



Platte River Recovery Implementation Program

SDM Workshop Agenda

December 2, 2015

Warwick Denver Hotel

1776 Grant Street, Denver, Colorado

Meeting Objectives

For the Platte River SDM process, confirm the scope of the decision, develop decision objectives and candidate performance measures, develop and clarify the scope of preliminary alternatives, and confirm next steps in the work plan.

Agenda

Start	Topic
8:30	Introduction Introductions and agenda review Overview of SDM Process
9:00	Decision Objectives Present draft decision objectives (Compass) Discuss and refine
10:15	Break
10:45	Performance Measures Present candidate performance measures (Compass) Discuss and refine
12:00	Lunch
1:00	Alternatives and Consequences Present approach to developing and evaluating alternatives (Compass) Discuss the scope of preliminary alternatives Clarify scope and bounds
3:00	Break
3:30	Next Steps Present approach to estimating consequences and uncertainties (Compass) Confirm work plan and next steps Clarify TAC meeting objectives
4:30	Close

Platte River SDM: GC Pre-Reading Package for 2015-12-02

Introduction

Over the course of the past few weeks, we have reviewed relevant Program documentation and held interviews with a majority of the GC and TAC members. Based on this work we have:

- Refined the description of the scope of the decision;
- Developed a means-ends diagram to help clarify objectives;
- Presented a preliminary set of decision objectives to serve as a starting point for discussion;
- Summarized, in broad terms, the range of alternatives under consideration.

This work is presented in this document for the purposes of providing a starting point for discussion at the December 2 meeting of the GC.

Some Key Messages from the Interviews

We present this section in a Question and Answer format for simplicity. We didn't ask most of these questions directly, but they concisely summarize some of the common messages we heard.

Q: Should we use water to build nesting habitat for terns and plovers?

A: No. There is agreement that it's not possible to do a water release capable of producing tern/plover sandbar nesting habitat within the existing water budget.

Q: If more water were available, should it be used to build nesting habitat for terns and plovers?

A: Maybe. But that is a Second Increment question.

Q: Are there other ways to use water to support terns and plovers?

A: Maybe. This SDM process could consider flow release options that support tern and plover reproductive success in other ways (e.g., at the time of nest initiation to increase habitat utilization, after nest initiation for moating, etc.). Several people suggested that there may be better uses for water (e.g., whooping cranes, phragmites control, channel widening to support a braided form, etc.) and there is a need for a broader decision process at some point to more fully evaluate the benefits of different uses of water. At a minimum, this SDM process should consider the opportunity cost of using resources for terns and plovers.

Q: Should we build on-channel nesting habitat for terns and plovers?

A: Maybe. Some say no on the basis of the cost-effectiveness of off-channel habitat relative to on-channel. But others say there may be ways to design on-channel habitat for terns and plovers that also deliver co-benefits for whooping cranes and/or non-target species. When co-benefits are considered, some believe these options may be worthwhile.

Q: Should we build or buy more off-channel nesting habitat for terns and plovers?

A: Maybe. Everyone indicated that they see value in the off-channel habitat that has been created. But many people see a need to address the question of "how much is enough?"

Q: Should the process be limited to adjusting to Big Question #1?

A: There was broad agreement that the two thumbs down conclusion on Big Question #1 offers an opportunity to evaluate tern/plover habitat decisions, and is an opportunity to test a way of adjusting to

new information prior to more in-depth discussions about the Second Increment. There's a common interest in constraining this decision process to something practical that the GC can accomplish in the next few months. But several people mentioned that there are important interactions among the Big Questions. In particular, Big Questions # 4, 6, 7 and 8 also provide useful information for informing decisions on tern/plover habitat.

Q. What do we want from the SDM process?

A. The most common answers were: ensure common understanding about findings to date; demonstrate ability to adjust to new information; make an informed and transparent decision about the right combination of on and off-channel habitat for terns and plovers; identify the best use of Program resources.

