Independent Science Advisory Committee (ISAC)

Responses to Questions Posed by the Platte River Recovery Implementation Program (PRRIP) in October 2014

Islands in Platte River near Elm Creek during high flows, Oct 2, 2013.

Submitted to
PRRIP Governance Committee

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The Platte River Recovery Implementation Program (PRRIP or Program) requested written input from the Independent Science Advisory Committee (ISAC) on six questions. These questions were the focus of discussions during the ISAC meeting on October 16, 2014 in Omaha, NE, which immediately followed the Adaptive Management Plan (AMP) Reporting Session on October 14-15, 2014. To enable the Program to easily extract ISAC recommendations from our overall discussion of the questions posed to us, we have put our most important recommendations in **blue bolded** text. These recommendations are contained within the context of the overall discussion of each question so that our rationale is clear.

General Questions

1) Are the 2014 Big Question assessments logical based on your understanding of Program data and consistent with what you have learned during your involvement with the Program?
Reference Document – 2014 State of the Platte Report Cards

We have the following high level comments and recommendations on the Big Question (BQ) assessments:

- In general, the ISAC likes the new format, and adds the following recommendations:
  - **the graphic is very important and will be main piece read by the Governance Committee, so making this graphic scientifically correct and easily understood is essential**
  - **slider bars should have the key metrics related to each big question (e.g., habitat for BQ 1, not # nests on third bar)**
  - **include more explanation in assessment caption for slider bars (e.g., relationship to objectives; showing Short-Duration High Flows (SDHF) on bars, meaning of red and green)**
  - **you may not need green on some bars, just red (more not always better)**
  - **include report cards at the front of State of the Platte Report so that previous lines of evidence are not lost, with updates to the State of the Platte report included in the main report**
- With respect to the text included in the report cards (and the overall State of the Platte report) **we recommend that the Program use phrases which distinguish among different levels of evidence, such as:**
  - We're certain of the following…
  - We estimate with confidence that…
  - Current models predict…
  - Remaining uncertainties include…
  - Our judgment is that…
  - Our predictive ability would be enhanced if…

The ISAC has the following specific comments on individual assessments of the Big Questions:

- BQ #1 - Will implementation of Short-Duration High Flow releases produce suitable tern and plover riverine nesting habitat on an annual or near-annual basis?
  - *Current rating in 2014 report card:* One thumb down now, possibly two thumbs down after peer review of 6 tern / plover synthesis chapters
  - *ISAC comments and recommendations:*

- ISAC agrees with 2014 report card conclusions on BQ #1.
- **Figure 1 should list the amount of suitable in-river habitat created next to each point, not the number of nests.**
- **Including cost on Figure 1 (top x axis) is misleading, since many of the high flow events were natural, and such high volumes would not have been purchased; the cost of water can and should be discussed in the text.**

- BQ #2 – Will implementation of Short-Duration High Flow releases produce and/or maintain suitable whooping crane riverine roosting habitat on an annual or near-annual basis?
  - *Current rating in 2014 report card:* Scratchy head; uncertain
  - *ISAC comments and recommendations:*
    - Without effective spraying and mechanical actions, SDHF could make things worse by causing an incised channel and depositing vegetation on existing bar forms.
    - SDHF on its own (as stated in BQ #2) will not be able to <u>produce</u> sufficient channel widths and suitable roosting habitat for whooping cranes in the Central Platte River. SDHF *may* be able to <u>maintain</u> sufficient channel widths, if (and only if) such flows follow *Phragmites* control and mechanical actions to remove vegetation, and SDHF are applied during the germination season.
    - We support the Program's proposal to adjust the current rating to 1 thumb down based on the above comments and the weight of evidence.
    - **In 2015, the Program should consider revising BQ #2 to BQ #2a: "*If applied after herbicide and mechanical actions to remove vegetation, will SDHF during the vegetation germination season be able to <u>maintain</u> suitable whooping crane riverine roosting habitat on an annual or near-annual basis?*"**
    - The USGS telemetry data presented by Aaron Pearse is very relevant to BQ#2. The report card should describe the 10th percentile and median channel widths used by satellite-tracked whooping cranes, since these data help to inform the definition of "suitable" in BQ#2. These values could be included on the slider diagram.
    - **The Program should describe a process and timeline for revising habitat suitability criteria for whooping cranes.** First, the Program should communicate a process and timeline for how they will use telemetry data results, (e.g., slides 35-43 from Aaron Pearse's PowerPoint) to evaluate and possibly refine their minimum habitat use criteria for whooping cranes. Second, the program needs to refine its understanding of the relationship between channel width and suitable habitat. At this point in time, it isn't clear whether the cranes select for channel width or for habitat that meets the use criteria identified by the Program. Note that developing habitat that meets the habitat use criteria may be a consequence of channel width, but could also be achieved by other means. There may be a mismatch between SDHF creating a 750' minimum channel width and the Program's minimum habitat criteria for cranes. None of the minimum habitat criteria include channel width (see pg. 76 in 2014 State of the Platte Report). The implied assumption of the Program is that creating a 750' wide unvegetated channel width will yield all or most of the minimum habitat criteria. Is this valid? Is it being tested?

- Further ISAC suggestions on vegetation monitoring and habitat suitability are found at the end of this report in parts d and e (respectively) of section **9) other ISAC Suggestions**.
- The caption for Figure 2 should indicate that pink areas are vegetated.

