PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
Year Four (2010) Target Species Assessment – Pallid Sturgeon

Purpose

As requested by the Governance Committee (GC), the Executive Director's Office (ED Office) prepared this assessment of Platte River Recovery Implementation Program (Program or PRRIP) activities to date regarding pallid sturgeon (*Scaphirhynchus albus*), a Program target species. This assessment is presented in the context of implementation of the Adaptive Management Plan (AMP), which provides the scientific framework for the Program. The assessment includes an evaluation of key priority hypotheses, progress on specific pallid sturgeon tasks identified in the Integrated Monitoring and Research Plan (IMRP), and a discussion of important outstanding technical and policy issues.

This assessment is provided to the GC in an effort to convey science learning thus far to assist with management and policy decision-making regarding this target species.

Background

The Program's **overall long-term goal** is to improve and maintain the associated habitats, which includes:

> "…3) testing the assumption that managing flow in the central Platte River also improves the pallid sturgeon's lower Platte River habitat." (Final Program Document, 2006)

For the purposes of the Program, lower Platte associated habitat is the reach between the Elkhorn River and Missouri River confluences, approximately a 40-mile (64-km) stretch. The assumption reflected in the long-term goal relates to the U.S. Fish and Wildlife Service's belief that existing water-related activities (those that depend on the Program for Endangered Species Act compliance) have at times reduced the quantity or rate of flow in the lower Platte between February and July and that further alterations (new depletions) to discharge patterns or channel morphology will degrade existing pallid sturgeon habitat in the lower Platte and thus impede recovery efforts.

As detailed in the AMP, Program participants developed a **conceptual ecological model** (CEM) as a graphical representation of the hypothesized understanding of the lower Platte River associated habitat relative to pallid sturgeon (Figure 1). The CEM includes inputs and management actions (some of which are predominantly outside the control of the Program) as well as a framework of "processes → response → indicators" that led to the development of several **priority hypotheses** related to pallid sturgeon. As with other Program target species, those priority hypotheses are to be assessed against the pallid sturgeon management objective #3 that states:

> "Avoid adverse impacts from Program actions on pallid sturgeon populations" (Adaptive Management Plan, 2006)

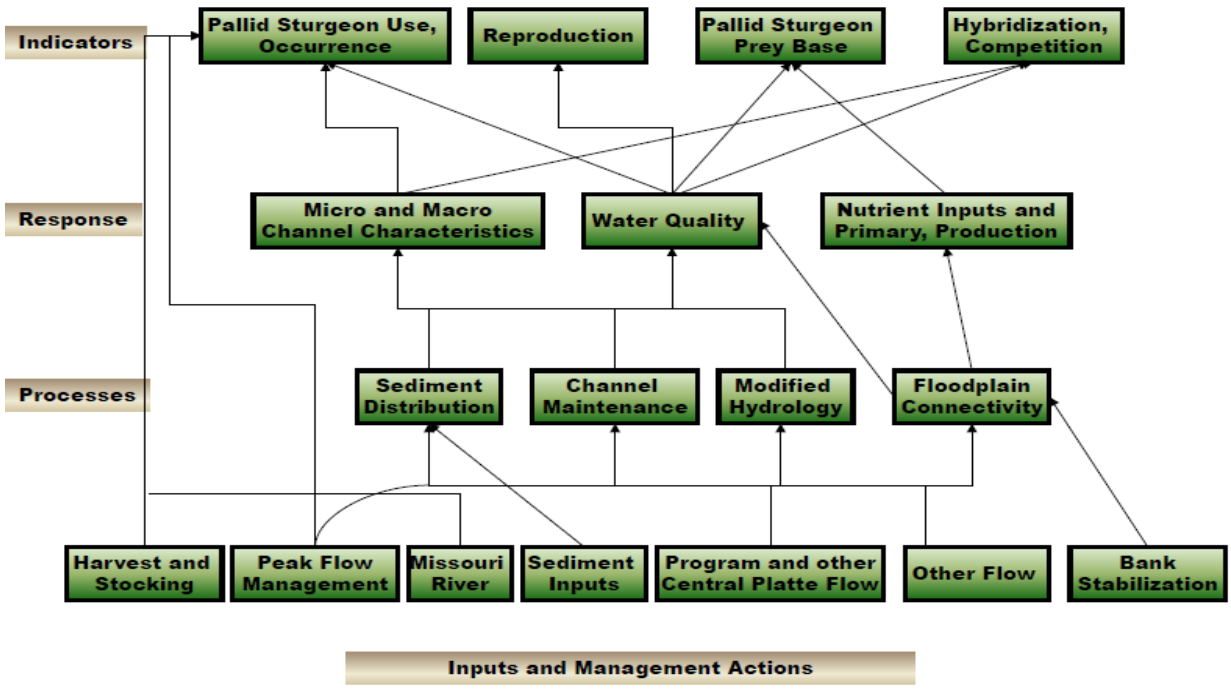

Figure 1. PRRIP pallid sturgeon conceptual ecological model.

