compass

Platte SDM GC Meeting Pre-read: Summary

Contents

1 Decision Objectives and Performance Measures

Table 1 summarizes the preliminary decision objectives and performance measures developed to date. Below are the key considerations in selecting useful decision objectives and performance measures.

Decision objectives are concise statements of the outcomes that matter and could be affected by the decision. They're used to identify and evaluate alternatives. Good decision objectives are:

- Complete – all of the important consequences of the decision are covered;
- Concise – the number of objectives is the minimum appropriate for quality analysis and there are no overlapping or redundant concerns;
- Sensitive – they are sensitive to the alternatives under consideration given the decision context and bounds;
- Specific – the consequences of concern are clear enough that performance measures can be readily defined;
- Understandable – any interested individual knows what is meant by it.

Performance Measures (PMs) are the specific metrics for describing the performance of the alternatives with respect to the decision objectives. Selecting good performance measures requires consideration of the following desirable criteria:

- Accurate and direct – there is a clear and well-accepted relationship between the PM and the decision objective;
- Unambiguous – it is clearly defined, suitably precise, and will be interpreted by everyone the same way;
- Understandable – consequences and value trade-offs made using the PM can be readily understood and communicated;
- Operational – information and tools needed to model and report it are or can be made available;
- Complete and concise – as a set, the PMs report all the essential consequences without duplication.

The performance measures presented here reflect the input from the February 10-11 TAC meeting and may be refined with further input from GC.

Table 1. Summary of Decision Objectives and Performance Measures

Objective	Sub-Objective	Candidate Performance Measures	Units	PM Description
Piping Plovers and Interior Least Terns[1]. The primary goal and driver of the decision process is to maximize the reproductive success of terns and plovers.	Reproductive Success	PRRIP Breeding Pairs	#/year	The number of breeding pairs nesting on Program habitat in the Associated Habitat Reach (AHR) in a year. The PM reports the average for the 50-year simulation period.
		PRRIP Fledge Ratio	#/year	The number of fledglings divided by the number of breeding pairs for each year on PRRIP habitat. The PM reports the average for the 50-year simulation period.
		PRRIP Total Fledglings	#	The total number of fledglings produced on PRRIP habitat over the 50-year model simulation period. The PM indicates the PRRIP contribution to the global population over time.
		AHR Breeding Pairs	#/year	The number of breeding pairs nesting in the Associated Habitat Reach (AHR) in a year (includes non-Program habitat). The PM reports the average for the 50-year simulation period.
		AHR Fledge Ratio	ratio	The number of fledglings divided by the number of breeding pairs for each year within the entire AHR. The PM reports the ratio of the long-term average breeding pairs and fledglings.

[1] Separate PMs will be reported for Least Terns and Piping Plovers, but their descriptions are identical.

Management Cost. This objective reflects a concern for the wise use of resources. Money and water used for terns and plovers are not available for use for other purposes and thus these objectives reflect the opportunity cost associated with using resources for terns and plovers.	Long-term Management Cost	Long-term cost (net present value over 50 years)	$	The net present value of habitat creation and maintenance costs assuming the alternative is implemented over a 50-year period. This PM provides a basis for comparing the financial implications of management actions over a range of hydrological conditions.
	Short-term Management Cost	First Increment cost (total over 2017-2019)	$	The total cost of implementing an alternative for the period of the First Increment (2017-2019). This PM serves as an indicator of the impact on the Program budget. It provides an understanding of the short-term financial opportunity cost of investing in plover/tern habitat during the First Increment rather than other Program projects.
	Land Acquisition Cost	Total Estimated Cost	$	The total estimated cost of any required land acquisition. This PM captures the effect on the land purchasing budget.
	Long-term Water Use	Proportion of Program water used	%	The opportunity cost of water used for flow-related actions. This PM reports the average annual proportion of Program water used over the 50-year simulation period for three hydrologic year categories – wet, normal and dry water years.
	Augmented Volume	Average Volume of Program water per year	Ac-ft / yr	The average volume of water augmented per year to reach target discharges for during the nest initiation period and/or the brood rearing period.