- BQ #3 – Is sediment augmentation necessary for the creation and/or maintenance of suitable riverine tern, plover, and whooping crane habitat?

  - *Current rating in 2014 report card:* One thumb up. Various complexities noted.

  - *ISAC comments and recommendations:*

    - ISAC generally agrees with 2014 report card assessment of BQ #3, but we think that sediment augmentation needs to be thought through more carefully. It appears that sediment augmentation is necessary upstream of Kearney, an area which is definitely in sediment deficit. The PRRIP plan was to add sediment near J2 and make the whole Associated Habitat Reach come to sediment balance. Unfortunately, it appears that large flow events create degradation, which then requires much more sediment.
    - Based on the modelling work by Tetra Tech presented by Bob Mussetter in Omaha on Oct. 14, it's challenging to determine whether or not the river is in balance in other areas (i.e., lots of samples required, uncertainty as to whether survey locations are representative of the overall reach and adequately cover spatial variability). If a reach were in sediment balance, then by the original definition of Flow-Sediment-Mechanical treatments (FSM) you would not need sediment augmentation to create / maintain habitat. Using green LIDAR to assess changes in channel geometry and aggradation / degradation over time (see ISAC comment in section 9) should provide better spatial coverage, even though it's less precise than data from cross-sections.

    - **We recommend addressing sediment augmentation on a small scale rather than on a 90 mile scale (e.g., in 5 miles below J2 reservoir, using finer sediment grain size; or at Shoemaker Island). This will be a much more tractable adaptive management experiment, with stronger spatial and temporal contrasts, that can be intensively monitored to accurately determine changes in sediment transport and storage as well as bar formation.**

- BQ #4 – Are mechanical channel alterations necessary for the creation and/or maintenance of suitable riverine tern, plover and whooping crane habitat?

  - *Current rating in 2014 report card:* One thumb up

  - *ISAC comments and recommendations:*
    - In general, we concur with the conclusion on BQ #4 – mechanical channel alterations are necessary. However, there are some subtleties which need to be discussed in either the report card or the State of the Platte report, as outlined below.

- The required *frequency* of channel maintenance may be somewhat different for whooping crane (WC) vs piping plover (PP) and least tern (LT) habitats. Whooping crane habitat was apparently maintained at Rowe Sanctuary, but it appears to be much more difficult to maintain piping plover and least tern nesting islands.
- Is there a "Goldilocks bar height" of mechanically created islands for piping plovers and least terns– not so high that turtles colonize them, yet high enough to not be frequently washed away during the nesting season, and low enough to remain islands (rather than peninsulas) so that birds use them? Or is that difficult to achieve in most of the Central Platte reaches for reasons outlined in the synthesis chapters, including flow timing / nesting conflicts, resulting in the need to apply mechanical treatments annually? What is the persistence of "Goldilocks" bars?
- If there is no such "Goldilocks bar height" for some reaches, then **the answer to BQ #4 will need to elaborate on the frequency of mechanical channel alterations required to create and maintain in-river piping plover and least tern habitat on a sustainable basis in these reaches.**
- Minor comments:
    - In the section "Answering BQ #4 in the First Increment" the phrase "if published in a peer-reviewed journal" should be changed to "if successfully peer-reviewed according to the Program's peer review process" (see ISAC 2013 report on the PRRIP).
    - The second y-axis in Figure 4 should have units of Watts/m^2. This is a very important figure.
    - The caption on Figure 5 states that Rowe Sanctuary retained "high habitat suitability". Please clarify whether this is for whooping cranes only or also for terns and plovers

- BQ #5: Do whooping cranes select riverine roosting habitat in proportions equal to its availability?

    - *Current rating in 2014 report card:* Uncertain – scratchy head

    - *ISAC comments and recommendations:*
        - We understand that the habitat selection study is not yet complete, and so this conclusion is reasonable at this time. The assessment should include inferences from both USGS telemetered birds and local data.
        - Once the present crane telemetry results are evaluated, it should be determined how useful local and telemetry monitoring has been in addressing crane-related Program Big Questions and if each form of monitoring should be continued, reactivated, redesigned, or discontinued (if past data are sufficient).
        - As stated, the phrasing of BQ #5 apparently refers to the *proportion of the total area* that is made up of riverine roosting habitat (i.e., a spatial comparison). This is subtly different than hypothesis WC-1, which states: "Whooping cranes that use the central Platte River study area during migration seasons prefer habitat complexes (Land Plan Table 1) and use will increase proportionately to an

increase in habitat complexes" [emphasis added]. WC-1 hypothesizes that both the area of Program habitat complexes and whooping crane use will increase *over time*. BQ #5 and WC-1 imply different kinds of data analyses. **The Program should clarify which question they really want to answer – WC-1 or BQ #5 (or both).**