This objective is commonly paraphrased as a "Do No Harm" objective and contains no measurable performance measures to assess progress, evaluate species response, or guide management actions. Instead, Program actions related to pallid sturgeon were to begin with **specific tasks** in the IMRP centered on better identifying sturgeon habitat and use rather than addressing specific in-river actions aimed at learning about species response (as done for other Program target species). Thus, Program activities since 2007 have been directed at monitoring and research designed to help fill existing data gaps and include:

1. A summary of existing information on the pallid sturgeon.
2. Micro- and macro-habitat use/selection by adult and juvenile sturgeon.
3. Identify the physical effects of subtly different rates of flow over time on connection, construction, maintenance, and evolution of pallid sturgeon habitat components.
4. Characterization of selected water quality parameters in the lower Platte and tributary contributions.
5. Periodic evaluation and peer review of information.

All but one (#2) of those activities is now complete or underway and can be evaluated in comparison to key priority hypotheses. An initial evaluation (Table 1) of the eight pallid sturgeon priority hypotheses identified in the AMP suggests two are most critical (Tier 1) and actions to test those two hypotheses are necessary first steps in the Program addressing pallid surgeon issues:

- ***PS-2:*** Program water management will result in measurable changes on flow in the lower Platte River.
- ***PS-4:*** Flows in the lower Platte will affect pallid sturgeon habitat suitability.

Assessment of Pallid Sturgeon Priority Hypotheses

PS-2*: Program water management will result in measureable changes on flow in the lower Platte River.*

Assessment strategy and rationale

To test this hypothesis, the Program initiated the Lower Platte River Stage Change Study (IMRP pallid sturgeon activity #3) in 2008 to develop a tool to evaluate the potential effects of Program water management activities (storage projects, re-timing, water conservation, depletions covered by state and federal depletions plans) on stage and how stage changes might affect the physical characteristics of the lower Platte River. Field sampling, 1-D and 2-D modeling, and analysis were completed in 2009 and the study is now final.

Space and time frames

Study scale

The full study scale was the lower Platte River from the Elkhorn River confluence to the Missouri River confluence, as defined in the Program document. Intensive fieldwork and modeling were conducted on a smaller study reach from the Highway 50 bridge to the reclaimed Pedestrian Bridge near Louisville, Nebraska.

Time scale

Data collection and modeling began in September 2008 and concluded in October 2009. A final report was delivered to the ED Office in December 2009 and the study team made a presentation to the GC in March 2010.

Performance measures, expected response, analysis, and conclusions

Performance measures

- **Water depth and velocity** between 3,700 cfs and 40,000 cfs
- **Percentage of Program water** reaching Louisville
- **Changes in habitat classifications** (slackwater, flat, riffle, run, isolated pool, plunge) between 3,700 and 40,000 cfs
- **Number of days** below 4,000 cfs @ Louisville (Dry Conditions Analysis)
- **Range of flows** below 4,000 cfs @ Louisville (Dry Conditions Analysis)
- **Number of consecutive days** below 4,000 cfs @ Louisville (Dry Conditions Analysis)

Expected response

We predicted that given the influence of the Loup and Elkhorn Rivers on lower Platte flows, water management activities in the lower Platte, flow attenuation, and their size and timing, Program water management activities would not have a statistically significant impact on lower

Platte flows or on the type or availability of pallid sturgeon habitat (as defined only by the study's habitat classifications).

Analysis and conclusions

Percentage of Program water reaching Louisville: Analysis of historic reach gains and losses showed not all flow reaching Grand Island is translated downstream to Louisville and that predicted changes in discharge due to Program water management activities is likely within the range of gage uncertainty.

Changes in habitat classifications: 2-D modeling accurately predicted changes in the six habitat classifications over the range of modeled discharges.

Dry Conditions Analysis: The period of record was analyzed for one period in the spring and one in the fall when flows were above target at Grand Island, the Program could divert some portion of that excess, and flows were simultaneously in the 4,000-6,000 cfs range at Louisville. Assuming habitat connectivity is important for pallid sturgeon and that connectivity declines below 4,000 cfs, this analysis showed that short-term connectivity could be problematic, but only for one or a few days.