Whooping Cranes. This objective reflects a desire to assess the effect of management actions designed for terns and plovers on the availability of suitable whooping crane habitat, and the potential use of that habitat.	WC Habitat Use	Habitat Suitability Scale (*changes* to habitat suitability)	7-point scale -3 to +3	Changes to the availability of suitable whooping crane habitat in the AHR during migratory periods, relative to current conditions, reported using a 7-point scale. This PM is a proxy for habitat use and ultimately migratory survival. The relationship between availability of suitable habitat and habitat use is unknown / unquantified. See Table 2 for definitions of specific levels.
Sediment Supply. This objective reflects a belief that maintaining an abundance of sediment in the channel is an important contributor to a river form used by the Program's target species.[2]	Contribution to Sediment Supply	Sediment Supply Scale	5-point scale -2 to +2	The likely effect of management action on channel sediment supply. The PM is reported using a 5-point scale. It is a proxy for a range of broader ecological benefits that are generally associated with increased sediment supply in a large braided river. The relationship between sediment supply and these broader benefits is unknown / unquantified. See Table 3 for definitions of specific levels.
Pallid Sturgeon. This objective reflects an interest in having a check in place to confirm the assumption that management actions taken for terns and plovers will not affect risks to pallid sturgeon.	Pallid Sturgeon Risk	Presence of critical water diversions	Y/N	A yes/no flag that indicates whether the management action includes water diversions during periods of critical low flow in the Platte River. A "No" indicates no negative impacts to pallid sturgeon are expected as a result of an alternative. A "Yes" suggests further analysis may be warranted if the alternative is considered further.

[2] This objective may be removed if preliminary analysis shows that it is insensitive to management actions.

Implementation Success This objective reflects an interest in ensuring that management actions are practical and feasible to implement.	Implementation Costs and Risks	Implementation Scale	5-point scale: 0 to -4	This PM reflects the effort and risks associated with permitting, negotiating with landowners, and coordinating with other agencies for the use of land and/or water. It reflects a range of implementation considerations, including permitting cost ($), neighbor relations and the probability of successful implementation. A score of 0 reflects an alternative requiring minimal effort with little risk of implementation failure, and -4 reflects high effort accompanied by a risk of not achieving full implementation. See Table 4 for definitions of specific levels.
Learning This objective reflects an interest in continual learning to improve the benefits from management actions.	Learning Potential – Plover and Tern Reproductive Success	Learning Potential Scale	3-point scale: 0 to 2	The potential to evaluate differences in plover and tern use and reproductive success from different plover and tern habitat creation and maintenance activities. In particular, the scale considers the ability to learn about incremental performance differences between on-channel and off-channel habitat. See Table 5 for definitions of specific levels.

Constructed Scale Definitions are provided in tables 2 through 5. Across PMs, negative values indicate negative effects (i.e., costs), and positive values indicate positive effects (i.e., benefits). For detailed rationales for how each specific alternative was scored relative to these scales, see the appropriate section of the PM Info Sheets document.

Table 2. Definitions for each level of the Whooping Crane Habitat Suitability Scale.

Score	Definition
-3	Reduction in habitat suitability (introduction of visual obstructions) in > 90 acres of the AHR
-2	Reduction in habitat suitability (introduction of visual obstructions) in < 90 acres and > 45 acres of the AHR
-1	Reduction in habitat suitability (introduction of visual obstructions) in < 45 acres of the AHR
0	No net change in habitat suitability
1	Increase in habitat suitability (reduction of visual obstructions) in < 45 acres of the AHR
2	Increase in habitat suitability (reduction of visual obstructions) in < 90 acres and > 45 acres of the AHR
3	Increase in habitat suitability (reduction of visual obstructions) in > 90 acres of the AHR

Table 3. Definitions for each level of the Sediment Supply Scale.

Score	Definition
-2	Potential long-term negative impact to sediment supply
-1	Potential short-term negative impact to sediment supply
0	No net influence on sediment supply
1	Potential short-term benefit to sediment supply
2	Potential long-term benefit to sediment supply

Table 4. Definitions for each level of the Implementation Effort Scale.

Score	Definition
- 4	Intense Effort/Risk of Failure. There is a risk (>50% probability) of not achieving the target land or water due to the complexity and/or intensity of permitting and negotiations required.
-3	High Effort. Substantial negotiation and permitting for on-channel land or water use is ongoing over the long-term (e.g., for on-channel habitat, a substantial but achievable amount is assumed to be 10 acres or less of habitat per year).
-2	Moderate Effort. Negotiation and/or permitting for on-channel land occurs in the short-term (i.e., short term effort for long-term agreements).
-1	Low Effort. Negotiation and/or permitting for off-channel land occurs in the short-term.
0	Minimal Effort. Minimal implementation effort is required (e.g. no negotiation or permitting for on- or off-channel habitat, and no water use).

Table 5. Definitions for each level of the Learning Potential Scale.

Habitat/Flow Combos	**Shorter-term learning** (>60 acres on-channel)	**Longer-term learning** (< 60 acres on-channel)
Only on-channel **or** only off-channel	0	0
On-channel **+** off-channel	2	1

2 Alternatives

In an SDM process, alternatives are iteratively developed, evaluated and refined. The consequences of the alternatives are estimated using available data, models and analysis. The first round of alternatives and consequences (Round 1) were presented to the TAC at their February meeting. The primary goal of the Round 1 alternatives was to learn. This included gaining a common understanding of how various management actions perform with respect to the decision objectives, and improving the models or estimation methods to report the performance measures.