- For BQ #5 as stated, if the analysis shows that whooping cranes are selecting particular habitats and preliminary analyses suggest that they appear to select managed lands despite using a wide range of habitats). The Program should first define a criterion for what constitutes selection (e.g., biologically and statistically significant differences between use and availability). If such differences are observed, the Program might reconsider their current ranking. For example, if managed lands make up 20% of the area, but have 40% of the cranes and this mean use is statistically different than availability then the birds are not selecting Program habitats in proportion to their availability.
- It will be important to explain to the Governance Committee that a 1-thumb down answer to this BQ (with birds selecting managed lands over other lands) actually means that the Program efforts to create habitat are effective (a confusing outcome). Are there other options like rephrasing the question (e.g., *Do whooping cranes select suitable habitat in proportions greater than its availability?*) The percent of the total whooping crane population using the Platte is a very useful secondary indicator of the suitability of roosting habitats for whooping cranes in the Central Platte (Figure 6).
- It is important that the Program not equate 'use' with 'preference'. For example, if managed lands make up 20% ± a confidence interval (CI) of available area, but cranes use managed lands 40% ± CI of the time or 40% + CI of the cranes were recorded on managed lands, it is incorrect to conclude that they 'prefer' managed lands over other habitats along the central Platte. 'Preference' implies selection of a particular habitat (i.e., any potentially limiting resource like food, habitat, mates) when ALL suitable habitats are available to choose from. It is unlikely that all suitable habitats for migrating cranes are present within the Central Platte Program Area, thus *preference* cannot be determined. In the above example cranes are '*selecting'* managed lands, perhaps because they are the most suitable of the options present within the Program, although they might prefer some other conditions. One benefit of the telemetry study is that it provides a larger sample of available habitats for the cranes to select from and thereby provide the Program with a more accurate measure of selection.
- Further suggestions on data analyses for BQ #5 are found at the end of this report in part e of section **9) Other ISAC Suggestions**.

- BQ #6 – Does availability of suitable nesting habitat limit tern and plover use and reproductive success on the central Platte River?
  - *Current rating in 2014 report card:* One thumb up
  - *ISAC comments and recommendations:*
    - Patterns of change in the Central Platte River are consistent with the hypothesis that more habitat leads to more birds, but there are alternative explanations which should be acknowledged and addressed.

- The above point was discussed in both the October 2013 and May 2014 ISAC reports, and was presented by the ISAC to the Governance Committee in June 2014 (Figure 1). As stated in the May 2014 ISAC report (page 3, point 6):

  > "As described in previous ISAC comments (PRRIP 2013 State of the Platte Report, pg. 46), there are other alternative mechanisms which might explain the observed patterns of increased nests and breeding pairs, including: increases in the overall meta-population; decreases in other habitats (e.g., Lake McConaughy) has caused birds to move to the Central Platte; improved predator control in off channel sand and water (OCSW) habitats (rather than increased habitat area) has resulted in improved survival and increased numbers of nests… **The Program should acknowledge these alternative explanations in the State of the Platte Report and evaluate them to the greatest degree possible given available data."**

- We understand that Program scientists "are still working through how to acknowledge these alternative explanations" (statement in the document "PRRIP Responses to May 2014 ISAC report"). There isn't much to work through. The State of the Platte report could simply quote or paraphrase text from the October 2013 or May 2014 ISAC reports as alternative explanations of the observed patterns. If alternative explanations are not acknowledged (even if they can't be tested with current data), it will likely be difficult for the published analyses of BQ #6 to pass successfully through a peer review. Peer reviewers need to see that scientists have openly considered all plausible explanations of observed patterns, not only their preferred hypothesis. **The ISAC recommends that the Program implement our previous recommendations from our October 2013 and May 2014 reports, and illustrate alternatives using comprehensive conceptual ecological models for each species, as recommended in the ISAC's 2009 report (pages 7, 15-18).**