Conclusion: *Generally, Program water management will not result in measurable changes on flow in the lower Platte River.* However, given that short-term connectivity could be problematic under certain but infrequent hydrological conditions and assuming the biological significance of habitat connection for pallid sturgeon above 4,000 cfs, the study tool could be used by the Program to implement proactive measures (e.g. altering excess-to-target-flow diversion timing or duration) to prevent potential negative impacts on habitat connectivity. Use of the tool for this purpose would be greatly enhanced if additional data were collected and analyzed regarding what defines pallid sturgeon habitat in the lower Platte and how that habitat is being utilized (see discussion regarding Priority Hypothesis PS-4).

Outstanding Issues

With respect to PS-2, several issues have been identified and are expanded upon in the concluding *Technical and Policy Issues to Address* section of this assessment. In brief form, the issues are as follows:

1) Peer review of the Lower Platte River Stage Change Study
2) Assessment of the representativeness of the stage change study's 2-D modeling section
3) Definition of pallid sturgeon habitat and use

***PS-4**: Flows in the lower Platte will affect pallid sturgeon habitat suitability.*

Proposed assessment strategy and rationale

Before testing additional pallid sturgeon hypotheses, more progress is required on better defining pallid sturgeon habitat in the lower Platte River, how that habitat is being utilized, and whether this habitat selection is resulting in pallid sturgeon reproduction and recruitment (IMRP pallid

sturgeon activity #2). The Peters and Parham study of pallid sturgeon habitat use and movement on the lower Platte River did provide useful information on pallid sturgeon ecology and additional information on pallids is being collected through an ongoing University of Nebraska-Lincoln sturgeon population characteristics study. However, that study is only capturing incidental pallid sturgeon (it is a shovelnose study), it is not providing habitat selection data, and even Peters and Parham (2008) suggested that additional habitat selection work is required.

In its 2009 report (Marmorek et al., 2009) the Program's Independent Scientific Advisory Committee (ISAC) provided the following guidance for addressing the pallid sturgeon priority hypotheses and management objective:

- Use a contingent, incremental approach for the sturgeon objective, only progressing to more detailed studies once initial questions have been answered. The stage sensitivity study will document the hydrologic sensitivity of lower Platte to central Platte flow management. If there is a change in flow which could be significant to sturgeon, then the next logical step would be to use a sparse, stationary telemetry framework to define migrations of sturgeon in/out of the Platte. If the telemetry results suggest that sturgeon are using the Platte for spawning, then consider studies of larval recruitment. One ISAC member has suggested that sparse telemetry studies *could* be done as a first step to determining the level and location of use of the Platte by pallid sturgeon, but to do such studies as part of the Missouri River Restoration Program (in coordination with the PRRIP).
- Evidence supports the notion that Platte River pallid sturgeon are Missouri River sturgeon. Movement of fish between the Missouri and Platte is a fundamental issue that needs to be addressed through expanded telemetry. If it is demonstrated that Program-managed discharge events persist downstream to affect reaches occupied by sturgeon, the remainder of the actions will depend on establishing the relative numbers of sturgeon using the Platte, and whether the Platte (or Elkhorn) provides critical habitat for its reproduction.

While the stage change study showed that, in general, lower Platte flow is not negatively impacted by potential Program water management activities, there are hydrological conditions and Program water actions that could result in some short-term loss of habitat connectivity unless preventative measures were undertaken to avoid the potentially negative impacts. According to the ISAC guidance, a next step should be taken through telemetry and habitat selection research to determine how pallids move from the Missouri to the Platte and if this movement is related to reproduction and recruitment (among other life history requirements). Then, results of this research could be used to test priority hypotheses PS-4 and potentially additional Tier 2 or Tier 3 hypotheses. In addition, this data could be used to refine the pallid sturgeon CEM and develop measurable indicators for assessing the current pallid sturgeon management objective.

Additional IMRP pallid sturgeon tasks also link to this potential habitat selection research:

IMRP Task #1 – Summary of existing information on the pallid sturgeon
Status: Complete; information review completed in 2008 and all documents available for consideration.