2.1 Key Messages from Round 1

The TAC reviewed the first set of alternatives (Round 1) at its February meeting. Outcomes are summarized in the TAC Meeting Summary. Some of the key findings included:

- **The tern and plover habitat model, which produces PM results for all Tern/Plover productivity PMs and all Management Cost PMs, is suitable for use in this process.**
  - The model has many uncertainties but most do not affect the relative results across alternatives.
  - The main uncertainties are related to on-channel habitat.
  - For any alternative that includes an off-channel habitat component, the effect of these on-channel uncertainties is dwarfed by off-channel effects.
  - These uncertainties are therefore a low priority for further refinement *unless* the GC wishes to consider alternatives that are composed of on-channel habitat only.
  - The proposed Minimum Significant Increment of Change (MSIC) of 10% is acceptable as a starting point. What this means is that for modeled results, differences of less than 10% are likely negligible or within modeling error, and will not be highlighted as significant.
  - On-channel habitat makes a relatively low contribution to productivity relative to off-channel, and on its own will not support tern and plover populations (due to low fledge ratios and intermittent habitat availability).
  - NPPD off-channel habitat has a stabilizing effect on performance.
- **The Whooping Crane and Sediment PMs are suitable for use in this process**
  - The Round 1 alternatives show that alternative ways of creating tern and plover habitat create different outcomes relative to whooping crane habitat suitability and sediment supply.
  - The PMs for whooping crane and sediment provides a reasonable description of relative differences.
  - The differences are small in scope.
  - The relationship between whooping crane habitat suitability and use is unknown in this analysis.
  - The relationship between the sediment PM and broader ecological benefits is unknown and not considered in this analysis.
- **Other PMs**
  - Implementation and Learning PMs were reviewed and accepted with minor changes. With the exception of the USFWS who abstained, the TAC supported the Pallid Sturgeon PM as defined.

- **Other key messages from the Round 1 alternatives:**
    - The contribution of on-channel habitat to productivity is small and uncertain relative to off-channel habitat.
    - The TAC agreed that the PMs adequately capture the arguments for including on-channel habitat – namely, there are no significant direct benefits for the tern and plover PMs, but there are benefits for Learning, and under an "MCA" approach, for Whooping Cranes and for Sediment, which may have indirect benefits for terns and plovers.
    - The USFWS prefers the MCA approach to building on-channel habitat (described in Table 2 of this document) over the Program's conventional method for building on-channel habitat, because of the co-benefits as reported by the whooping crane and sediment PMs.
    - There is no evidence to support the assumption of a relationship between brood rearing flows and productivity.

2.2 Round 2 Alternatives

After reviewing the Round 1 alternatives, the TAC was asked to provide input on the alternatives to present to the GC. Recognizing the importance of limiting the set to a reasonable number, the TAC recommended:

- Do not include on-channel only alternatives (due to low productivity).
- Include off-channel only and combo alternatives (alternatives with both on and off-channel habitat).
- Include nest initiation flows but not brood rearing flows (since there is no evidence of a relationship between brood rearing flows and productivity).
- Include alternatives that use the "MCA" approach to on-channel habitat.
- Include (but distinguish between) alternatives that are achievable with existing Program lands only and alternatives that require the acquisition of new land (but lead to greater productivity).
- Ensure the alternatives can be readily compared to each other (minimize the number of things that vary across the alternatives).

Accordingly, the Round 2 alternatives are divided into two sets. Set A alternatives are achievable without acquiring new land. Tern and plover outcomes are the result of implementing the defined set of actions on the defined amount of on- and off-channel habitat. Set B alternatives are stretch alternatives that would require the acquisition of new land. The stretch alternatives are arbitrarily designed to achieve a doubling of plover productivity over a defined time period. These are illustrative only; different targets and timelines could be defined.

A short summary of the Round 2 alternatives is shown in Table 6. Some supplementary information is provided in the document: *PlatteSDM_GC2_Alternatives.*

Please note the following:

- Alternatives are modeled over a 50-year simulation period in order to accurately represent performance over a range of hydrologic conditions.
- Non-Program off-channel habitat management is assumed to continue at the current level over the whole simulation period.

- Program activities that are not related to Tern/Plover management (e.g., channel widening, sediment augmentation, Water Plan-Land Plan-AMP implementation) are assumed to continue at the level described in the 2016 PRRIP Work Plan.
- Changes to the model and PM scoring made at the TAC meeting mean that Round 1 and Round 2 alternatives cannot be directly compared.
- The numbering for Round 2 alternatives is different than the numbering for Round 1 alternatives.