Decision Scope and Context

We propose a slight re-framing of the decision scope and context to focus on *what are the best management actions to take*, rather than *what's the best way to use Program resources*, namely:

Given the two-thumbs-down assessment for Big Question #1, what's the best combination of management actions to take, for the remainder of the First Increment (assumed to be 2016 to 2019), for the purpose of maintaining or enhancing habitat for interior least terns and piping plovers?

Scope considerations include:

- The focus is on evaluating alternative ways of maintaining or enhancing habitat for terns and plovers, but implications for other objectives (e.g., whooping cranes, pallid sturgeon, etc.) will be evaluated;
- Alternatives are expected to include actions for off-channel habitat, on-channel habitat, or a combination of both;
- Alternatives are expected to include mechanical actions, flow actions or a combination of both;
- No alternatives related to using sediment augmentation to build or maintain habitat have been proposed;
- Alternatives will be feasible within existing water, land, and financial budgets.
- There are a range of other actions that the Program is or will be doing anyway that will not be influenced by this SDM process.

Questions that this SDM process *will* answer:

- What is the preferred combination of on- and off-channel management actions for terns and plovers for the remainder of the First Increment?

Questions this SDM process *will not* answer, as currently scoped:

- **What's the best use of Program resources?** The decision process will identify the best actions for terns and plovers, based on currently available information. But it isn't scoped to evaluate whether money and water spent on plovers and terns would be better spent on other Program goals and objectives (e.g., whooping cranes). It can provide a general understanding of opportunity cost (in the form of the estimated financial cost and water cost of the recommended actions), but will not directly compare the *benefits* that would be realized from using water and money across the full range of possible competing uses.
- **How much is enough?** The outcome of the SDM process will represent what the GC thinks is "enough" for the remainder of the First Increment. However, the process will not try to produce a final answer to this question for future increments.

Process Objectives

Process objectives are objectives for how the decision is made rather than what management actions are selected. Some of the process objectives from interviews include:

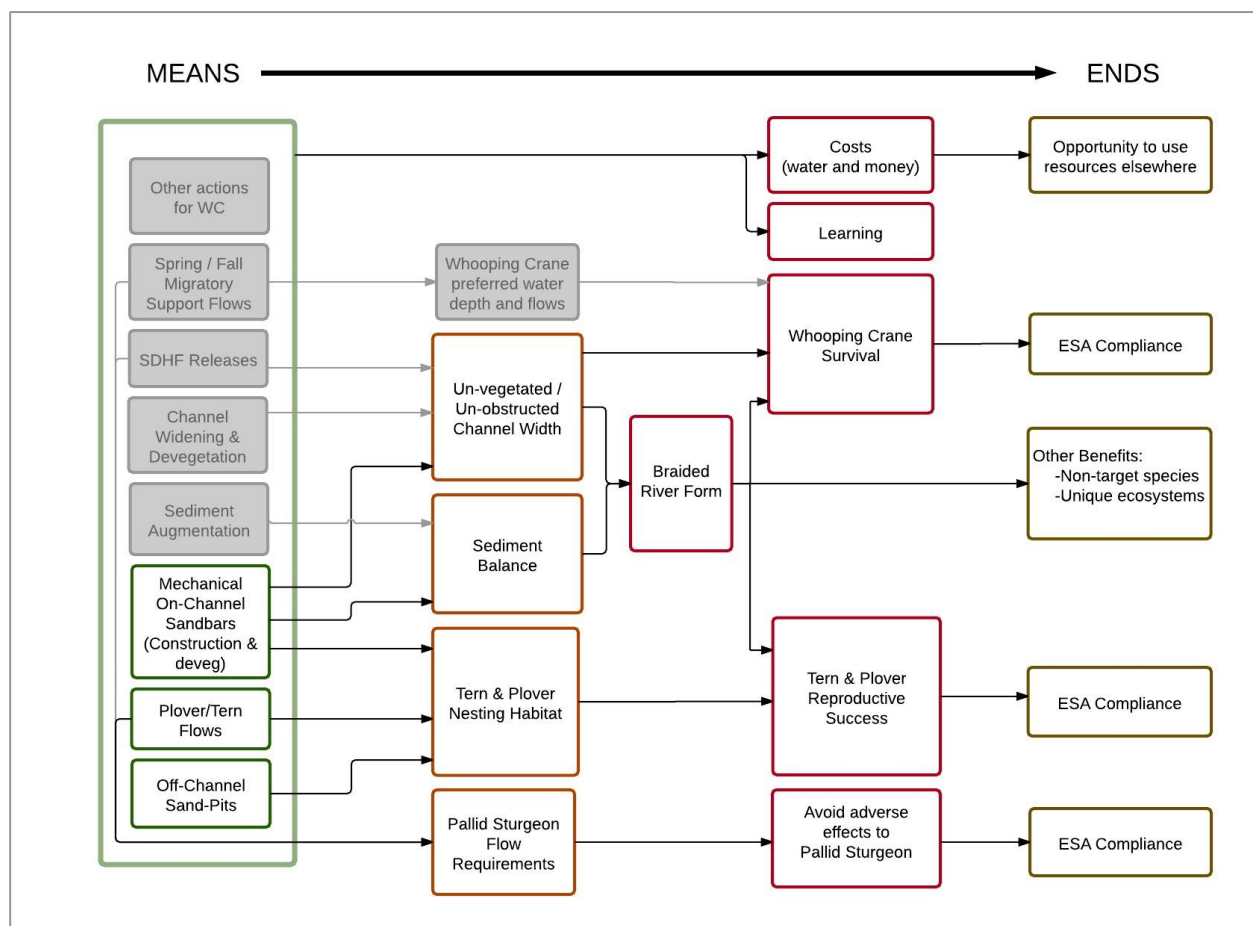
- Build common understanding among GC members about Program findings to date;
- Ensure transparency of decisions – including transparency in trade-offs made, as well as transparency in assessment of consequences;
- Ensure scientific rigor – i.e. an evidence-based process that applies defensible methods for evaluating potential management actions;
- Use a level of analysis that is “good enough” for choosing between alternatives – for some decision objectives, a qualitative evaluation of performance may be sufficient, especially if quantifying performance would require substantial additional effort;
- Demonstrate ability of the AMP to help the Program adjust to new information;
- Demonstrate progress to stakeholders/observers.

Means and Ends

A key concept is discriminating between fundamental objectives and means objectives. Fundamental objectives are the essential things that matter to decision makers. Means objectives are important only because of their influence on the fundamental objectives. These tend to occur on a continuum and there is not always a clear line between them. From a practical perspective, what’s important is to think about the means-ends continuum and identify the objectives that will be most useful in discriminating among alternatives. These will be the decision objectives used in the SDM process, or in other words, the objectives that will be used to evaluate and decide among alternatives.

A means-ends diagram, as shown in **Figure 1**, can be useful for understanding means and ends. This diagram is a summary of the objectives and management actions identified in the interviews.

Figure 1. Means and Ends



At the right hand side of the diagram are fundamental objectives – the outcomes people really care about. At the left hand side are the means or management levers available to influence the fundamental objectives. In between are the primary mechanisms by which the actions are believed to influence the fundamental objectives. The diagram is useful for determining which decision objectives and performance measures will be most useful for a given decision context.

To develop this diagram, we asked at various points throughout the interviews “What are the outcomes that matter in measuring success?” and “Why is that important?” both of which lead to fundamental objectives. We asked “how could we influence or achieve that?” to lead to means objectives and eventually specific management actions.