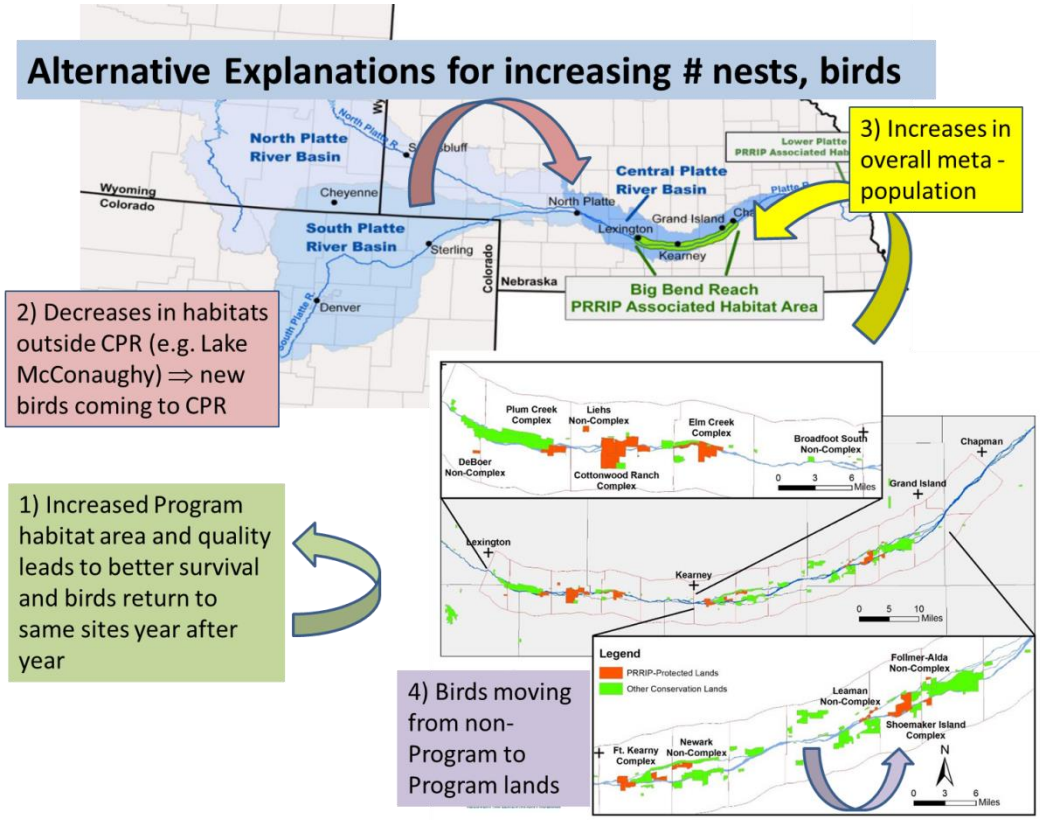
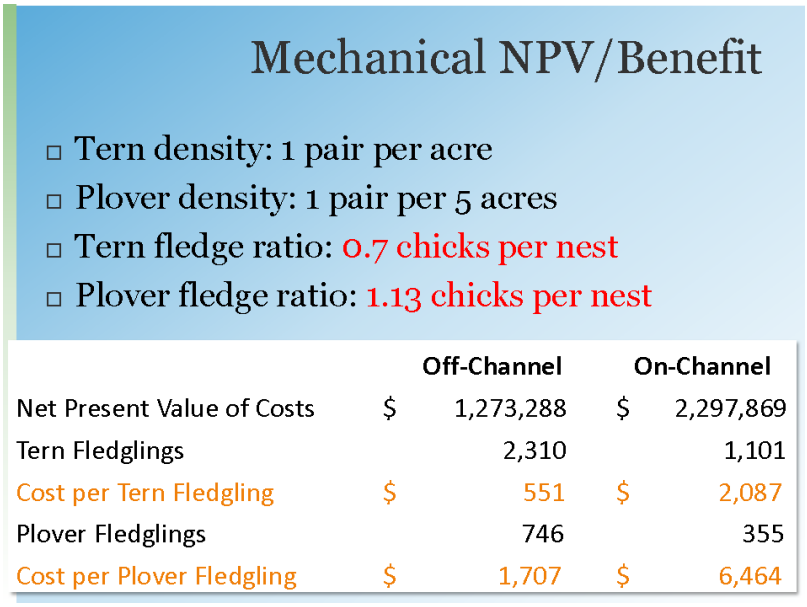


Figure 1: Illustration of alternative hypotheses to explain increasing numbers of nests and birds on Program Lands. (Source: ISAC presentation to Governance Committee on June 10, 2014).

- BQ #7 – Are both suitable in-channel and off-channel nesting habitats required to maintain central Platte River tern and plover populations?
    - *Current rating in 2014 report card:* One thumb down
    - *ISAC comments and recommendations:*
        - We agree with the one thumb down assessment. Furthermore, Jason Farnsworth's very helpful analysis (Table 1) showed that fledging birds on off-channel habitat is more cost-effective than fledging birds on in-channel habitat.
        - Jason's analysis assumed that the fledge ratio of birds nesting on in-river islands was equal to fledge ratios on off-channel habitats. The synthesis papers show that the height of bars and timing of peak flows in the Central Platte unfortunately increase the risk of nest loss, so in-river habitats likely have lower fledging rates and higher costs / fledgling than indicated in Table 1. It would be good for Jason to show a range of costs / fledgling that incorporate a range of reasonable assumptions about fledgling rates.
        - In addition to the metrics in Table 1, it would be helpful to show the cost per fledgling based on the sum of both terns and plovers.

Table 1: Comparison of the costs of creating off-channel and in-channel habitat. (Source: Jason Farnsworth, Land Presentation at 2014 AMP Session)



	Off-Channel	On-Channel
Net Present Value of Costs	$ 1,273,288	$ 2,297,869
Tern Fledglings	2,310	1,101
Cost per Tern Fledgling	$ 551	$ 2,087
Plover Fledglings	746	355
Cost per Plover Fledgling	$ 1,707	$ 6,464

- BQ #8 – Does forage availability limit tern and plover productivity on the central Platte River?
    - *Current rating in 2014 report card:* One thumb down
    - *ISAC comments and recommendations:*
        - ISAC agrees with this conclusion, and has comments on the draft journal article (see more detailed responses below under ISAC question #6).
        - The most important finding is that tern fledging does not decline at low flows

- BQ #9 – Do Program flow management actions in the central Platte River avoid adverse impacts to pallid sturgeon in the lower Platte River?
    - *Current rating in 2014 report card:* One thumb up
    - *ISAC comments and recommendations:*
        - ISAC agrees with this conclusion. No new information was presented to change this assessment.
- BQ #10 – How do Program management actions in the central Platte River cumulatively contribute to least tern, piping plover, and whooping crane recovery?
    - *Current rating in 2014 report card:* One thumb up
    - *ISAC comments and recommendations:*
        - ISAC agrees with this conclusion
        - **The word "How" should be removed from BQ #10, so that the question can be answered either positively or negatively.**

2) Is the PRRIP (stakeholders, EDO, and contractors) implementing Adaptive Management Plan management actions, research and monitoring, and data synthesis in a way that facilitates hypothesis/Big Question testing and evaluation of the FSM management strategy?