Table 6. Round 2 Alternative Descriptions

#	Alternative Description	On-channel (acres)	Off-channel (acres)
STC	**Stay the Course – build and maintain habitat <u>at current levels</u> on Program-owned land – including <u>on and off-channel</u> habitat.** In this alternative, the Program continues to build and maintain current levels of permitted on-channel and off-channel habitat for the remainder of the First Increment (2017 to 2019) and for the rest of the simulation period (50 years). This involves maintaining existing off-channel habitat and creating/maintaining on-channel habitat at the target of 42 acres. On-channel habitat is created using the current approach (i.e. raising islands up to an 8,000 cfs elevation within habitat complex areas). No flow actions are included.	42	102
"A" Alternatives – achievable with no new land acquisition			
A1	**Maintain <u>existing off-channel habitat only</u> on Program-owned land**. This alternative relies on the existing Program off-channel habitat, and discontinues the creation and maintenance of on-channel habitat islands.	0	102
A2	**Add the <u>maximum amount of new habitat</u> on Program-owned land – including both off-channel and on-channel habitat.** This alternative includes maintaining existing on- and off-channel habitat plus creating and maintaining the maximum amount of new habitat on lands already owned by the Program. Compared to Stay the Course, it adds 40 acres to on-channel habitat and 50 acres to off-channel habitat. The current approach to creating on-channel habitat is used (islands are built to floodplain elevation, ~8000 cfs) and no flow actions for terns and plovers are included. Off-channel habitat is constructed new (i.e. does not involve rehabilitating sandpits or using mine sites).	82	152
A3	**Same as A2, but swap 82 acres of on-channel habitat (using the current approach) with 10 acres of on-channel habitat (using the Moving Complexes Approach, or MCA).** MCA involves creating/maintaining on-channel habitat in a reach, allowing the habitat to erode, and then moving on to create/maintain new habitat in a different reach. This differs from the current approach where on-channel habitat is re-constructed in the same habitat complex once it erodes. MCA involves two main activities (1) de-vegetating permanent islands on an ongoing basis throughout the AHR at a rate of 10 acres/year on average, and (2) treating naturally-formed sandbars that meet the Program's minimum habitat criteria to maintain them in a de-vegetated state. Naturally-formed sandbars are modeled with an assumption that approximately 30 acres are formed twice in the 50-year simulation period. The de-vegetated islands and sandbars are left at their natural elevation (i.e. they are not raised to an 8,000 cfs elevation as in the	10 +	152

#	Alternative Description	On-channel (acres)	Off-channel (acres)
	current approach to building on-channel islands). This approach requires entering into management agreements with landowners; due to practical constraints, MCA is limited to 10 acres.		
A4	**Same as A3 but add nest initiation flows for terns and plovers.** Includes a flow target during the plover and tern nest initiation period of 1,200 cfs in wet and normal years and 8oo cfs in dry years. These are the USFWS target flows. The nest initiation period for plovers is May 1 to June 23 and for terns is May 28 to July 12.	10 +	152
"B" Alternatives – Doubling of Plover Breeding Pairs			
B1	**Double plover breeding pairs in 30 years using only off-channel habitat.** This alternative was developed by adding off-channel habitat using the lowest-cost construction method until the plover target was reached in 30 years. The 302 acres includes: • 102 acres of existing off-channel • 4 additional mine sites for a total of 200 acres of mined-off channel habitat that comes on line over first 28 years of the simulation.	0	302
B2	**Double plover breeding pairs in 20 years using only off-channel habitat.** This alternative was developed by adding off-channel habitat using the lowest-cost construction method until the plover target was reached in 20 years. The 302 acres includes: • 102 acres of existing off-channel • 30 acres of newly constructed off-channel habitat • 50 acres of rehabilitated sandpit habitat • 3 additional mine sites for a total of 120 acres of mined-off channel habitat that comes on line over first 20 years of the simulation.	0	302
B3	**Same as B2 but add on-channel habitat (MCA).** The MCA component is as described in A3.	10 +	302
B4	**Same as B3 but add nest initiation flows for plovers and terns.** The flow targets are as described in A4.	10 +	302

3 Preliminary Results

In this section we present the preliminary results from modeling the Round 2 Alternatives. In the consequence tables that follow, green cells indicate performance that is better than the alternative highlighted in blue. Red cells are worse than the highlighted alternative. White cells perform similarly to the highlighted alternative (less than 10% different). "Dir" indicates the preferred direction of change for that performance measure (H, or higher, means higher numbers are better than lower numbers). The results are separated into two sets to help simplify and focus on some of the key messages. These results incorporate the feedback from the TAC at the February 10-11 meeting. Input from the GC may result in further changes to the definition or calculation of PMs.