During interviews, the most common answers to the “what matters” questions included: supporting the reproductive success of terns and plovers, supporting the migratory success or survival of whooping cranes, maintaining the braided river form, and minimizing management cost (or maximizing cost efficiency). As a starting point for discussion, we are proposing that these objectives (in red boxes) may be suitable as decision objectives for this process, along with (possibly) learning and avoiding adverse effects to pallid sturgeon.

Some people noted that enhancing tern and plover reproductive success, enhancing whooping crane survival and avoiding adverse effects on pallid sturgeon are means to a broader objective of ESA compliance.

Maintaining the braided form of the river is broadly understood to be a key means for supporting the target species (terns/plovers and whooping cranes). Braided rivers are somewhat rare and are thus also valued for their role in supporting unique ecosystems and a range of non-target species. Assessment of these broader ecosystem benefits is beyond the scope of this process, but they reinforce the importance that is generally assigned to braided river form.

The green box on the left hand side of the diagram contains the main categories of management actions that were identified during interviews. The actions in grey boxes are ones that we propose are out of scope for evaluation in this decision process. They do, however, represent areas where Program resources could be directed if they are not spent on plovers and terns. These out of scope actions include spring/fall migratory support flows for whooping cranes, SDHF releases for enhancing un-vegetated/un-obstructed channel width, and other channel widening/devegetation actions. The actions in white boxes are in-scope for this process and are further described in the “Preliminary Alternatives” section.

Useful Decision Objectives – A Starting Point for Discussion

A practical set of decision objectives and measures needs to strike a balance between being complete (representing all the things that matter) and concise (a manageable number). It will also strike a balance between fundamental objectives (the things we really care about) and means objectives (the things we can directly manage to influence the fundamental objectives). It should avoid duplication and focus on things that the decision can influence. We propose the following preliminary draft decision objectives to serve as a starting point for discussions at the GC meeting in December. We will discuss the rationale for this preliminary set at the meeting and use the meeting for feedback and refining. We will almost certainly make changes to better reflect both GC values and the scientific understanding of how best to measure and report on those values.

Below, we use the terminology of “maximize” or “minimize” to indicate direction: all else being equal, “maximize” means more of this objective is preferred. Clearly it’s not possible to maximize or minimize all of them at the same time. The overall intent of the SDM process is to find the best balance across the objectives.

Performance measures are the specific metrics used to report the effects of management actions on the decision objectives. In some cases below, we comment on candidate performance measures. These are preliminary; after the December 2 meeting, the TAC will focus on developing these further.

Maximize reproductive success of terns and plovers

- **Maximize average fledging success rate**
- **Maximize total number of fledglings**

The primary goal and driver of the decision process is to maximize the reproductive success of terns and plovers. There are two potentially relevant elements to reproductive success. One is the average reproductive success over time, normalized by the number of breeding pairs (i.e., fledge ratios), and the second is the actual numbers of fledglings produced over time. As these objectives are refined and candidate performance measures are identified, there may also be other important elements of reproductive success that emerge. There are a range of possible performance measures for any objective. Candidate measures that directly report on reproductive success include fledge ratios and # of fledglings. These measure and report different things. The TAC will need to develop the rationale for using these or other performance measures and reach agreement on how they are to be interpreted. Models are under development that can estimate these as a function of habitat area and longevity, for a range of on- and off-channel management actions.

Maximize co-benefits for whooping cranes

- Contribute to the survival of whooping cranes during migration

While the primary purpose of the decision process is to address terns and plovers, some of the proposed management actions may entail co-benefits or risks for whooping cranes. This objective reflects a desire to assess the effect of these actions on the availability of suitable whooping crane migratory habitat. The selection of useful performance measures will depend on the availability of information and modeling capability. One option to consider is a constructed scale for “co-benefit potential”, with scores assigned by TAC members or other experts.