IMRP Task #4 – Characterization of selected water quality parameters in the lower Platte and tributary contributions
Status: Ongoing; annual water quality monitoring for temperature, turbidity, dissolved oxygen, and specific conductivity in both the central and lower Platte continues; sets baseline data on water quality parameters believed to be of importance to pallid sturgeon; will be analyzed in conjunction with additional habitat data

IMRP Task #5 – Periodic evaluation and peer review of information
Status: Ongoing; this assessment, the upcoming workshop, and additional ISAC and other peer review will continue.

Outstanding Issues
With respect to PS-4 and the other tasks linked to habitat selection and use, it is the very issues of habitat definition, selection, and use that need addressed and these issues are expanded upon in the concluding *Technical and Policy Issues to Address* section of this assessment.

Technical and Policy Issues to Address
Based on the preceding material several issues have been identified that should be addressed. These issues are explored individually below, with options for action and estimated costs associated with the actions. In the opinion of the ED Office, Items #1 and #3 are necessary for scientific defensibility.

Peer Review of Stage Change Study

1. If the Governance Committee approves at the June 2010 meeting, then seek **peer review of stage change study.** The Program would contract with three to four independent peer reviewers representing expertise in pallid sturgeon biology, hydrology, and engineering in summer 2010 to provide a peer review of the study's methodology and conclusions.
   Estimated Cost: $20,000
   Funding: Existing funding for this peer review is available in the approved FY 2010 Program budget (line item PD-3: AMP & IMRP Peer Review)

Following from #1 ⇨

2. If the peer review suggests revisions are necessary and the TAC and GC agree, then contract with HDR to **complete stage change study revisions.**
   Estimated Cost: $10,000-$30,000
   Funding: Existing funding for potential study revisions is available in the approved FY 2010 Program budget (line item PS-2: Lower Platte River Stage Change Study)

Habitat Definition, Selection, and Use

To advance the discussion of habitat definition, selection, and use, tapping into the knowledge of pallid sturgeon experts from the Platte River and Missouri River in a workshop setting is recommended. The series of potential actions that could follow is provided below.

3. If the GC approves at the June 2010 meeting, then convene a **lower Platte River pallid sturgeon workshop** in fall 2010 with TAC members, ISAC members, and pallid sturgeon experts from the Platte River and Missouri River. Workshop discussion topics will include:
   - Whether the stage change study reach is representative of the associated habitat below the Elkhorn River confluence for purposes of further applying the study tool.
   - Based on results of the stage change study and additional data, is there potentially a change in lower Platte flow due to Program actions that could be significant to pallid sturgeon (is there a possibility that the Program is violating its "avoid adverse impact" objective for pallid sturgeon?)?
   - If so, assess the extent and scope of necessary habitat selection research.

   Estimated Cost: $25,000
   Funding: Existing funding for this workshop is available in the approved FY 2010 Program budget (line items PD-4: AMP Workshops and PD-11: AMP Reporting).

Following from #3, either #4 or #5 ⇨

4. If consensus at the pallid sturgeon workshop is the study reach is representative of the lower Platte associated habitat and if no revisions are necessary to the study (or after those revisions are complete; see #2 above), then determine logistics of **using the stage change study tool in conjunction with Program water management activities.** ED Office needs to explore how best to utilize the stage change study tool in planning for and operation of Program water management activities.
   Estimated Cost: N/A
   Funding: Existing funding for this work is available as staff time in the approved FY 2010 Program budget.

5. If consensus at the pallid sturgeon workshop is the study reach is not representative of the lower Platte associated habitat, then solicit TAC recommendation and GC approval of contracting with HDR to **revise and update study accordingly.**
   Estimated Cost: Depends on extent of revisions necessary; $25,000-$100,000+
   Funding: Additional funding for this activity would be included in proposed FY 2011 Program budget under line item PS-2; solicit GC approval in December 2010

Following from #3 ⇨

6. Pallid sturgeon have been sampled upstream of the Elkhorn River confluence (Hamel et al., 2010). If consensus at the pallid sturgeon workshop is the lower Platte upstream of the Elkhorn River confluence should be evaluated, then solicit TAC recommendation and

GC approval in fall 2010 to **extend the stage change study** to cover the reach of the lower Platte from the Elkhorn River confluence upstream to the Loup River confluence near Columbus, Nebraska.
Estimated Cost: Phase I (scalability assessment) – $30,000-$50,000; Phase II (perform stage change study based on Phase I assessment) – $200,000
Funding: Additional funding for this activity would be included in proposed FY 2011 Program budget under line item PS-2; solicit GC approval in December 2010

