Pallid Sturgeon Workshop Pre-read: Decision Sketch

This document summarizes the context and framing of the decisions the GC will address in September about Program policy and actions for pallid sturgeon for the First Increment Extension.

History/Background

- There are different perceptions among GC members about the Program's role and responsibilities with respect to pallid sturgeon. These have persisted since the Program inception due to discrepancies in how goals and objectives are framed in different documents.
- To date, Program activity on pallid sturgeon has focused on the preparation and peer review of the stage change study, and use of that final GC-approved document to develop an assessment for Big Question #9 – Do Program flow management actions in the Central Platte River avoid adverse impacts to pallid sturgeon in the Lower Platte River?
- Based on the results of the peer-reviewed stage change study, the EDO assessed Big Question #9 as being answered in the affirmative and committed to using the stage change study tool to develop appropriate operational guidelines for Program water projects to ensure excess flows are not diverted at times the stage change study suggest could impact pallid sturgeon in the Lower Platte River.
- The U.S. Fish and Wildlife Service (Service), citing lingering uncertainties, does not concur with this assessment. In June 2016, the Service proposed some next steps to the GC, including an expert workshop, designed to provide insight into the current status of pallid sturgeon science and how the Program might engage in additional knowledge acquisition that could guide Program actions on pallid sturgeon in the future. Additionally, the Service's 2017 Environmental Account Annual Operations Plan specifically referenced maintenance and rehabilitation of Lower Platte River pallid sturgeon habitat as a purpose of a proposed late spring pulse release. This has increased attention on the need to clarify expectations about the use of Program resources to support pallid sturgeon.
- In late 2016, the GC approved a pallid sturgeon scope of work for Compass Resource Management including: a) clarifying the current state of knowledge about pallid sturgeon use of the Lower Platte River and the Program's ability to affect pallids, and b) clarifying the Program policy with respect to pallids. The Pallid Sturgeon Task Group was established to prepare the knowledge summary, which has been shared with GC members (July 10 webinar, and associated materials). The September workshop is intended to explore policy implications.
- In December of 2016, the Program confirmed its intention to seek a thirteen-year extension to the First Increment. Program goals, objectives, and milestones will not change during the Extension, which will enable the Program to follow a streamlined NEPA process. As a result of this direction, the ability to change Program policy and objectives is constrained.
- The purpose of the September workshop involves clarifying what the Program's focus/responsibility with respect to pallids will be for the First Increment Extension, in light of this history and constraints.

Decision Context

Some Starting Assumptions

Based on GC interviews and review of Program founding documents, we believe that the following statements have either been expressly supported by all GC members or are unambiguously stated in the founding Program documents. They form a useful starting point for framing the decision:

- Pallid sturgeon is a target species, and the Program is intended to secure benefits for target species;
- The Program long term goal is to improve and maintain associated habitats, which for pallid sturgeon is identified as the reach between the Elkhorn and the Missouri;
- The goal includes "testing the assumption that managing flow in the Central Platte River also improves the pallid sturgeon's Lower Platte River habitat";
- The Program's ability to influence pallid sturgeon is more limited than its ability to influence other target species, which affects the relative priority and amount of effort the Program should allocate to pallids;
- The AMP pallid management objective of "avoiding adverse impacts from Program actions" reflects, among other things, a recognition of this limited influence;
- The AMP is intended to serve Program objectives;
- Changes to the stated Program goals are not feasible without triggering a full EIS process; however, the GC could provide clarifying language, and/or change the management goals of the AMP.

What's a benefit?

Different GC members have different perspectives on what constitutes a benefit for pallid sturgeon *in the context of the Program*, including:

- *Avoiding adverse effects*: Since actions for other target species are required, and since such actions could have an adverse effect on pallids, a policy that ensures that actions taken for other species do not harm pallids can be understood as a benefit;
- *Testing assumptions*: Monitoring and studies that confirm, or reduce uncertainty about, the Program's effects on pallids can be understood as a benefit;
- *Managing flow*: Identifying opportunities to use existing water resources to provide benefits to support life history needs;
- *Managing (building or protecting) physical habitat*: Identifying certain types of limiting habitats that the Program could build or buy or otherwise protect;
- *Enhancing knowledge in support of broader recovery planning*: Identifying ways the Program could help (alone or in partnership with others) fill knowledge gaps that could support broader recovery efforts for Lower Platte pallid sturgeon.

Given this context, for the purposes of this workshop, we will assume that pallid sturgeon is and will remain a target species for the duration of the Extension, and that the relevant question is not whether or not to seek benefits, but rather: what is the best way for the Program to use its resources, including water and money, to support pallid sturgeon for the First Increment Extension.

