

# ADAPTIVE MANAGEMENT ON THE PLATTE RIVER



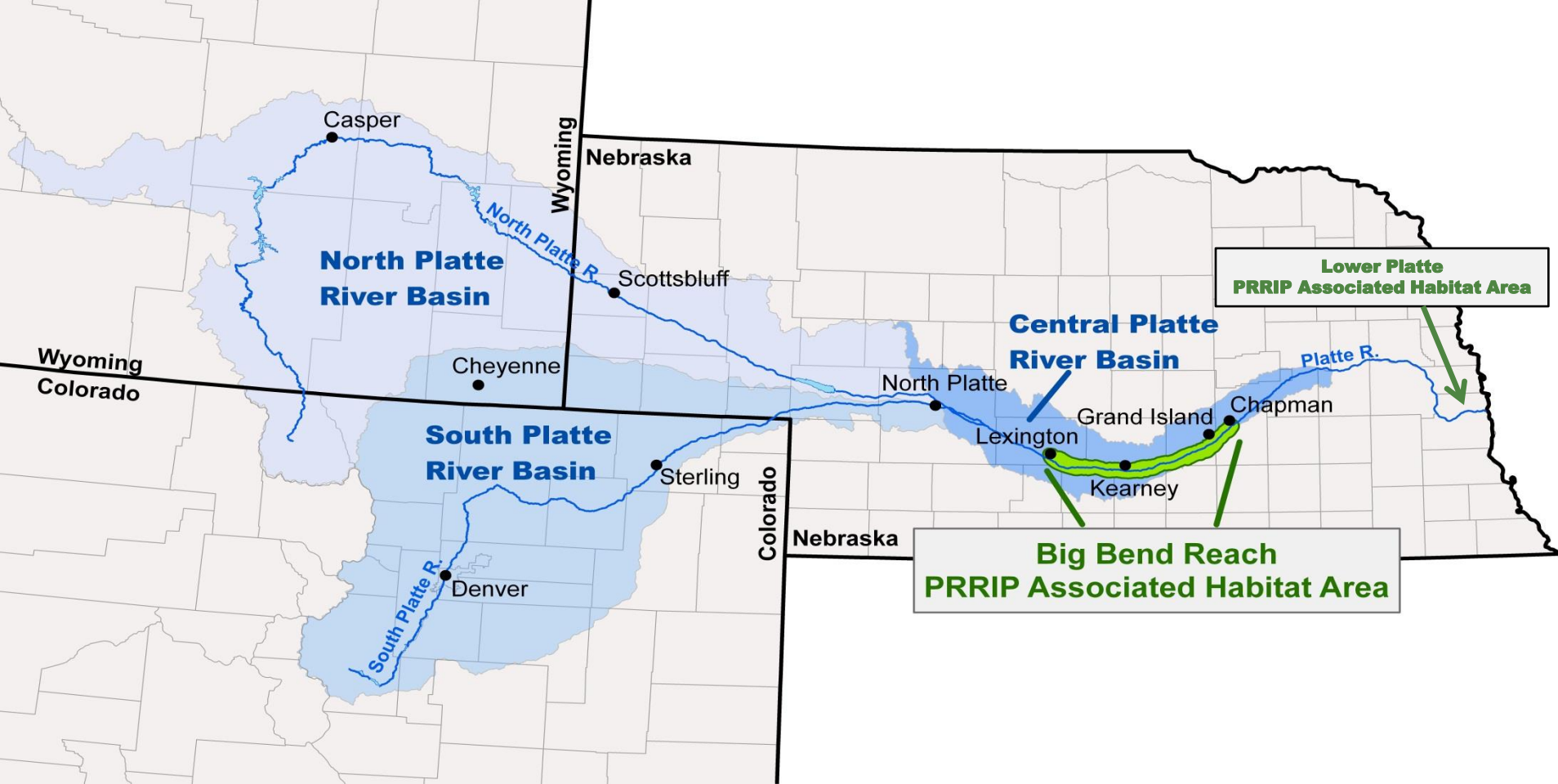
PLATTE RIVER  
RECOVERY IMPLEMENTATION PROGRAM

**Elm Creek Complex Flow-Sediment-  
Mechanical (FSM)  
“Proof of Concept” Experiment**

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**National Conference on Ecosystem  
Restoration – Chicago, IL  
July 31, 2013**