- The ISAC believes that the Program is doing adaptive management as intended in the Adaptive Management Plan. In both this and previous reports the ISAC has made various recommendations for improving the design and implementation of actions, as well as monitoring and evaluation methods. The Program has been very responsive to the ISAC's recommendations, and such iterative improvements are a hallmark of rigorous adaptive management.
- Adaptive management involves iterative learning from management actions, research and natural variability. The Program has been intensively involved in such learning, as evident through the annual Adaptive Management Plan reporting sessions, and periodic changes in actions, modelling, monitoring, analyses and conclusions.
- The program is implementing AM as described in the U.S. Department of Interior technical guide to adaptive management (Williams et al. 2009) and is consistent with other earlier guides to adaptive management (Holling et al. 1978, Taylor et al. 1997, Sit and Taylor 1998, BC Ministry of Forests 2000).
- Adaptive management hypotheses can be tested using unexpected natural events as well as deliberately implemented management experiments (Taylor et al. 1999, Melis et al. 2006). For example, as described in the ISAC Oct 2013 report (answers to BQ 1), the Program does not need to have exactly SDHF magnitude and duration of flows to gain knowledge about the efficacy of SDHF for habitat creation and maintenance. Flows in excess of SDHF have occurred opportunistically, and where there is sediment balance these events are reasonable tests of SDHF and provide useful information for BQ 1. Further suggestions on tests of SDHF and geomorphic monitoring are found at the end of this report in part c of section **9) Other ISAC Suggestions**.
- **We recommend that the Program concisely document each of the AM steps that have been completed for each of the Big Questions in each year of the program (conceptually illustrated in Table 2), including documenting the learning that has occurred from both planned and unplanned/natural experiments.** This would be a valuable synthesis for both the Platte Program and other large AM programs. To be valuable for Program learning, this documentation will require a detailed description of exactly how hypotheses were tested, a candid assessment of the challenges encountered, and various iterations to revise previous steps in the AM cycle (i.e., the devils are in the details). To lessen the burden of this task, we suggest that the

EDO go through a first pass at a high level in a concise format, and then evaluate the most appropriate form and timing for a more detailed description.

- **We also advise the Program to conduct periodic evaluations of all existing research and monitoring programs to assure they are yielding information capable of discriminating among alternative priority hypotheses that address Big Questions, and revise or eliminate those that do not.**

Table 2. Conceptual illustration of documenting AM steps completed by the Program for each Big Question. The arrows in 2012 and 2013 illustrate hypothetical revisions of hypotheses, experimental designs, monitoring and evaluation.

Big Question	AM Step	2007	2008	2009	2010	2011	2012	2013	2014
1	1-Assess	Step 1.1	Step 1.2				Step 1.3		
	2-Design		Step 2.1	Step 2.2			Step 2.3	↘	
	3-Implement			Step 3.1	Step 3.2		↑		
	4-Monitor			Step 4.1				Step 4.2	
	5-Evaluate			Step 5.1				Step 5.2	
	6-Adjust						Step 6.1		
2									
…									

3) **Given existing channel conditions and multiple outside influences on performance (e.g. extensive vegetation encroachment and associated management), how can the Program best test the hypotheses underlying Big Question #2 and arrive at an answer?**
Reference Document – 2014 State of the Platte Report Cards

- The ISAC's view is that the range of flows and channel width responses experienced over the last several years is sufficient to answer BQ #2 and test hypothesis PP-1b. The ISAC supports the Program's proposal to change the answer to both BQ #2 and hypothesis PP-1b to 1 thumb down.
- Figure 4 in the Big Questions report cards illustrates that SDHF is not sufficient on its own to increase the width of the vegetation-free channel. SDHF could only work in concert with *Phragmites* control (spraying, grazing, drying) and other mechanical actions. **It is worth exploring biological controls on *Phragmites* including cattle, though we recognize the challenges of keeping cattle out of the river. Additional ideas are given here: http://greatlakesphragmites.net/files/JGilbert-Phrag-talk_April-5-2013.pdf**
- The best test of alternative combinations of actions would involve measures of biological effectiveness, cost effectiveness, and persistence over time.

4) **How should the Program evaluate the "cumulative contribution" of management actions to target species recovery and thus develop an assessment for Big Question #10?**
Reference Document – 2014 State of the Platte Report Cards

- As stated above, the Program should remove "How" from start of big question 10 since in its current form the question can't be answered either positively or negatively.

- To answer BQ10, work through cause-effect pathways in conceptual models for each species (i.e., from implementation of actions to habitat change to biological response measures), evaluating the likelihood of each step being true, and also examining the likelihood of other explanations (e.g., Figure 2, Table 3)