Set A – Alternatives that are achievable with existing Program land

This consequence table compares STC (Stay the Course) with alternatives A1 through A4. This set of alternatives addresses four questions:

1. What's the least cost way to use existing Program-owned land to support plover and tern productivity (A1)?
2. What's the maximum improvement in reproductive success that can be achieved using existing Program-owned land (A2)?
3. What is the effect of swapping the current on-channel approach for the new MCA approach (A3)?
4. What is the effect of adding nest initiation flows (A4)?

Some key messages from these alternatives are summarized below.

Terns and Plovers

- For both terns and plovers, breeding pairs and fledglings are strongly correlated. Fledge Ratio is not directly correlated; it varies as the proportion of on vs. off-channel habitat changes. Alternatives with more on-channel habitat (such as A2) produce more breeding pairs, but lower fledge ratios.
- A1 involves scaling back on tern and plover habitat by discontinuing on-channel habitat creation and maintenance; the difference between A1 and STC reflects the relative benefit of on-channel habitat.
- A2 has more off-channel and on-channel habitat relative to STC (Stay the Course). As a result it outperforms STC with respect to tern and plover productivity. Because it has more on-channel habitat than A3 and A4, it also outperforms A3 and A4 on the average breeding pair and total fledgling PMs. However, since on-channel habitat has a lower fledge ratio than off-channel, A2's fledge ratio PM is lower than A4.
- Relative to A3, A4 produces negligible improvements in breeding pairs and total fledglings (within the MSIC), due to the small area of on-channel habitat.

Management Cost

- Short-term management cost is largely driven by the construction costs of building new off-channel habitat. STC and A1 have the same amount of off-channel habitat. However because A1 does not maintain on-channel habitat the short term costs are somewhat reduced. A2, A3 and A4 all build the same amount of new off-channel habitat (50 acres) and as a result, incur substantially higher costs in the short term than STC and A1. This will be a direct impact on the Program budget.
- Long-term costs on the other hand are driven less by the one-time construction costs of creating new off-channel habitat, and more by the ongoing costs of building on-channel habitat (which typically erodes and requires rebuilding within a few years). A2 therefore has higher long term cost relative to STC and the other A alternatives.
- MCA (A3 and A4) results in low on-channel costs in both the short and long term relative to STC due to the smaller habitat area (MCA is constrained to 10 acres due to feasibility considerations).

- The only alternative that uses water is A4. This represents an opportunity cost to the Program as this water would not be available for other purposes.

Whooping Crane

- Based on the scoring system for this PM, alternatives that introduce new visual obstructions into the channel produce a loss in habitat suitability. A2 therefore scores worse on this PM than any other alternative. The score of -1 indicates a reduction in habitat suitability of < 45 acres in the AHR. This is a change in habitat suitability; the relationship between suitability and use has not been explored.
- In contrast, A3 and A4 build a small amount of on-channel habitat using the MCA method. The MCA method improves unobstructed channel width because it de-vegetates permanent islands on a regular basis, and allows them to erode, thus eliminating visual obstructions. As a result, A3 and A4 outperform STC, A1 and A2.

Pallid Sturgeon

- None of the alternatives involve water diversions during the critical period.

Sediment

- Based on scoring system for this PM, A2 (with a score of +1) has the potential to deliver a short term benefit to sediment supply relative to A1 and STC because it increases the amount of on-channel nesting habitat over current levels, which involves removing vegetation from areas where it exists currently.
- A3 and A4 outperform STC, A1 and A2 with respect to sediment supply. The score of +2 indicates that these alternatives are expected to deliver long-term benefits. These occur because under these alternatives, islands are de-vegetated on a regular basis.

Implementation

- A2 is expected to have moderate implementation effort (-2) because the land is already owned by the Program, and just requires permitting.
- MCA requires substantially more effort to coordinate and negotiate with landowners. The score of -3 for A3 and A4 indicates an intense level of effort, but little risk of implementation failure.

Learning

- At this point the Learning PM is a crude indicator and will require refinement if it is an important driver in the decision. As defined, A2 outperforms the other alternatives because it has more habitat and therefore learning would be expected to occur at a faster pace.

Dominance: If the MSIC is accepted (i.e., that differences of less than 10% should be ignored), then A4 is dominated (outperformed or equivalent on all PMs) by A3. (Subject to refinement of the Learning PM.)