## Platte River Recovery Implementation Program Scale

- ❑ **Cooperative effort between Department of Interior, Colorado, Wyoming, Nebraska, & stakeholders**
- ❑ **Initiated on January 1, 2007**
- ❑ **\$325 million First Increment (2007-2019)**

# PRRIP Target Species



Whooping crane



Interior least tern

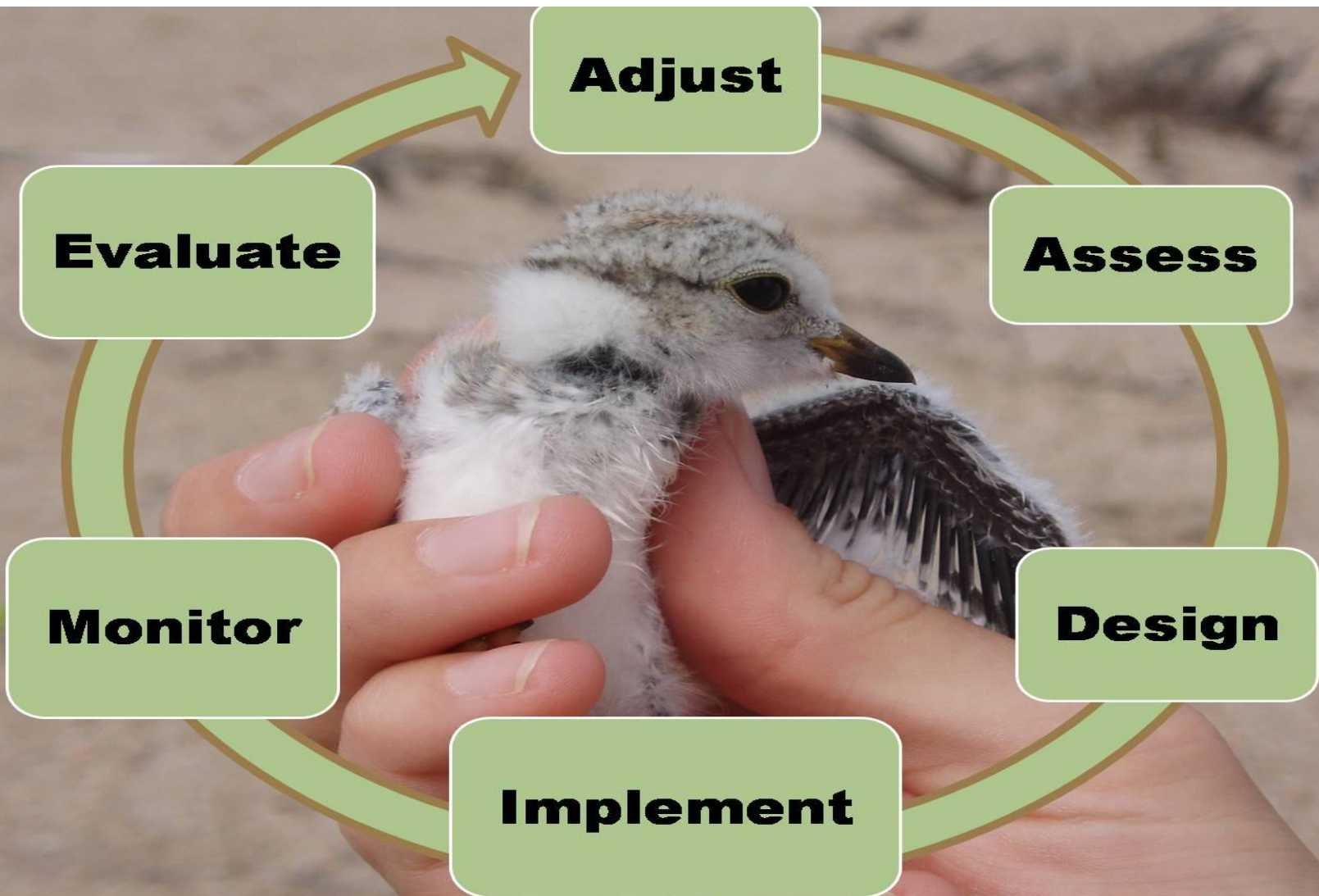


Pallid sturgeon



Piping plover

# Adaptive Management – What is it?



Rigorous approach for designing and implementing **management actions** to maximize learning about **critical uncertainties** that affect **decisions**, while simultaneously striving to meet multiple management objectives.