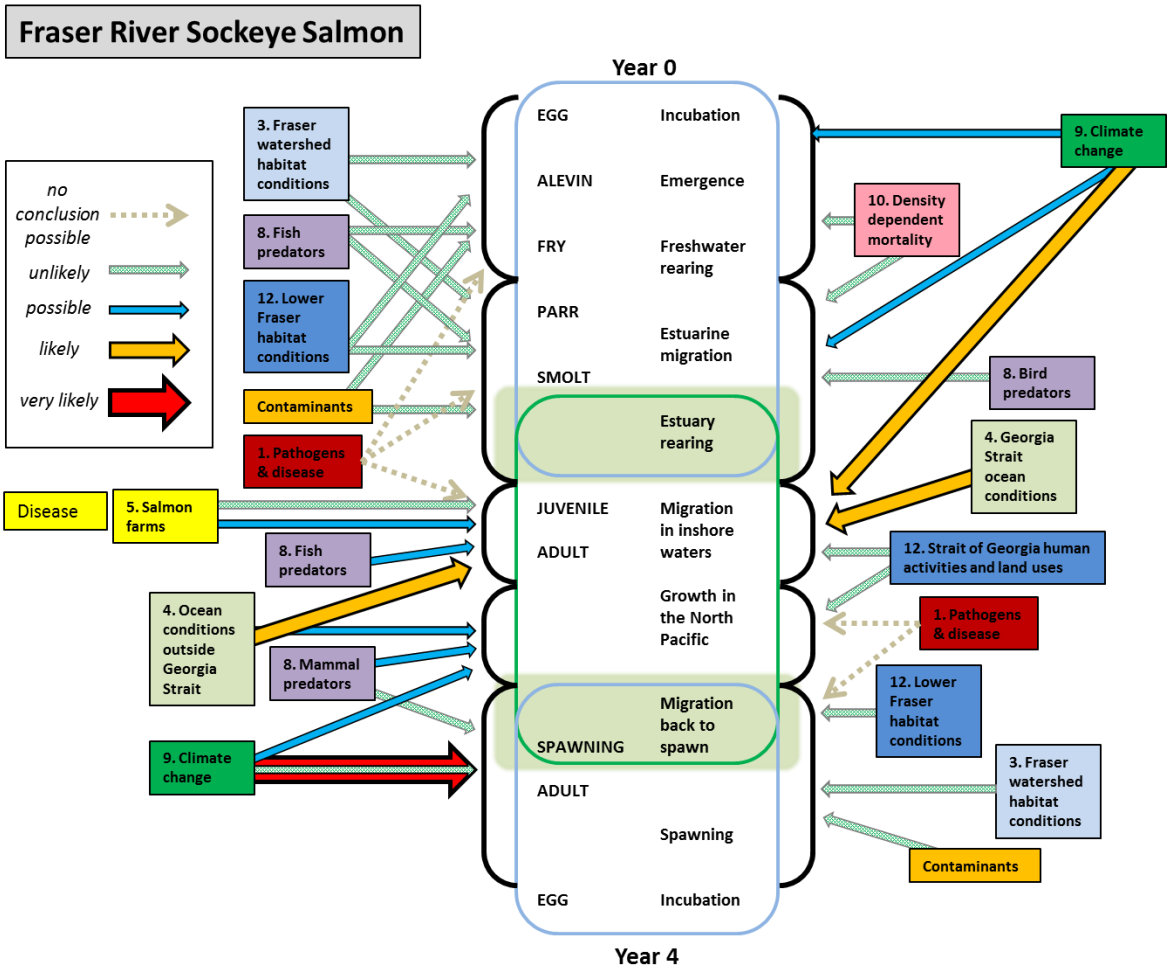


Figure 2. Example of a conceptual model that summarizes the likelihood of different causes for observed changes in a species. The topic illustrated is declines in the productivity of sockeye salmon in the Fraser River, with twelve hypothesized causes that interact cumulatively to affect different life history stages (middle part of diagram). The sockeye conceptual model and possible mechanisms of change are much more complicated than the Platte conceptual models. The width and color of the arrows designates the likelihood of each possible cause (see legend in upper left). Table 3 shows the same analysis in tabular form. Source: summary presentation of Marmorek et al. 2011.

Table 3. Tabular representation of the likelihood of different causes for observed changes in a species (alternative form to summarize the information in Figure 2). Source: Marmorek et al. 2011

Factor	Life History Stage				
	STAGE 1 Incubation, Emergence and Freshwater Rearing	**STAGE 2** Smolt Outmigration	**STAGE 3** Coastal Migration & Migration to Rearing Areas	**STAGE 4** Growth in N. Pacific and Return to Fraser	**STAGE 5** Migration back to spawn
Forestry[a]	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Mining	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Large hydro	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Small hydro	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Urbanization above Hope	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Agriculture	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Water Use	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Contaminants	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Density Dependent Mortality	Unlikely	Unlikely	Unlikely[b]	Unlikely[b]	Unlikely[b]
Pathogens	No conclusion possible	No conclusion possible	No conclusion possible	No conclusion possible	No conclusion possible
Predators	Unlikely	Unlikely	Possible	Possible	Unlikely[b]
L. Fraser land uses	Unlikely	Unlikely	n.a.	n.a.	Unlikely
Strait of Georgia human activity & land uses	n.a.	n.a	Unlikely	Unlikely	n.a.
Climate Change	Possible	Possible	Likely	Possible	Definitely[c] Unlikely[d]
Marine Conditions	n.a.	n.a.	Likely	Possible	n.a.
Salmon Farms – Waste	n.a.	n.a.	Unlikely	n.a.	n.a.
Salmon Farms – Escapees	n.a.	n.a.	Unlikely	n.a.	n.a.
Salmon Farms – Sea Lice	n.a.	n.a.	Unlikely	n.a.	n.a.
Salmon Farms – Disease	n.a.	n.a.	Possible Unlikely	n.a.	n.a.
Hatcheries - Disease	n.a.	n.a.	Unlikely	n.a.	n.a.

c: escapement and harvest

d: R/S productivity

5) Are the assumptions, methods, results, and conclusions in the sixth Tern and Plover Habitat Synthesis chapter reasonable?
Reference Document – EDO memo on channel width and nest incidence

- Yes. ISAC members have provided the EDO with detailed suggestions on how to improve the presentation of these results.