Figure 1: Round 2 Alternatives – Set A

Objective	Performance Measure	Units	Dir	STC	A1	A2	A3	A4
Piping Plovers								
Program Repro Success	Average Breeding Pair (BP)	#/year	H	22	18	34	28	29
	Average Fledge Ratio	#/year	H	1.30	1.40	1.27	1.37	1.34
	Total Fledglings over 50 yr	#	H	1,420	1,271	2,144	1,903	1,929
AHR Repro Success	Average Breeding Pair	#/year	H	30	27	42	36	37
	Average Fledge Ratio	#/year	H	1.33	1.40	1.30	1.37	1.36
Interior Least Terns								
Program Repro Success	Average Breeding Pair (BP)	#/year	H	97	91	141	134	136
	Average Fledge Ratio	#/year	H	1.07	1.10	1.06	1.09	1.08
	Total Fledglings over 50 yr	#	H	5,187	4,992	7,462	7,312	7,339
AHR Repro Success	Average Breeding Pair	#/year	H	140	133	182	176	177
	Average Fledge Ratio	#/year	H	1.08	1.10	1.07	1.09	1.09
Management Cost								
Short-term Management Cost	1st Increment Cost (2017-2019)	1000$	L	$130	$41	$1,220	$1,081	$1,081
Long-term Management Cost	NPV (50 yrs)	1000$	L	$2,931	$464	$6,225	$2,343	$2,343
Land Acquisition Cost	Est. Total Cost	1000$	L	$0	$0	$0	$0	$0
Water Use - Wet Years	Proportion of Program water used	%	L	0%	0%	0%	0%	9%
Water Use - Normal Years	Proportion of Program water used	%	L	0%	0%	0%	0%	63%
Water Use - Dry Years	Proportion of Program water used	%	L	0%	0%	0%	0%	77%
Augmented Volume	Avg. Volume Program water / yr	ac-ft/year	L	0	0	0	0	39090
Whooping Crane								
Habitat Use	Habitat Suitability Scale	-3 to +3	H	0	1	-1	2	2
Pallid Sturgeon								
Pallid Sturgeon Risks	Presense of critical water diversio	Yes/No	L	No	No	No	No	No
Implementation Effort								
Implementation Costs/Risks	Implementation Scale	-4 to 0	H	0	0	-2	-3	-3
Learning								
Learning Potential	Learning Potential Scale	0 to 3	H	1	0	2	1	1

Legend

- Better than selected
- Worse than selected
- Selected

Set B – Alternatives that require the acquisition of new land

This consequence table examines the effects on cost and other decision objectives, of alternatives designed to achieve a doubling of plover productivity over a defined time period. They require the acquisition of new land. The highlighted alternative is B3; the color coding is relative to B3. Some key messages from Set B are summarized below.

Terns and Plovers

- All of the alternatives in the B set outperform the alternatives in the A set for tern and plover productivity.
- Alternative B1 reaches the same target as B2 but takes longer to do so. As a result, the average # of breeding pairs and the total number of fledglings over the simulation period are lower than the other B alternatives (but still higher than the A alternatives).
- The addition of MCA habitat in B3 relative to B2 has negligible effect (the difference is within the MSIC), due to the very small amount of on-channel habitat.
- The addition of flow in B4 relative to B3 has negligible effect (the difference is within the MSIC), due to the very small amount of on-channel habitat.
- For terns, differences in productivity across all the B alternatives are within the MSIC.

Management Costs

- Because B1 achieves the target over a longer time period, it is able to rely on mine sites, which have very low cost. As a result, both its short and long term costs are substantially lower than the other B alternatives. Its costs are also substantially lower than all of the A alternatives except for A1.
- The short term cost of Alternatives B2 through B4 are virtually the same. This is because they all use the same amount and type of off-channel habitat. B3 and B4 both use MCA on-channel habitat which is small acreage and lower in cost than current on-channel methods.
- The only alternative that uses water is B4. This represents an opportunity cost to the Program as this water would not be available for other purposes.
- All of the B alternatives have similar land acquisition costs. The cost is very uncertain. For the purposes of estimating Round 2 consequences, assumptions include: 1) All land costs $8,000 per acre; 2) 2 acres of land must be acquired to create 1 acre of new mined habitat; 3) 2.5 acres of existing sandpit habitat must be acquired to rehabilitate 1 acre of habitat; 4) 1.5 acres of land must be acquired to mechanically create 1 acre of new mechanical habitat.

Whooping Crane

- Alternatives using MCA (B3 and B4) outperform B1 and B2 with respect to habitat suitability, because MCA improves unobstructed channel width. This occurs because it de-vegetates permanent islands on a regular basis, and allows them to erode, thus eliminating visual obstructions.

Pallid Sturgeon

- None of the alternatives involve water diversions during the critical period.

Sediment

- Alternatives using MCA (B3 and B4) outperform B1 and B2 with respect to sediment supply. The score of +2 indicates that they are expected to deliver long-term benefits. These occur because under these alternatives, islands are de-vegetated on a regular basis.