PRRIP Big Questions = What we don't know but want to learn	Broad Hypotheses <sup>1</sup>	Priority Hypotheses <sup>2</sup>
<b>Implementation – Program Management Actions and Habitat</b>		
<p><b>1. Will implementation of SDHF<sup>3</sup> produce suitable<sup>4</sup> tern and plover riverine nesting habitat on an annual or near-annual basis?</b></p>	<p><i>PP-1a: Flows of 5,000 to 8,000 cfs magnitude in the habitat reach for a duration of three days at Overton on an annual or near-annual basis will build sandbars to an elevation suitable for least tern and piping plover habitat.</i></p>	<p>Flow #1</p>
<p><b>2. Will implementation of SDHF produce and/or maintain suitable whooping crane riverine roosting habitat on an annual or near-annual basis?</b></p>	<p><i>PP-1b: Flows of 5,000 to 8,000 cfs magnitude in the habitat reach for a duration of three days at Overton on an annual or near-annual basis will increase the average width of the vegetation-free channel.</i></p>	<p>Flow #3, Flow #5</p>
<p><b>3. Is sediment augmentation necessary for the creation and/or maintenance of suitable riverine tern, plover, and whooping crane habitat?</b></p>	<p><i>PP-2: Between Lexington and Chapman, eliminating the sediment imbalance of approximately 4000,000 tons annually in eroding reaches will reduce net erosion of the river bed, increase the sustainability of a braided river, contribute to channel widening, shift the river over time to a relatively stable condition, and reduce the potential for degradation in the north channel of Jeffrey Island resulting from headcuts.</i></p>	<p>Sediment #1</p>
<p><b>4. Are mechanical channel alterations (channel widening and flow consolidation) necessary for the creation and/or maintenance of suitable riverine tern, plover, and whooping crane habitat?</b></p>	<p><i>PP-3: Designed mechanical alterations of the channel at select locations can accelerate changes towards braided channel conditions and desired river habitat.</i></p>	<p>Mechanical #2</p>

PRRIP Big Questions = What we don't know but want to learn	Broad Hypotheses	Priority Hypotheses
<b><u>Effectiveness</u> – Habitat and Target Species Response</b>		
<p><b>5. Do whooping cranes select suitable riverine roosting habitat in proportions equal to its availability?</b></p>	<p><i>WC-1: 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. WC-4: In the central Platte River study area, whooping cranes prefer conditions created by species target flows and annual pulse flows.</i></p>	<p>WC1, WC3</p>
<p><b>6. Does availability of suitable nesting habitat limit tern and plover use and reproductive success on the central Platte River?</b></p>	<p><i>TP-1: In the central Platte River study area, terns and plovers prefer/do not prefer riverine habitats as described in Land Plan Table 1 and use will/will not increase proportionately to an increase in habitat complexes.</i></p>	<p>T1, P1</p>
<p><b>7. Are both suitable in-channel and off-channel nesting habitats required to maintain central Platte River tern and plover populations?</b></p>	<p><i>TP-2: The maintenance of tern and plover populations in the central Platte requires/does not require that sandpits and river continue to function together to provide nesting and foraging habitat. TP-3: Ephemeral nesting areas in the river are/are not needed for long-term nesting success of tern and plover.</i></p>	<p>TP1</p>
<p><b>8. Does forage availability limit tern and plover productivity on the central Platte River?</b></p>	<p><i>TP-4: Existing river flows do/do not provide a sufficient forage base throughout the central Platte River study reach for populations of terns and plovers during the nesting season.</i></p>	<p>T2, P2</p>
<p><b>9. Do Program flow management actions in the central Platte River avoid adverse impacts to pallid sturgeon in the lower Platte River?</b></p>	<p><i>PS-2: Water related activities above the Loup River do/do not impact pallid sturgeon habitat.</i></p>	<p>PS2</p>
<b><u>Larger Scale Issues</u> – Application of Learning</b>		
<p><b>10. Do Program management actions in the central Platte River contribute to least tern, piping plover, and whooping crane recovery?</b></p>	<p><i>S-3: Program management actions will/will not have a detectable effect on target species use of the associated habitats.</i></p>	<p>S1b</p>
<p><b>11. What uncertainties exist at the end of the First Increment, and how might the Program address those uncertainties?</b></p>	<p>N/A</p>	<p>N/A</p>