Following from #3 ⇨

7. If consensus at the pallid sturgeon workshop is habitat selection research (telemetry study) should be conducted on the lower Platte, then develop **objectives, scope of work, and schedule; assemble funding partners** to allow Program to be a minor funding partner (in association with other Platte River and Missouri River efforts); and solicit TAC recommendation and GC approval in fall 2010 to **move ahead with research in 2011.**
Estimated Cost: Habitat selection research was estimated to cost roughly $2.6 million (Adaptive Management Plan, 2006) during the First Increment; $650,000 (25% of original estimate)
Funding: Funding for this activity would be included in proposed FY 2011 Program budget under new line item PS-3: Pallid Sturgeon Habitat Selection and Use Research; solicit GC approval in December 2010

References

Adaptive Management Plan. 2006. Final Platte River Recovery Implementation Program. U.S. Department of the Interior, State of Wyoming, State of Nebraska, State of Colorado.

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Hamel, M.J., Pegg, M.A., Hammen, J.J., and Anderson, T.L. 2010. Interim report: Population characteristics of sturgeon in the lower Platte River, Nebraska (Year 1). University of Nebraska-Lincoln.

HDR. 2009. Lower Platte River State Change Study Final Protocol Implementation Report.

Peters, E.J. and Parham, J.E. 2008. Ecology and management of sturgeon in the lower Platte River, Nebraska. Nebraska Game and Parks Commission, Neb. Tech. Ser. 18.

Table 01. Sequencing table for PRRIP priority hypotheses related to pallid sturgeon.

Priority Hypotheses	Detectability	Sensitivity	Feasibility	Priority	Sequence	Critical Path Comments
PS-1: Program flow/sediment mgmt. will result in a + species response by pallid sturgeon in the lower Platte River.	Low Low population numbers and low translation of Program flow and sediment to lower Platte make detection difficult	Low Low ability to structure analysis to see pop. responses to flow and sed changes	Low Requires spatially and temporally intensive monitoring	Low	Tier 3 Only assess after all Tier 1 and 2 hypotheses	
PS-2: Program water management will result in measurable changes on flow in the lower Platte River.	Medium Tool developed but central Platte flow largely attenuated	**High** Can use tool to evaluate impacts on PRRIP water mgmt.	**High** Study complete and tool developed	**High**	**Tier 1** Quantify through Stage Change Study by 2010	Stage change study complete; consider extending spatial scale of study to Loup River confluence and defining additional "worse case scenarios" for analysis
PS-4: Flows in the lower Platte will affect pallid sturgeon habitat suitability.	Medium Proper sampling effort should yield useful data	Medium Experience on Missouri suggests telemetry will work with low #s	**High** Partner with Missouri River agencies to maximize effort and technology	**High**	**Tier 1** Assess through habitat selection research; continue through at least 2015	High priority, but low population numbers and large expanse of lower Platte will make this research difficult and expensive
PS-5: Pallid sturgeon habitat suitability is maximized between water temperatures of X and Y in the lower Platte River.	Low Low populations numbers make detection difficult	Medium Could bound habitat use with water temperature	Low Would require spatially and temporally intensive monitoring	Low	Tier 3 Only assess after all Tier 1 and 2 hypotheses	Not feasible unless and until habitat selection research complete; need to include specific measurement of water quality as a variable
PS-6: ↑ flow in the lower Platte will affect pallid sturgeon habitat availability.	Medium Once habitat defined could use stage change study model to evaluate	Medium Tool sensitive to habitat changes over range of flows	Medium Once habitat defined could use stage change tool to evaluate	Medium	Tier 2 Assess after Tier 1 hypotheses	Not feasible unless and until habitat selection research complete
PS-7: ↑ habitat availability in the lower Platte will ↑ pallid sturgeon use.	Medium Small population can be monitored for use	Low Many confounding factors	Low Requires spatially and temporally intensive monitoring	Low	Tier 3 Only assess after all Tier 1 and 2 hypotheses	
PS-9: ↑ Program flow releases will ↓ water temperatures in the lower Platte River.	Low Attenuation and trib inflow make PRRIP water difficult to detect	Low Many confounding factors	Low Requires spatially and temporally intensive monit.	Low	Tier 3 Only assess after all Tier 1 and 2 hypotheses	
PS-11: Non-Program actions (e.g. harvest, stocking, Missouri River conditions) determine the occurrence of pallid sturgeon in the lower Platte River.	Low Too many confounding factors	Low Difficult to assess which factors are controlling	Low Would require substantial effort to develop analysis methodology	Low	Tier 3 Only assess after all Tier 1 and 2 hypotheses	