Maximize maintenance of a braided river form

- Maximize sediment balance/minimize deficit (short term and long term)

- Maximize the unvegetated, unobstructed channel width

This objective reflects a belief that by approximating the river’s historical natural braided form condition, it will be better able to deliver a range of ecological benefits. A braided river form is broadly understood to be a key means for supporting the target species (terns/plovers and whooping cranes) as well as a range of non-target species. Two primary drivers of braided form that can be influenced by Program management actions are sediment balance and the maintenance of an unvegetated unobstructed channel width. There are differences of opinion about the extent to which any of the actions that will be evaluated in this process (e.g., in-channel island building) can influence these drivers. In order to explore and reach common understanding about these benefits, it will be useful to develop impact hypotheses and performance measures for them. Performance measures will need to be specific about both the extent and duration of benefits (e.g., short versus long-term). Depending on the availability of information and modeling capability, performance measures could include quantitative metrics (e.g., volume of sediment released, days of sediment accrual per year, etc.) or constructed scales (systematic scoring systems). That latter would be used by TAC members or other designated experts to assign scores. Such performance measures would serve as proxies for the extent to which a management action supports the maintenance of a braided river form. We note that the two drivers identified here (e.g., sediment balance and unvegetated unobstructed channel width) are derived from our brief and primarily non-technical interviews; a more thorough technical review may result in confirming or modifying these.

Avoid or minimize adverse impacts to pallid sturgeon

- Minimize flow conditions that could adversely affect pallid sturgeon

It is not expected that any of the proposed management actions will have any influence on pallid sturgeon. However, given the overall Program objectives, it will be important to confirm that this is the case. This objective reflects an interest in having a check in place to flag any proposed action that has the potential to harm or introduce risks to pallid sturgeon. A suitable performance measure could simply define a critical flow threshold below/above which it is reasonable to conclude that effects would be negligible. If any action exceeds the threshold, then more sophisticated analysis would need to be conducted.

Minimize management costs

- Minimize financial cost of management actions

- Minimize water cost of management actions

This objective reflects a concern for the wise use of resources. All else being equal, actions that increase tern and plover productivity at lower cost are preferred. There are two kinds of costs – financial costs associated with land acquisition or management actions, and water costs – the volume of water used for terns and plovers. Two performance measures are likely needed. A financial measure would report the net present value or levelized annual cost of management actions over the assumed life of the planning period

(First Increment). A second measure would report the average annual water used to create habitat for terns and plovers. Money and water used for terns and plovers are not available for use in management actions for other purposes (e.g., whooping cranes, etc.) and thus these objectives also reflect (that is, serve as proxies for) the opportunity cost associated with using resources on terns and plovers.

Maximize learning (ability to answer Big Questions)

- **About terns and plovers**
- **About whooping cranes**
- **About mechanisms for maintaining a braided river form and characteristics of the braided river form that support target species**

This objective reflects an interest in continual learning to improve the benefits from management actions. As the decision process proceeds, opportunities for learning may be identified and need to be evaluated alongside other potential uses for resources. In some cases, there may be trade-offs associated with learning. For example, alternatives may be developed in this process that have benefits for learning about terns and plovers, but are not estimated to result in as many fledglings. The longer-term benefits of learning will need to be weighed against the short-term benefits of more fledglings. Given the budget constraints in the First Increment, it is not yet clear whether opportunities for learning will be significant.

Preliminary Alternatives

In this SDM process, different combinations of management actions will be grouped into discrete alternatives for evaluation against the decision objectives. Typically, the first iteration of alternatives starts with simple alternatives that can demonstrate the range of possible outcomes for the decision. We sometimes call these *bookend* alternatives. These alternatives are then iteratively refined based on evaluation results. The following broad alternatives are preliminary and are presented for illustration purposes. They will be developed further over the next few months.