Implementation

- MCA requires substantially more effort to coordinate and negotiate with landowners. The score of -3 for Alternatives B3 and B4 indicates an intense level of effort, but little risk of implementation failure.

Dominance

- If the MSIC is accepted (i.e., that differences of less than 10% should be ignored), then B4 is dominated (outperformed on all PMs) by B3. (Subject to refinement of the Learning PM.)

Figure 2: Preliminary Alternatives – Set B

Objective	Performance Measure	Units	Dir	B1	B2	B3	B4
Piping Plovers							
Program Repro Success	Average Breeding Pair (BP)	#/year	H	43	48	49	50
	Average Fledge Ratio	#/year	H	1.40	1.40	1.38	1.37
	Total Fledglings over 50 yr	#	H	3,006	3,346	3,379	3,400
AHR Repro Success	Average Breeding Pair	#/year	H	51	56	57	58
	Average Fledge Ratio	#/year	H	1.40	1.40	1.38	1.37
Interior Least Terns							
Program Repro Success	Average Breeding Pair (BP)	#/year	H	215	225	226	226
	Average Fledge Ratio	#/year	H	1.10	1.10	1.09	1.09
	Total Fledglings over 50 yr	#	H	11,802	12,361	12,347	12,318
AHR Repro Success	Average Breeding Pair	#/year	H	256	263	264	264
	Average Fledge Ratio	#/year	H	1.10	1.10	1.09	1.09
Management Cost							
Short-term Management Cost	1st Increment Cost (2017-2019)	1000$	L	$44	$1,042	$1,068	$1,068
Long-term Management Cost	NPV (50 yrs)	1000$	L	$996	$2,124	$2,810	$2,810
Land Acquisition Cost	Est. Total Cost	1000$	L	$3,200	$2,920	$2,920	$2,920
Water Use - Wet Years	Proportion of Program water used	%	L	0%	0%	0%	9%
Water Use - Normal Years	Proportion of Program water used	%	L	0%	0%	0%	63%
Water Use - Dry Years	Proportion of Program water used	%	L	0%	0%	0%	77%
Augmented Volume	Avg. Volume Program water / yr	ac-ft/year	L	0	0	0	39090
Whooping Crane							
Habitat Use	Habitat Suitability Scale	-3 to +3	H	1	1	2	2
Pallid Sturgeon							
Pallid Sturgeon Risks	Presense of critical water diversio	Yes/No	L	No	No	No	No
Implementation Effort							
Implementation Costs/Risks	Implementation Scale	-4 to 0	H	-1	-1	-3	-3
Learning							
Learning Potential	Learning Potential Scale	0 to 3	H	0	0	1	1

Legend
- Better than selected
- Worse than selected
- Selected

4 Discussion Questions

On-channel vs off-channel

1. **Does the GC want to consider on-channel only alternatives?** The TAC concluded that the tern and plover productivity performance of on-channel only alternatives is poor and uncertain, and did not recommend that such alternatives be further considered. Does the GC agree? If alternatives with a high proportion of on-channel habitat are to be further considered, some of the uncertainties associated with on-channel habitat may need further exploration prior to the June GC meeting.

2. **Does the GC want to focus further evaluation of on-channel habitat on the MCA approach rather than conventional on-channel habitat?** The USFWS has expressed a preference for on-channel habitat to be constructed using the MCA method. At the TAC meeting, no participants expressed interest in continuing with the conventional on-channel habitat approach. Does the GC agree?

3. **Are the benefits associated with on-channel MCA habitat, as described by the Learning, Whooping Crane and Sediment PMs, worth the incremental costs and effort? What additional information, if any, does the GC need to compare alternatives that have on- and off-channel components?** Modeling results suggest that the contribution of on-channel habitat to tern and plover productivity is low relative to off-channel habitat. On-channel predictions are also less certain than off-channel predictions. The TAC discussed the rationale for continuing to consider on-channel habitat given its low and uncertain contribution to tern and plover productivity. They agreed that the PMs capture the main costs and benefits – namely, that there are no significant direct benefits for the tern and plover PMs, but there are benefits for Learning, for Whooping Cranes and for Sediment, which may have indirect benefits for terns and plovers. Eventually, the GC will need to address a key value trade-off: *Are the benefits associated with on-channel MCA habitat, as described by the Learning, Whooping Crane and Sediment PMs, worth the incremental costs and effort? (Compare Alternatives B3 and B2.)* What additional information does the GC need to make an informed judgment about this trade-off?

