinyon Environmental
Dennis Murphy	ISAP
Jamie Myers	USACE
John Norder	ISAP
Darren Ranco	ISAP *(Ad Hoc)*
Aaron Quinn	USACE
Bill Warren-Hicks	ISAP
Tiffany Vanosdall	USACE
Barbara Shepard	

Appendix C – Product Delivery Team and DEIS Authors

The following individuals were listed as preparers of the DEIS (Chapter 9 from the DEIS).

Individual	DEIS responsibility	Agency/Firm
Drew Minert	Chapter 3, Flood Risk Management and Interior Drainage section	USACE
Dan Pridal	Chapter 3, River Infrastructure and Hydrological Processes, HEC-RAS	USACE
Christine Cieslik	Chapter 3, River Infrastructure and Hydrological Processes, HEC-RAS	USACE
Aaron Quinn	NEPA Lead, Project Manager, Chapter 2, Alternatives, Abstract, Executive Summary, Chapter 3, Fish and Wildlife, multiple other sections	USACE
Kara Reeves	Support for and peer review of Chapter 3, Human Considerations sections	USACE
Clayton Ridenour	Chapter 1, Purpose and Need, Section 3.3, Pallid Sturgeon, Editing and Review of multiple sections	USACE
Margaret Ryan	Chapter 3, Hydropower section	USACE
Jennifer Salak	Technical Editor, Public Involvement Support	USACE
Ryan Larsen	Hydrology, Water Management and Reservoir Simulation Modeling	USACE
Tiffany Vanosdail	Project Manager, Technical Reviews	USACE
Cathy Warren	Technical input to Chapter 3, Tribal Interests section	USACE
Joe Bonneau	Adaptive Management Plan	USACE
Kate Buenau	Adaptive Management Plan; technical input to Chapters 2, 3 and 4; plover and tern modeling	Pacific Northwest National Laboratory
Craig Fischenich	Adaptive Management Plan and technical input to Chapters 2, 3, and 4	US Army Engineer Research and Development Center
Craig Fleming	Adaptive Management Plan	USACE
Graham Long	Adaptive Management Plan; data analysis for and input to Chapter 2 and Chapter 3, Human Considerations sections	Compass Resource Management Ltd

Individual	DEIS responsibility	Agency/Firm
David Marmorek	Adaptive Management Plan	ESSA Technologies Ltd
Holly Bender	Chapter 3, Recreation, Land Ownership, Thermal Power, Wastewater, Ecosystem Services, Mississippi River Assessment, Navigation, Flood Risk Management, and Program Expenditures Regional Economic Development sections	USACE
Chris Dixon	Data analysis of and input for Chapter 3, Recreation, Thermal Power, Wastewater, and Cultural Resources, Program Expenditures sections	ABT
Lisa McDonald	Chapter 3, Water Supply, Irrigation, Environmental Justice, Navigation, Land Ownership, Mississippi River Assessment sections	ABT

Appendix D – ISAP Commentary on Near-Bottom Dissolved Oxygen Measurements

For the purpose of ISAP's review of the Fort Peck DEIS (see Panel Comment 17), the Panel requested a document by Bramblett and Scholl (2015) to substantiate the statement on page 3-99 that "*Lake Sakakawea headwaters…are presumed to be lethal to pallid sturgeon*…". After reviewing Bramblett and Scholl (2015) in the context of the DEIS, this study was found to be an unreliable source for linking near-bottom dissolved oxygen (DO) concentration to mortality of age-0 Pallid Sturgeon. The methods reported in this and related studies in the upper Missouri River do not measure near-bottom, dissolved oxygen concentration in a conventional manner. Rather, the study by Bramblett and Scholl (2015) documents only that organic matter concentration and associated biological oxygen demand is greater in fine/silt sediments than in sand substrate.

The near-bottom oxygen concentration is a critical habitat feature for all phases of the Pallid Sturgeon life-cycle; therefore, it is important to measure this DO concentration correctly. A conspicuous feature of the sediment boundary is the microzone that defines the mud-water interface (Wetzel 2001). The oxygen content in the microzone is affected primarily by two processes: microbial decomposition of organic matter in the sediments and diffusion of oxygen into surficial sediments from overlying water. Although low redox potentials can occur in the upper sediments, a thin but effective oxidized microzone can be maintained at the sediment-water interface (Figure 1).