Decisions to be made in September

The decisions the GC will address in September are:

a) How should the Program focus its efforts and existing resources with respect to pallid sturgeon for the First Increment Extension? Related questions: Do we have enough information to select a preferred option? If yes, what additional information do we need to support implementation of that option? If no, what additional information is needed to inform the choice? And in light of this, what is the need for, and what would be the focus of, any additional engagement with external experts?

b) Is there any clarification to the Program policy (long-term goal) with respect to pallid sturgeon that would be helpful to make to guide the First Increment Extension?

c) Is there any clarification or change to the AMP policy (management objective) with respect to pallid sturgeon that would be helpful to guide the First Increment Extension?

To inform these decisions, we've identified five illustrative alternatives (i.e. strategies or options that the Program might consider for the First Increment Extension) and evaluated them relative to a set of preliminary decision objectives inferred from GC interviews.

Decision Objectives

Decision objectives are concise statements of the fundamental interests that matter in a decision. They are the endpoints or outcomes that could be affected by the decision and that must be considered when choosing among alternative policies or actions. Decision objectives provide a basis for creating and evaluating different management alternatives.

Based on review of Program documents, interviews with GC members, and work with the Task Group (TG), we have identified a preliminary set of decision objectives summarized below:

- **Pallid Sturgeon**: Pallid sturgeon are one of four target species. While different GC members would likely put different weight on this objective, all GC members have acknowledged that pallids are likely lower in priority for the Program than the other target species, largely due to recognition of the more limited influence the Program has on them.
- **Whooping Crane Flows:** Whooping cranes are also a target species, and are generally recognized by GC members as a priority for Program attention and resources. To the extent that a management option for pallid sturgeon infringes on the ability of the Program to deliver whooping crane flows, this trade-off should be considered in decision making.
- **Ability to Meet General Program Water/Land Goals:** To the extent that Program funds are spent on pallid sturgeon-related initiatives, they are not available for meeting other Program goals, including the acquisition of water and land (for whooping cranes, terns, or plovers).
- **Ability to Inform the Second Increment:** Decisions about what to monitor or research for the First Increment Extension may affect the ability to make informed decisions in the Second Increment.

Alternatives

Table 1 provides a summary of the range of alternatives that have been identified to date. Option 1, labeled "Base", largely reflects the current Program operation. Although the general intention is to avoid adverse impacts, several current Program water actions likely have benefits for pallids. Option 2, "Base + Test Program Effects", is the same as Option 1, but adds efforts to improve the evidence in support of the assumption that the current operation either avoids adverse effects or provides benefits to pallids. The other three alternatives correspond to the three major ways identified for more actively seeking benefits for pallid sturgeon – i.e., through knowledge/research investments, physical habitat alterations, and water releases designed specifically for pallid sturgeon.

Table 1 Summary of Alternatives

Alternative	Description
1. Base	**Manage water for other species, with rules to avoid adverse effects on pallids *based on existing information*; no new learning about Program effects on pallids.** This alternative involves managing Program water for other species (e.g., whooping crane) but establishing measures to avoid adverse impacts to pallids in the Lower Platte including: - Avoid diversions during periods of greatest potential impact, based on the existing stage change study results; - Establish operational rules (once water projects are up and running) to ensure that the avoidance measures are implemented.
2. Base + Test Program Effects	**Base + invest in learning more about the effect of Program water management on pallids.** This alternative involves implementing the actions to avoid adverse effects (as in Base), but additionally: - Refining the stage change study (e.g., extend further upstream from Elkhorn River to Loup River or even to Chapman, etc.) - Conducting additional studies to clarify linkages between Central Platte hydrology, habitat effects, and pallid use of the Lower Platte River.
3. Base + Broader Research	**Base + invest in broader (non-Program related) research to support pallid recovery; no new learning about Program effects on pallids**. This alternative involves ceasing efforts to understand how Program water management affects pallid sturgeon habitat and use of the Lower Platter River. Instead, invest in research relevant to broader management and recovery of Lower Platte pallid sturgeon, likely through partnership with other managers/programs who have greater ability to influence pallid outcomes. Research may include: ecology, limiting factors, habitat selection, species management, linkages between habitat and population/species effects, the role of the Lower Platte in recovery relative to its full range.
4. Base + Physical Habitat	**Base + invest in physical habitat enhancement**; **no new learning about effect of Program water management on pallids**. This alternative involves ceasing efforts to identify ways to use Program water to improve pallid sturgeon habitat and use of the Lower Platter River. Instead, identify, purchase and manage areas of river with limiting habitat between the Elkhorn and the mouth. Conceptually, options include setting back levees, reconnecting side channels, etc. However, practical options/relevance on the Lower Platte River may be limited, given its geomorphology/topography. The Program currently does not have and would need to acquire the authority, financing, partners, etc. to do this.
5. Water Release(s) for Pallids	**Manage water explicitly to achieve benefits for pallids (e.g., late-spring pulse); conduct monitoring and research to test effects.** This alternative involves releasing water during seasons important for pallids:

Alternative	Description
	- The average volume of controllable First Increment water will be approximately 90,000-100,000 acre-ft. - Implementing the late-spring pulse (May 20 – June 20) in normal and wet years would require average release of 120,000 acre-ft. - Research would be required to evaluate the linkages between Program flow releases, habitat effects, and pallid use of the Lower Platte. Given the opportunity cost of this water, monitoring to confirm benefits would be required (i.e., included in this alternative).

Implications for Pallid Sturgeon

Changes to flow in the Lower Platte River can affect pallid sturgeon in three main ways:

- **Channel connectivity**: flows below 4000 cfs in the Lower Platte contribute to poor connectivity in the channel.
- **Availability of important habitats:** while pallids use a variety of habitats in the Lower Platte, they have typically been captured in the deepest areas.
- **Mortality events at very low flows:** very low flows are associated with high water temperatures, which can cause stress for individual fish.

While the Program's ability to affect hydrology in the Lower Platte is limited due to the heavy influence of the Loup and Elkhorn Rivers, Program retiming diversions and new depletions in the Central Platte during periods of excess flow will decrease river stage and/or depth in the Lower Platte. Likewise, Program releases – during shortages to target flows or pulse flows – will increase stage and/or depth downstream. It is not known if these increases are biologically significant.

Given that these possible effects of Program actions, Table 2 summarizes the key implications for pallid sturgeon, drawn from the Knowledge Summary documents, relative to each of the alternatives described above.

Table 2 Implications of the Alternatives for Pallid Sturgeon

Alternative	Implications for Pallid Sturgeon

1. Base	Program water will both increase (releases of new and retimed water) and decrease (withdrawals for retiming and new depletions) river stage and depth in the Lower Platte River. There is limited ability to influence the hydrology of the Lower Platte due to limited available water and the magnitude of influence from the Loup and Elkhorn Rivers:
	• There is strong evidence that:
	  • Stage changes in the Lower Platte resulting from Program actions are small and muted by more proximate tributaries.
	  • The greatest potential for negative impacts occur when flows in the Lower Platte are between 4000 and 6000 cfs while flows in the Central Platte are above target flows. The coincidence of these two conditions is relatively rare in the hydrologic record.
	• There is some (or conflicting) evidence that:
	  • Impacts to pallid sturgeon can be avoided through development of operational rules that prohibit Program diversions when Lower Platte River discharges fall below 4,000 cfs. However, the relationship between sub-4,000 cfs and impacts to pallid sturgeon capacity and habitat connectivity is not known.
	  • Predicted changes in Lower Platte River pallid sturgeon habitat resulting from Program water management actions in the Central Platte are similarly small to undetectable and thus these changes should not provide additional stress to the pallid sturgeon population. However, uncertainties remain.
	  • Existing flow monitoring is sufficient to guide Program operations in the limited situations when hydrologic impacts from the Central Platte are more likely.
	
	What do we know about the magnitude of the effect?
	• Quantifying impacts requires understanding of the relationship between flow/stage and pallid sturgeon habitat suitability/connectivity and the relationship between habitat availability and pallid sturgeon use and/or condition. These relationships are highly uncertain.
	• Based on habitat suitability and connectivity relationships from Peters and Parham 2008, reductions due to PRRIP retiming projects would generally reduce Lower Platte suitability and/or connectivity by less than 5%. It is unknown whether or not changes of this magnitude are biologically important to pallid sturgeon.
	• Other factors, such as depletions authorized under the new depletions plan, may be additive to Program withdrawals and consequently have additive impact, but the combined effects are not well understood at this time.