6) Are the assumptions, methods, results, and conclusions in the Forage Fish Analysis manuscript reasonable?
Reference Document – Forage Fish Analysis manuscript

- ISAC has some questions on the draft manuscript's assumptions, but generally agrees with the overall conclusion that forge fish availability does not limit tern fledgling success (productivity). The most convincing evidence in the paper is in Figure 3 (relationship between fledgling success and flow), which does not require using the forage fish data. There are alternative hypotheses that could explain the paper's conclusions that were unable to be tested given the design of the forage fish monitoring program. Detailed comments and suggestions which we think would greatly improve the manuscript have been provided to the EDO.

- **We recommend that once this manuscript is revised to include multiple lines of evidence (USGS Sherfy report data; tern bioenergetics model), that it undergo the Program's internal peer review process as recommended by ISAC guidelines (2013 Report on the Platte River Recovery Implementation Program, pgs. 11-16) prior to submitting for publication.**

- We reiterate previous recommendations over the approach taken to address forage fish availability that are specific to this Big Question, but applicable to Program monitoring in general (ISAC 2009 Report on the Platte River Recovery Implementation Program; e.g. pg. 29: *It is recommended that a forage fish evaluation program be designed to explicitly test PRRIP interior least tern (ILT) foraging priority hypotheses, and be based primarily on the tern's perspective not the fishes*'.). Robust AM requires monitoring programs be designed and implemented to yield results that explicitly assess performance of management actions at achieving Program objectives (see Block et al 2001, Nichols and Williams 2006, Lyons et al 2008 for general guidance on designing monitoring for AM). Legacy monitoring such as the Nebraska Public Power District and Central Nebraska Public Power and Irrigation District's forage fish monitoring protocol were adopted to address Big Question 8, "Does forage availability limit tern and plover productivity on the central Platte River?. However, these legacy monitoring programs did not provide information specifically designed to serve Program needs. Preparing this product as a manuscript to illustrate how surveillance monitoring data can be statistically analyzed for an AM/decision analysis case study, perhaps better illustrates the importance of designing targeted effectiveness monitoring capable of discriminating among alternative priority hypotheses at a program's outset.

7) **Are the assumptions, methods, results, and conclusions in the Planform Management manuscript reasonable?** *Reference Document* – Planform Management manuscript

- The ISAC felt that the oral presentation at the AMP Reporting Session was much stronger than draft manuscript.
- **The Planform Management manuscript needs much more work before it is ready to be submitted for peer review or to a journal.** Specifically, the manuscript should:
    - have a clearly stated objective that leads to evidence and a conclusion (the paper at present has a very "meandering" form);
    - use more recent planform literature (many of the references cited in Table 1 are no longer considered valid hypotheses, and are therefore not worthy of evaluation);
    - clarify the purpose of Table 1 with a more informative caption, which clarifies the meaning of the symbols (e.g., increasing the relationship variable is related to an increase (+) or decrease (-) in width, depth, etc.)
    - recognize that a lot of planforms that are called "braiding" may not be whooping crane habitat; and
    - respond to other detailed comments provided to the EDO by the ISAC.
- There is a worthwhile journal article here though it will require a fresh start. The available data sets for the Central Platte are unusually rich, and include records of channel change, planform and dimensions, together with flows, sediment transport, and vegetation. The focus on older references throughout is misguided. There are a number of significant independent variables which need to be considered, well beyond what even more recent contributions have considered, (e.g., the relative importance of flows during seed germination versus the annual peak). The authors should consider focusing the paper on rejection of oversimplified planform models /

discriminators in making decisions in the Platte as even the more mechanistic planform predictors do not capture some of the key processes that affect unvegetated width (the most direct physical metric related to the biological endpoint).

- A recommended path forward would be to have a revised version of the paper put through the Program's internal peer review process and then decide if it's appropriate to be published in a journal.

8) Do you have any recommendations for revisions or updates to the Target Flow Process recommended by the ISAC to the Governance Committee in 2012?
Reference Document – Target Flow Scope of Work

- Adaptive management involves learning. The ISAC has changed its view since 2012 on the best Target Flow Process in response to Program research and monitoring and the improved understanding of the system.
- Our current view is that the best possible use of program resources within the First Increment is to assess what *combinations* of actions (flow, sediment, mechanical) are likely to be most *effective* in achieving Program goals and objectives within currently available amounts of land and water, rather than focusing only on tools for determining target flows.
- This assessment should be accomplished through structured decision analysis, as recommended in comments 10 and 11 from our May 2014 report, including both cost and biological effectiveness of different actions.
- Such a decision analysis would explore a range of alternative combinations of actions, including changing the frequency, magnitude, timing and location of interacting flows, sediment and mechanical actions.
- The models used within the decision analysis could include a variety of tools and approaches which would have been explored under the original target flow process. Additionally, it will require more comprehensive conceptual ecological models (CEMs) built around the life-history of each of the target species that the Program specific CEMs currently in use (See main findings on CEMs from ISAC 2009 pgs. 7, 15-18).
- While it will be essential to externally review a completed decision analysis, the ISAC believes that this structured decision making process could be accomplished by the EDO working with the TAC and ISAC and using advice from an outside decision analysis expert as needed, rather than bringing in many outside experts through a workshop process as suggested in the 2012 target flow process.