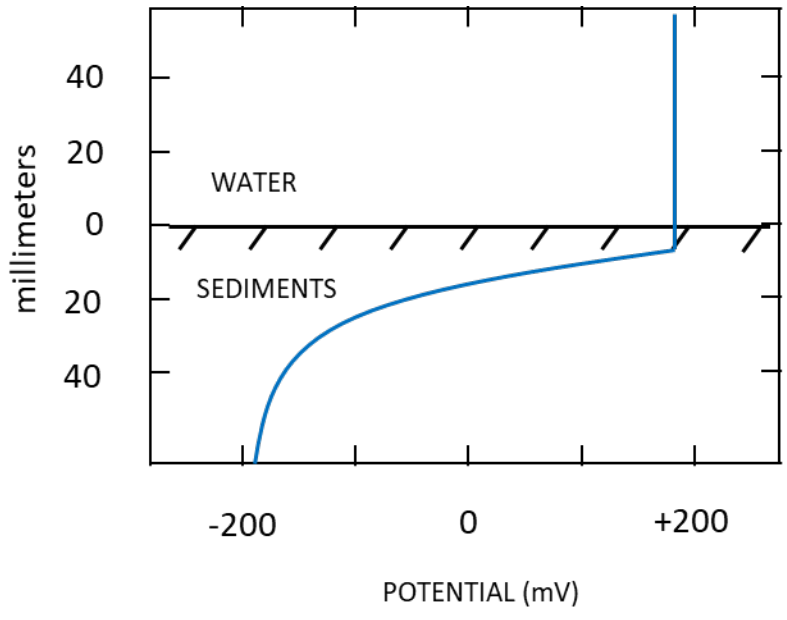

Figure 1. Depth profile of redox potential across the sediment-water interface. In this example, the oxidized microzone (hash marks) extends about 5 mm into the sediment layer. At sediment depths >20 mm, low redox potential is indicative of reducing conditions (i.e. anoxic environment). Adapted from Wetzel (2001).

When oxygen demand in the surficial sediments exceeds oxygen diffusion at the sediment-water interface, near-bottom dissolved oxygen concentration in the overlying water declines resulting in a clinograde dissolved oxygen profile (Figure 2).

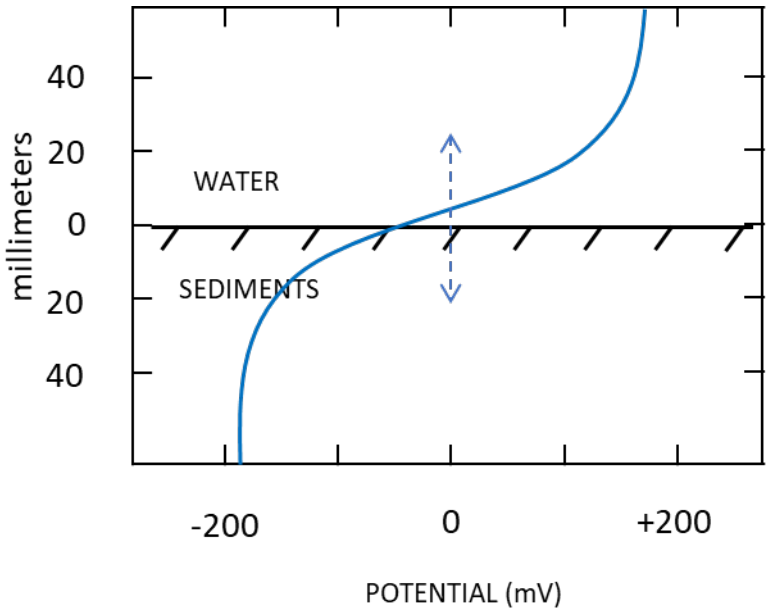

Figure 2. Clinograde curve of redox potential. The dashed, vertical arrow illustrates the upward or downward movement of redox conditions across the sediment-water interface. When oxygen demand in the sediment exceeds oxygen diffusion, the clinograde curve moves "up" and vice versa.

A critical aspect of documenting habitat suitability for Pallid Sturgeon lies in accurate assessment of oxygen concentration from undisturbed, overlying water. The study by Bramblett and Scholl (2015) falls short in this regard. Per their methods, Bramblett and Scholl (2015) measured near-bottom dissolved oxygen concentration as follows: "*Where silty or flocculated sediments existed, we allowed the sounding weight and probe to penetrate into the sediments. In May 2015, we waited for up to 10 min for DO readings to stabilize when DO readings were dropping slowly. DO concentrations eventually reached 0 in most cases. We standardized the waiting period to 2 min when DO meter readings were dropping in subsequent months to save time*." Thus, by disturbing the sediments and then waiting to measure oxygen concentration, they effectively reduced near-bottom oxygen concentration rendering their conclusions about hypoxic (or anoxic) conditions for Pallid Sturgeon unsubstantiated. This is unfortunate, given that the only relevant, published information on DO in upper Lake Sakakawea is that presented

in Bolgrien et al. (2009), although their "near-bottom" DO measurements were about 3 ft from the river bottom (Figure 3).