Flows

4. **If there is an on-channel habitat component, does the GC want to use water for nest initiation flows, or retain the option to use it for other purposes?** The addition of a nest initiation flow is estimated to provide negligible benefits (within the MSIC) for tern and plover productivity. This is due to the low acreages of on-channel habitat under consideration in this set of alternatives. It may provide learning benefits, as the relationship between nest initiation flows and habitat utilization is uncertain, although that would depend on the specific learning objectives and the amount of on-channel habitat. If that water is used for terns and plovers, it is not available for use for other purposes (e.g., whooping crane migratory flows, etc.). If the GC continues to consider alternatives with an on-channel habitat component, they will eventually need to address a *key value trade-off: Are the benefits associated with nest-initiation flows, as described by the Tern and Plover Productivity PMs and the Learning PM, worth the opportunity cost and implementation effort? (Compare Alternatives A4 and A3, and B4 and B3.)* What additional information does the GC need to make an informed judgment about this trade-off? If, for example, the use of the water for terns and plovers is justified on the basis of learning, the GC may need to clarify specific learning objectives, and identify and evaluate monitoring or experimental design options. Or, if the GC is concerned about the potential value of the water in other uses, is there any additional information

that it needs (and can be gathered within the scope of this process) to help understand that option value?

5. **Does the GC want to further consider brood rearing flows?** The TAC concluded that there is no evidence of a relationship between brood rearing flow and tern/plover productivity. Does the GC accept this conclusion? *Does the GC want to halt further consideration of alternatives that include a brood rearing flow?*

How much and how fast?

6. **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. According the Decision Charter, this process does not need to produce a final answer to this question for future increments. However, also consistent with the Decision Charter, the intent is to consider long term costs and benefits when making a decision for the remainder of the First Increment. *A key value trade-off that the GC will need to address is: Are the incremental benefits associated with expanding beyond Program-owned land, as described by the Tern and Plover Productivity PMs (compare A1 and B1), worth the incremental costs?* If the answer to that is yes, then it may affect the GC's decision about what to do for the remainder of the First Increment. What additional information does the GC need to make an informed judgment about this trade-off? Does the GC have a clear idea about what constitutes recovery or a sufficient contribution of the Program to recovery? At this stage of the process, the GC will need to provide direction on whether it is interested in considering alternatives with more ambitious goals for terns and plovers ("stretch alternatives" as in Set B). Or, if the GC wants to stay within existing land, are the incremental gains from A2 through A4 worth the incremental costs? What additional information does the GC need to make an informed judgment about this trade-off?

7. **How important is the timeline?** It is possible to substantially reduce management cost by relaxing the timeline for tern and plover productivity results (compare B1 and B2). *The GC will need to address a key value trade-off related to time preferences: are the benefits of faster-acting alternatives (as reported by the Total #Fledglings PM) worth the additional cost? What additional information does the GC need to make an informed judgment about this trade-off?*

Refining Performance Measures

8. **Redundant Productivity PMs.** We have included a number of supplementary PMs to make sure that GC/TAC members have a full picture. However, it will eventually be important to trim these down to a manageable number of non-redundant PMs. *Does the GC accept the proposal that the primary PM for tern and plover productivity is Program Breeding Pairs?*

9. **Multiple Cost PMs.** As above, we have included a number of supplementary PMs to make sure that GC/TAC members have a full picture, but it will eventually be important to trim these down to a manageable number of non-redundant PMs.

    - For water use, the consequence table currently shows the proportion of water used in wet, dry and normal years as well as the augmented volume. *Which PM is the most appropriate to use as the primary PM?*

    - For financial cost, the consequence table currently shows separately: short-term financial cost (an indication of the impact on the Program First Increment budget), long-term financial cost (an indication of the impact on future management budgets), and land acquisition costs (an upfront capital cost, not currently in the Program budget). While the TAC and GC have both indicated a preference to view these separately as they may be weighted differently, there may be value in aggregating these to show a net cost or cost-effectiveness with respect to terns and plovers (total net cost or total net cost per tern/plover fledged over the simulation period).

10. **Learning.** If the GC is considering actions that would be justified on the basis of learning, then there will be a need for more rigorous evaluation of the potential for and benefits of learning, given the specific alternatives under consideration and the specific learning objectives. The existing Learning PM is a crude placeholder intended to flag possible differences across alternatives, but does not account for a number of considerations that will influence the value of information.

11. **Sediment and Pallid Sturgeon.** The GC had asked that these decision objectives and PMs be included on a preliminary basis, pending confirmation that they are sensitive to the range of alternatives under consideration. The TAC found that Sediment is sensitive to the alternatives (different alternatives produce different effects with respect to sediment) but Pallid Sturgeon is not. Does the GC accept these PMs and conclusions? (As part of an action item from the TAC meeting the USFWS may have additional information or perspectives to share at the meeting.)