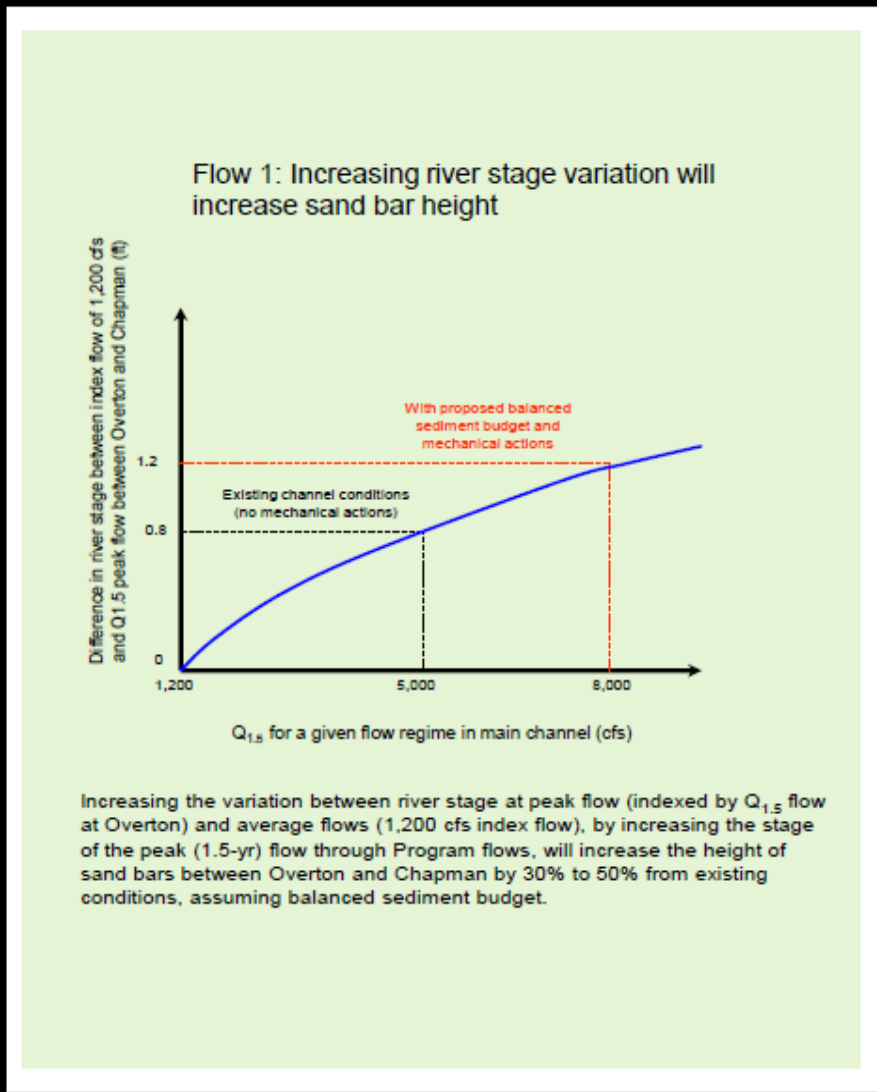
PRRIP “Big Questions”	Priority Hypotheses	Alternative Hypotheses	X-Y Graphs
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**Implementation – Program Management Actions and Habitat**

1. Will implementation of SDHF produce suitable tern and plover riverine nesting habitat on an annual or near-annual basis?