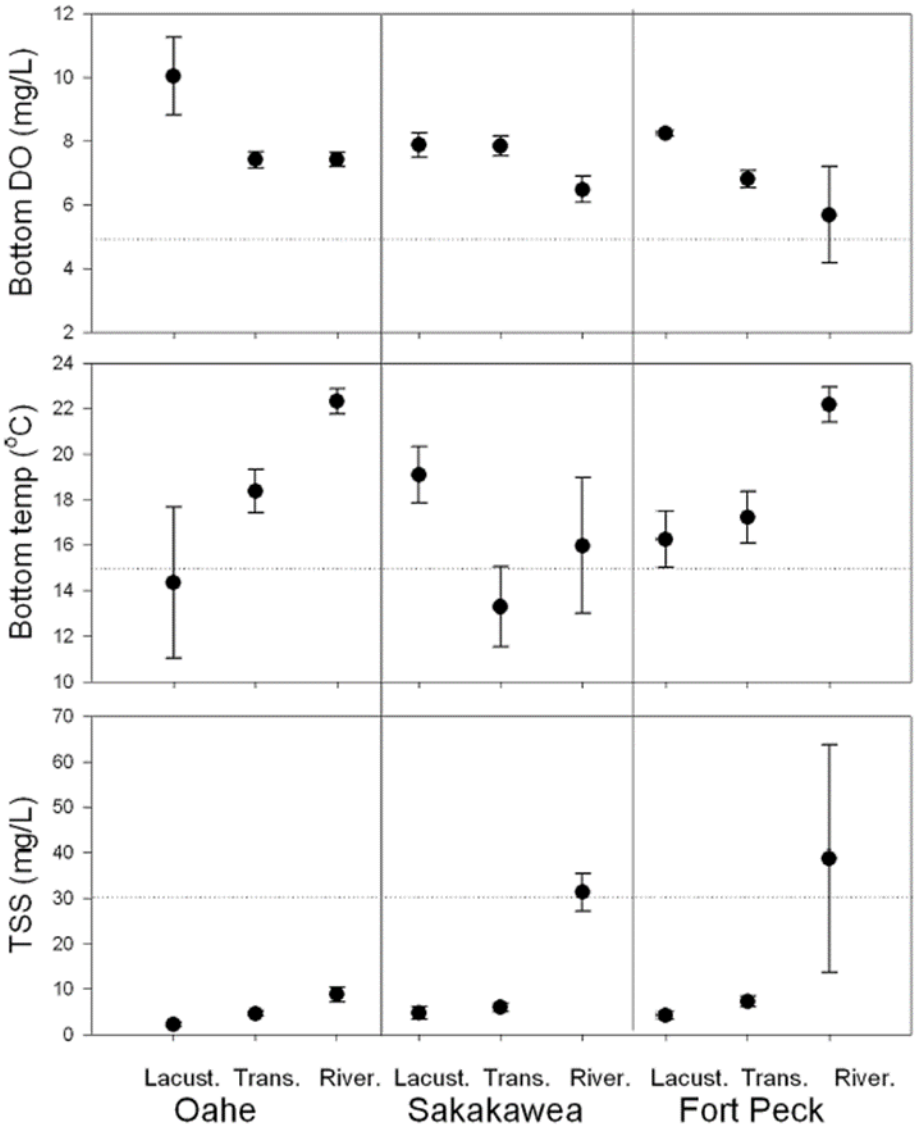

Figure 3. Bottom dissolved oxygen concentration (upper panel) in the riverine, transition and lacustrine zones of Lake Oahe, Lake Sakakawea and Fort Peck reservoirs. Adapted from Figure 11 in Bolgrien et al. (2009).

References

Bolgrien, D.W., J.V. Scharold, T.R. Angradi, T.D. Corry, E.W. Schweiger, and J.R. Kelley. 2009. Trophic status of three large Missouri River reservoirs. Lake and Reservoir Management 25:176-190.

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Wetzel, R.G. 2001. Limnology – Lake and Reservoir Ecosystems – 3rd edition. Academic Press, Dan Diego, CA.