1. **Stay the course.** Continue to maintain current levels of permitted on-channel and off-channel habitat. No additional flow actions for terns and plovers.
2. **Off-channel actions only.** In addition to maintaining the currently permitted off-channel habitat, the maximum possible amount of additional off-channel habitat is created within financial and time constraints.
3. **On-channel actions only.** In addition to creating and maintaining current levels of on-channel habitat at permitted sites owned by the Program, the maximum possible amount of new on-channel habitat is created at non-permitted sites owned by the Program (permits would have to be obtained) and permitted sites owned by others within financial and time constraints. Variations of this alternative could include different flow releases, such as: (1) a defined flow release during the nesting initiation period to increase habitat utilization; (2) a defined flow release during the incubation and rearing period as a “moating flow” (i.e. predator barrier); and/or (3) no flow augmentation for terns and plovers.
4. **Combination of on- and off-channel actions.** In addition to maintaining current levels of permitted on-channel and off-channel habitat, 50% of the remaining financial budget is spent on new on-channel habitat and 50% is spent on new off-channel habitat. The same flow variations as alternative #3 could be included.

Within each of these there are also variations in how habitat may be acquired, created and/or maintained. **Table 1** summarizes some of the ideas proposed by GC and TAC members during the interviews. One of the core tasks of the TAC will be to explore the different ways of building habitat and different types of

270 flows for terns and plovers. The TAC will then make recommendations to the GC on how best these
 271 different actions can be combined into a reasonable number of alternatives for evaluation.

272 **Table 1 Preliminary Alternatives Identified During Interviews**

<p>On-channel nesting habitat for terns and plovers</p> <ul style="list-style-type: none"> • Build and maintain big, permanent sandbars (using mechanical methods). Where available, these sandbars are created by buying vegetated sandbars and de-vegetating them. Once de-vegetated, the sandbars erode. Continual maintenance is required to counteract erosion. • Build small, shifting groups of sandbars. The sandbars erode over time and are re-built in a different location. This is thought to be more cost-effective than building and maintaining big permanent islands and may help to prevent the creation of predator traps. • Extend the life of naturally formed sandbars. In high flow years, sandbars are formed at a range of heights. Sandbars above the minimum height for nesting would be maintained in a de-vegetated state to extend the length of time available for nesting. Bars just below the minimum height could be used as a base for the construction of higher sandbars. • De-vegetate sandbars and allow them to erode (i.e. no mechanical maintenance of sandbars). Most of these sandbars are owned privately and would either have to be bought or management agreements or easements would have to be negotiated. There may be potential short-term co-benefits to this action for whooping cranes (by increasing unvegetated width of the channel) and sediment augmentation (by releasing sediment trapped in a vegetated sandbar).
<p>On-channel flows for terns and plovers</p> <ul style="list-style-type: none"> • Maintain a “nest initiation flow”. Program data suggest that increasing discharge during the nest initiation period increases on-channel habitat utilization under low flow conditions. • Maintain a “moating flow”. The intent would be to separate sandbars from the mainland during incubation and rearing. It is hypothesized by some that providing a moating flow reduces predation from terrestrial predators. Thus far, the Adaptive Management Plan has not tested this hypothesis.
<p>Off-channel nesting habitat for terns and plovers</p> <ul style="list-style-type: none"> • Maintain current off-channel habitat. The Program is currently managing 135 acres of off-channel nesting habitat, which includes a combination of rehabilitated sandpits, mined sandpits, and mechanically created sandpits. • Acquire new off-channel habitat at mining sites. Acquire and/or negotiate agreement with mine operators to conduct mining operations in such a way as to create tern and plover nesting habitat. This approach is typically quite inexpensive but very slow. It often takes operations a decade or more to mine out an entire site. • Acquire and restore off-channel sandpit habitat. Acquire existing abandoned mine sites and rehabilitate suitable nesting habitat through vegetation removal and modification of existing spoil areas. This approach is quick and typically inexpensive but there are a limited number of existing abandoned mine sites. • Construct new-off channel sandpit habitat. Acquire lands adjacent to the channel or in the floodplain and construct nesting habitat through mass grading operations. This approach is typically quite expensive but habitat can be constructed quickly.

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