2. Base + Test Program Effects	While there is some evidence that operational rules will avoid adverse effects and that some Program actions have benefits, uncertainties remain. The main benefit of this alternative is reducing uncertainty – that is, increasing confidence that Program actions don't adversely affect pallids, and that some Program actions provide benefits for pallids. Remaining uncertainties include: • Relationship between discharge, channel connectivity, and pallid sturgeon mobility • Relationship between discharge, physical habitat characteristics in the channel, and pallid sturgeon occurrence

	Detection of Program effects is complicated by hydrocycling from the Loup River and difficulty sampling pallid sturgeon. Our predictive ability would be enhanced if: • The stage-change study was expanded to encompass the full range of physical channel conditions in the Lower Platte River. • The stage-change study was extended upriver to include the section between the Loup and Elkhorn confluences, or upstream to the Associated Habitat Reach (Chapman) (to better understand flow losses and attenuation). • Resource selection analyses were developed based on physical conditions at sample and capture locations (depth, velocity, temperature). This would improve our understanding of the relationship between discharge, physical habitat conditions, and pallid sturgeon occurrence. • Increased telemetry tracking effort in the Lower Platte would improve our understanding of pallid sturgeon movements in relation to channel connectivity.
3. Base + Broader Research	There is limited ability for the Program to affect the hydrology of the Lower Platte: • The effects of withdrawals are smaller than the effects of releases, though both are proportionally small. • The influence of hydrocycling in the Loup River and the additions of the Elkhorn River mask Program effects. There are a range of other factors outside the control of the Program that could influence recovery of the species. Given the limited ability for the Program to influence pallids, it is possible that the same investment applied to other research questions could produce greater benefit, either in the Lower Platte or more broadly.
4. Base + Physical Habitat	There is limited ability for the Program to affect the hydrology of the Lower Platte: • The effects of withdrawals are smaller than the effects of releases, though both are proportionally small. • The influence of hydrocycling in the Loup River and the additions of the Elkhorn River mask Program effects. Given the limited ability of the Program to affect hydrology, it has been suggested that there may be merit in exploring opportunities to manage or protect physical habitat. Both the availability of plausible options and magnitude of potential benefit is completely unknown.
5. Water Release(s) for Pallids	Late spring pulse flows for pallid sturgeon would take place from approximately May 20 to June 20, and release an average of 120,000 ac ft of water. What is known about the magnitude of the effect, based on existing discharge-habitat suitability relationships: • Late-spring pulse flow release would generally increase Lower Platte River habitat suitability by less than 5%. Channel connectivity below the Elkhorn River would also change little. • Connectivity upstream of the Elkhorn could increase by around 10% in dry to normal years. • It is unknown whether changes of this magnitude are biologically important to pallid sturgeon. Remaining uncertainties include:

	• The relationship between flow depth/velocity and pallid sturgeon habitat suitability and **t**he relationship between habitat suitability and pallid sturgeon occurrence/condition. • The relationship between discharge and channel connectivity and the relationship between channel connectivity and pallid sturgeon mobility. • Strength of any relationships between discharge, stream temperature, stream turbidity and pallid sturgeon habitat suitability/condition. • Strength of any relationships between discharge, pallid food resources, and pallid sturgeon habitat suitability/condition.

In addition to these effects on pallid sturgeon, the alternatives would also have consequences for other concerns identified in the GC interviews. Table 3 provides a qualitative summary of these consequences, with an emphasis on exposing key trade-offs and discussion questions. Some key messages include:

Pallid Sturgeon. The benefit of testing assumptions about Program effects (Alternative 2) is that information is available to inform Second Increment action, with possible benefits to pallids at that time. Benefits to pallids from a Research focus (Alternative 3) would be indirect in the sense that they would be achieved through the application of knowledge by other managers/programs with more ability to influence pallid outcomes. Benefits of physical habitat alteration (Alternative 4) are very uncertain; in addition to uncertainty about the effectiveness of such options, it is not known if there even exist plausible options. Alternative 5 will produce improvements in habitat suitability (up to 5%) and connectivity (around 10% in dry-normal years above the Elkhorn); the biological significance of this is unknown.

Whooping Crane Flows. For the purposes of this process, we are accepting that the provision of whooping crane flows is a priority (we are not exploring the effectiveness of these flows on whooping cranes). Because total amount of water available is fixed, any water used for pallids (e.g., a late spring pulse as in Alternative 5) is not available for use in other periods, and will affect the Program's ability to provide whooping crane flows. Other alternatives do not have a direct effect on planned whooping crane flows.

Ability to Meet Water/Land Goals. Alternatives that involve monitoring, research, or studies for pallids (Alternatives 2 through 5) will have financial costs that detract from the ability to purchase water or land. (There is an existing draft budget for pallids for the First Increment Extension, but funds in that budget could be re-allocated.)

Ability to inform the Second Increment. Alternative 1 involves accepting the information base available today, managing with that information, and not investing any further in knowledge acquisition about pallid sturgeon. This means that there will be no new information available to support decision making in the Second Increment. All other alternatives will produce additional information that could support either more refined management actions in the Second Increment, or a decision to remove pallid sturgeon as a target species. There is not enough information about the nature of the knowledge acquisition under each alternative to discriminate any further.