9) Other ISAC suggestions

- The ISAC has the following additional suggestions to improve the Program:

a. Format of AMP reporting sessions:

i. have presentations link back to big questions and hypotheses, either via the EDO or directly

ii. have documents and 3-page executive summaries intended for review distributed at least 10 days prior to ISAC meetings, so that ISAC members have time to review them,

iii. distribute all PowerPoint files 24-hours prior to presentations; and

iv. use hyperlinks in documents.

b. The cost analysis provided by Jason Farnsworth (Table 1) was very helpful. It may be worth putting this material into a separate document, or under BQ 10. See ISAC comments 10 and 11 from our May 2014 report.

c. ISAC thoughts and recommendations on geomorphic sampling:

i. The Tetra Tech geomorphic assessment delivered orally on October 14th indicated that given what has been learned to date, the current monitoring regime will not deliver enough observations within an acceptable time frame (both sediment transport and cross-sections). It's likely not feasible to assess year to year changes in sediment storage and transport. The monitoring of both cross-sections and sediment transport could be improved by more intensive, site-specific sampling on a rotating annual schedule (e.g., once every 5 years), rather than making a couple of observations each year at every site. Sediment transport sampling needs to span a wide range of discharges, including high flows. Intensive sampling will still encounter high variance, but will be able to develop more reliable estimates of any changes over time in mean sediment transport.

ii. Similar slope, discharge and grain size means that there isn't much difference in cross sections within a reach, and also little change from year to year. Variability within a year is however a concern.

iii. The ISAC recommends more intensive sampling within a year at fewer places (e.g. 20-30 samples over 1 year across a wide range of discharges including high flows), with a 5-year sampling frequency to see if the sediment-discharge relationship has changed. The sampling frequency may need to be adapted to flow conditions (i.e., sampling in years with a wide range of flows will be much more informative than sampling during a very low flow year), though we recognize that it isn't possible to accurately predict water year conditions in advance.

iv. Shoemaker Island is an example of a high priority reach which could be a focus for more intensive sampling

v. Continue LIDAR (ideally green LIDAR) and aerial photography every year to get system wide estimates of changes in topography

vi. **It would be worth exploring the ability to create contrasts in FSM (i.e., some F&M, some FSM), and to further clarify the purpose of FSM (i.e., to build bars, to prevent channel degradation, to remove vegetation, or all of these).** First, if there is a decision to tinker with the low flow regime to suppress vegetation encroachment through inundation (during germination) and/or drying, then those flows will be expressed differently (e.g. depth, duration, hydroperiod, soil moisture) in varying cross-section / floodplain geometries across program lands. These sites may have diverse assemblages of plant species with different tolerances that occupy elevational gradients that vary in frequencies and durations of inundation / drying across sites. Flows that drown one species may help another by increasing soil moisture later on. Second, mechanical approaches may include spraying, grazing, and heavy equipment. This would seem to lend itself to some systematic testing of different combinations of these F&M treatments, and sediment augmentation might also contribute to setting up some contrasts. The right set of contrasts depends on the objectives, which could be either: 1) taking another shot at getting the river to build higher bars with finer sand (challenges with stage-discharge and flow timing relative to nesting notwithstanding); or 2) simply offset a probable trend of reach wide degradation. Mechanical approaches are clearly necessary –we don't need to look at

treatments without mechanical as non-Program channels will shrink over time. The river is evolving to "pearls on a string" (the wide places where mechanical interventions have widened the channel). Contrasts could include different combinations of mechanical treatments (with and without sediment augmentation in areas of likely channel degradation).

vii. **the Program should explore the feasibility of acquiring finer sand (but not too fine), to build higher bars** (building on the physical comparison synthesis paper), though the stage-discharge relationship may still preclude the creation of sufficient bars in the Central Platte reach

d. ISAC thoughts and recommendations on vegetation sampling:

i. The vegetation sampling seems disconnected from program goals and big questions. Identifying all of the different vegetation species on thousands of quadrats seems very labor intensive, and these data are not being used to test any specific Program hypotheses or big questions.

ii. The key performance measure of interest is unvegetated width, which does not require enumerating other species. The Program is interested in understanding what happens to distribution and abundance of undesirable species (e.g., *Phragmites*, 7 others), but enumerating all other species is not required.

iii. The sampling frequency (annual) is insufficient to detect the causes of vegetation change (e.g., ice, flows, herbicide, mechanical).

iv. It is worth rationalizing the vegetation sampling to focus on the species which the Program hopes to remove with flows and other actions, with less detailed observations at each quadrat for the system scale monitoring. Monitoring should focus on testing the effectiveness of specific actions (e.g., dry flows, inundation) for killing particular species of undesired vegetation.

v. Get a system wide picture of *Phragmites* and other plants, and get a detailed picture of mechanisms of vegetation scour etc. at a smaller intensively monitored site such as Shoemaker Island.

vi. Flying LIDAR and hyper spectral imagery to assess vegetation, and then ground truthing with vegetation sampling of key undesirable species might save lots of money.

e. Monitoring of whooping crane habitat selection for BQ #5:

i. It is worth finishing local analyses that are in progress by WEST, and to clearly understand the uncertainty in conclusions given the small sample sizes

ii. USGS analyses of GPS data for whooping cranes were very worthwhile in informing Program habitat criteria and should be given a high weight in future Program decisions on habitat suitability criteria for whooping cranes (see detailed comments on BQ #5 under ISAC question 1)

iii. once local and GPS analyses are completed, then it's worth assessing what is the most cost effective investment (i.e., more money into GPS work vs local work in the CPR)

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