**Flow #1:** ↑ the variation between river stage at peak (indexed by Q<sub>1.5</sub> flow @ Overton) and average flows (1,200 cfs index flow), by ↑ the stage of the peak (1.5-yr flow through Program flows, will ↑ the height of sandbars between Overton and Chapman by 30% to 50% from existing conditions.

Flow magnitudes and channel compilations are insufficient to generate bars high enough to provide habitat for ILT and PP. Bars may become quickly vegetated, making them poor habitat for target species. Bars can be created or maintained by mechanical or other means.





**Flow-Sediment-Mechanical  
(FSM)**  
“Clear/Level/Pulse”



**Mechanical Creation & Maintenance  
(MCM)**  
“Clear/Level/Plow”



## **Project objective:**

- Provide data relevant to detecting influence of FSM management strategy on river morphology and vegetation and thus evaluating the ability of FSM to create and/or maintain target species habitat

## **Project components:**

- Elm Creek Complex (replicate at Shoemaker Island complex downstream)
- Short-duration high flows (SDHF) – 5,000-8,000 cfs for three days
- Sediment balance (or near balance)
- Mechanical “prepping” of channel
- Modeling, monitoring, and analysis
- 2011-2013

## **What are we watching:**

- Green line and plant mortality
- Sand bar area and height
- Channel width
- Habitat criteria
- Bird use

Platte River near Overton, April 1, 2013



Platte River near Overton, April 14, 2013



Pulse at Overton, Nebraska: April 12 – April 15, 2013 (70,000 acre-feet of water used)

- Peak flow: 4,040 cfs
- Flow above 3,800 cfs for 1.6 days
- Flow above 3,000 cfs for 2.6 days



- Pilot-scale management action (means and methods)
- 50,000 tons pumping, 50,000 tons pushing X 2 = 200,000 tons