Table 3. Summary of Consequences and Key Trade-offs (text in blue/orange denotes difference, better or worse, relative to Base)

	(1) Base *Manage water for other species, with rules to avoid adverse effects on pallids based on existing info*	(2) Base + Test Program Effects *Base + invest in learning more about effect of Program water management on pallids*	(3) Base + Broader Research *Base + invest in broader (non-Program) research to support pallid recovery (no new learning about Program effects on pallids)*	(4) Base + Physical Habitat *Base + invest in physical habitat enhancement; no new learning about effect of Program water management on pallids*	(5) Water Release(s) for Pallids *Manage water to achieve benefits for pallids (e.g., late-spring pulse); conduct monitoring and research to test effects*
Pallid sturgeon	Provides some (unquantified) benefits to pallids from water mgmt for other species; avoids adverse effects in worst cases; residual uncertainty about adverse effects remains	Additional indirect/long-term benefits from reducing uncertainty about Program effects (more informed future actions)	Additional indirect/long-term benefits to pallids from research used by others	Low/uncertain probability of success (unknown opportunity, feasibility, benefits)	Increases of up to 5%/ 10% in habitat suitability /connectivity in specific reaches and seasons; biological significance unknown
Whooping Crane Flows	Achieve WC target flows	Achieve WC target flows (no change)	Achieve WC target flows (no change)	Achieve WC target flows (no change)	Miss WC target flows in 50-75% of years[1]
Ability to Meet Water / Land Goals	Base	$ for research/monitoring not available to buy water or land for other species[2]	$ for research not available to buy water or land for other species	$ for land not available to buy water or land for other species	$ for research/monitoring not available to buy water or land
Ability to inform 2nd Incr	Limited, nothing new is being learned (base case)	Better understanding of Program effects	Better understanding of what's limiting for pallids	Better understanding of role of physical habitat	Better understanding of specific flow releases
Key Questions	**If we implement these operational rules, without further study to reduce the remaining uncertainties, how sure are we that the Program will avoid adverse effects? Are we sure enough?**	**Given available water, the effect of confounding factors, and sampling difficulties, can we reduce uncertainty enough to make a difference to decision making?**	**Would money be better spent reducing uncertainty about effects of Program water management on pallids, or contributing to broader recovery management efforts?**	**Is there sufficient opportunity to warrant exploration of this alternative?**	**Given limitations in its hydrologic influence and financial resources, could the Program detect the population-level effects of flow releases for pallids?**

[1] If implementing full late-spring pulse

[2] Funding (approximately $3 million) for pallid research is currently built into the Extension budget. However, other research priorities could be funded in lieu of pallid research or that money could be used to buy water.

Key questions raised by the alternatives

Alternative 1: If we implement these operational rules, without further study to reduce the remaining uncertainties, how sure are we that the Program will avoid adverse effects? Are we sure enough?

Alternative 2: Given limitations in available water, the effect of confounding factors, and sampling and measurement difficulties, can we reduce uncertainty enough to make a difference to decision making?

Alternative 3: Would money be better spent reducing uncertainty about the effects of Program water management on pallids, or contributing to broader recovery management efforts?

Alternative 4: Is there sufficient opportunity to warrant exploration of this alternative?

Alternative 5: Given limitations in its hydrologic influence and financial resources, could the Program detect the population-level effects of flow releases for pallids?

Other Discussion Questions

1. **Are there other criteria for comparing alternatives that have not been considered?** What is missing?
2. **Are there other alternatives (i.e. Policy options) not listed here?** Are there other ways that the Program can provide benefits than are included in the initial set of alternatives?
3. **Are there any alternatives that are dominated or otherwise unacceptable that can be eliminated from further consideration?**
4. **What technical questions need to be addressed to inform the selection of a preferred alternative?** There are many uncertainties about pallid sturgeon and Program Impacts on them. Which ones are important for making an informed decision about how to focus Program resources in the First Increment Extension?
5. **If the preferred alternative includes further research and/or monitoring, what are the appropriate spatial boundaries, given what we know now?** Specifically, is the focus on the designated associated habitat (below Elkhorn) appropriate? Or is there a rationale to expand?
6. **What do we need to do to inform the Second Increment?** What questions are we trying to answer to inform the Second Increment? What is the range of actions on the table? Will there be more water available? Is it an option to remove pallids from the list of target species? What information would be needed to do that?
7. **What do we need to do to assess whether the information from further studies has value to the Program?**
    - What would the Program do differently, given perfect information about its effects?
    - Can the uncertainty be reduced enough to drive a change in management?
    - What is the cost of reducing the uncertainty and is it worth it, including both financial cost and the implications for other objectives or species?