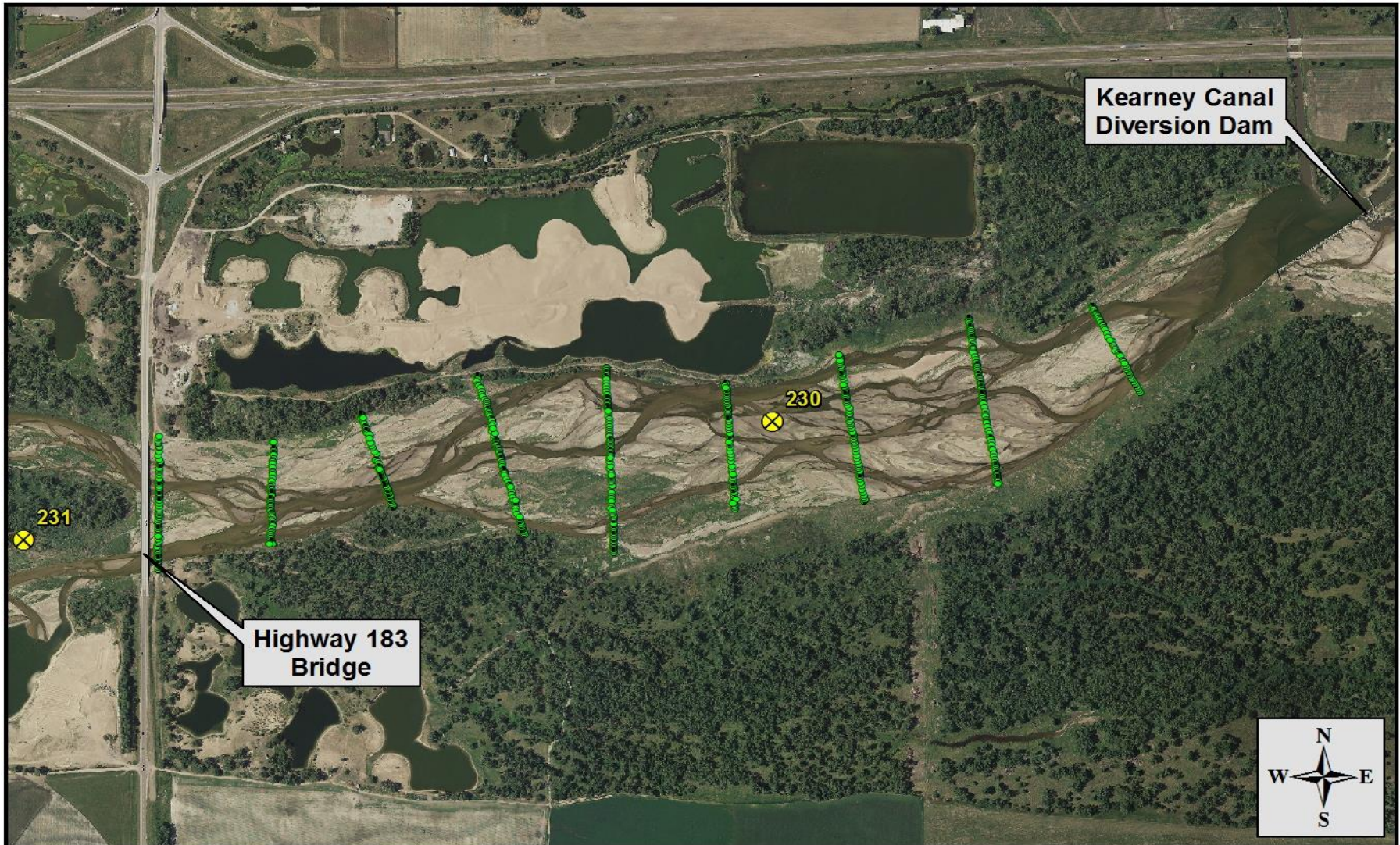


- Tree clearing
- Vegetation removal
- Sand bar grading

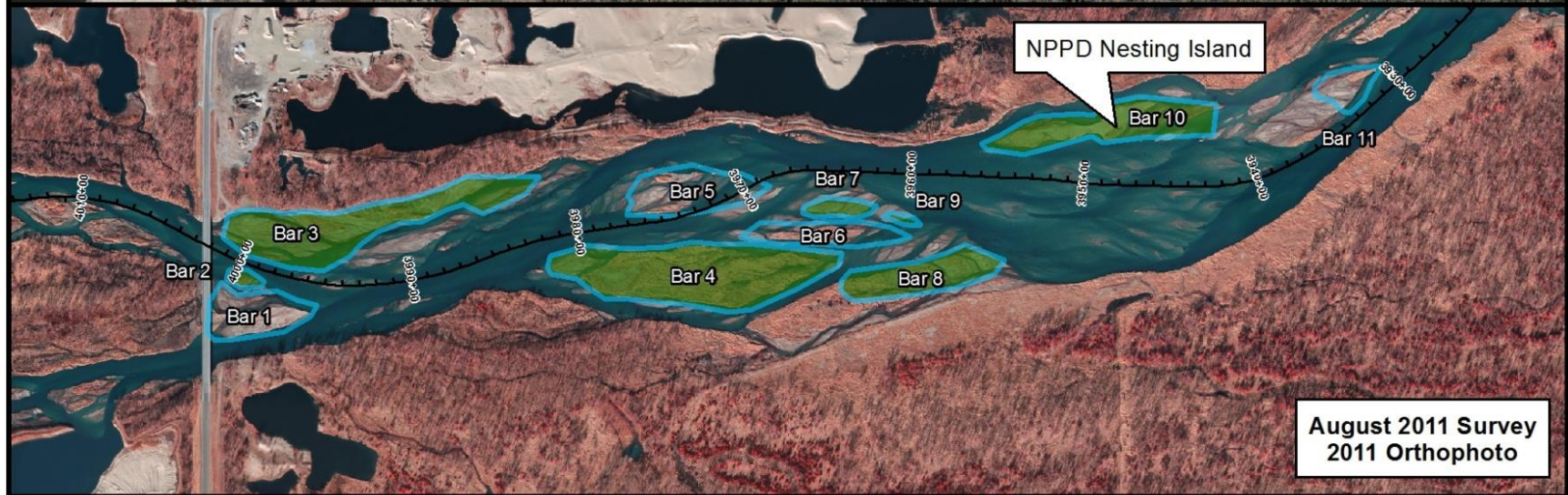
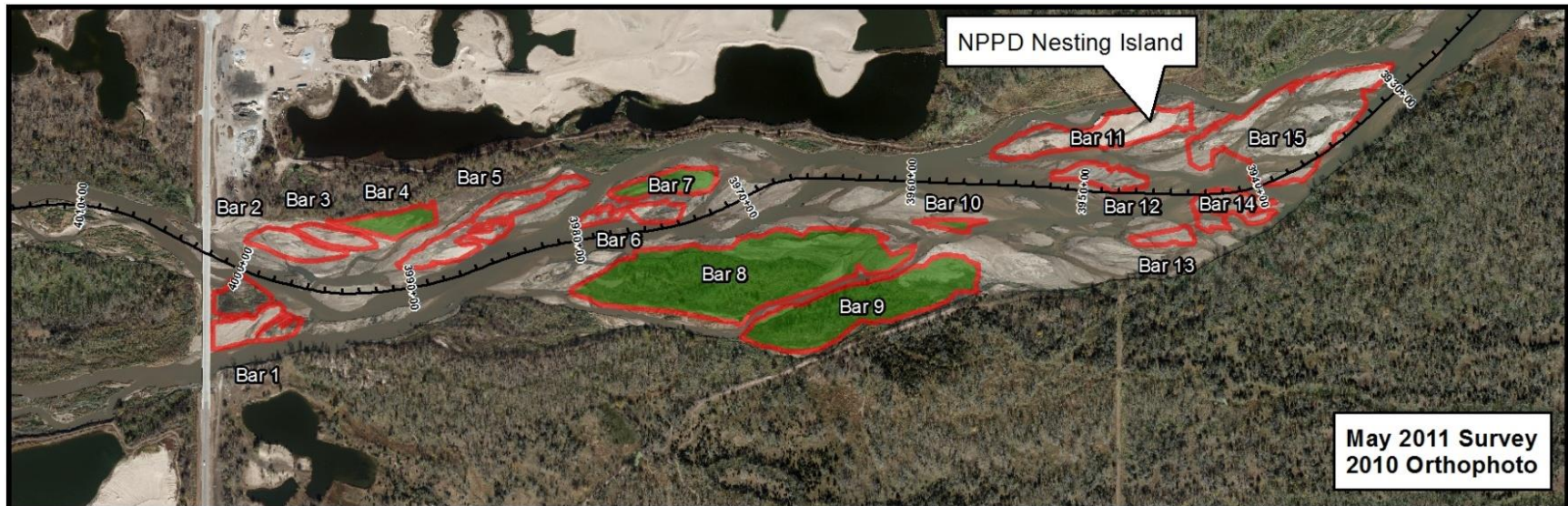
# FSM Proof of Concept Performance Measures



Hypothesis	Performance Measure	Benchmarks	
		Min	Target
Flow #1	Mean and maximum sand bar height relative to peak stage of formative flow event	-0.7	0.0
Flow #1	Mean and maximum sand bar height relative to 1,200 cfs stage for flow events of 5,000 to 8,000 cfs	1.5'	N/A
Flow #1	Unvegetated sand bar area exceeding height of 1.5' above 1,200 cfs stage per ¼ mile of river channel	1.5 ac	N/A
Flow #3	Elevation of green line above 1,200 cfs stage for flow event of 5,000 to 8,000 cfs (ILT and PP nesting)	>1.5'	N/A
Flow #3	Unvegetated channel width following flow event of 5,000 to 8,000 cfs (WC roosting)	750'	1,125'
Flow #5	For flows of 5,000 to 8,000 cfs, is 90% of vegetation scoured in any inundated sand bar area 1.5' above 1,200 cfs?	YES	N/A
Flow #5	For flows of 5,000 to 8,000 cfs, channel width at which 90% vegetation scour is achieved.	750'	1,125'
Flow #5	Can sustain releases necessary to inundate 750' wide channel >0.25' deep for period exceeding inundation mortality threshold?	YES	N/A

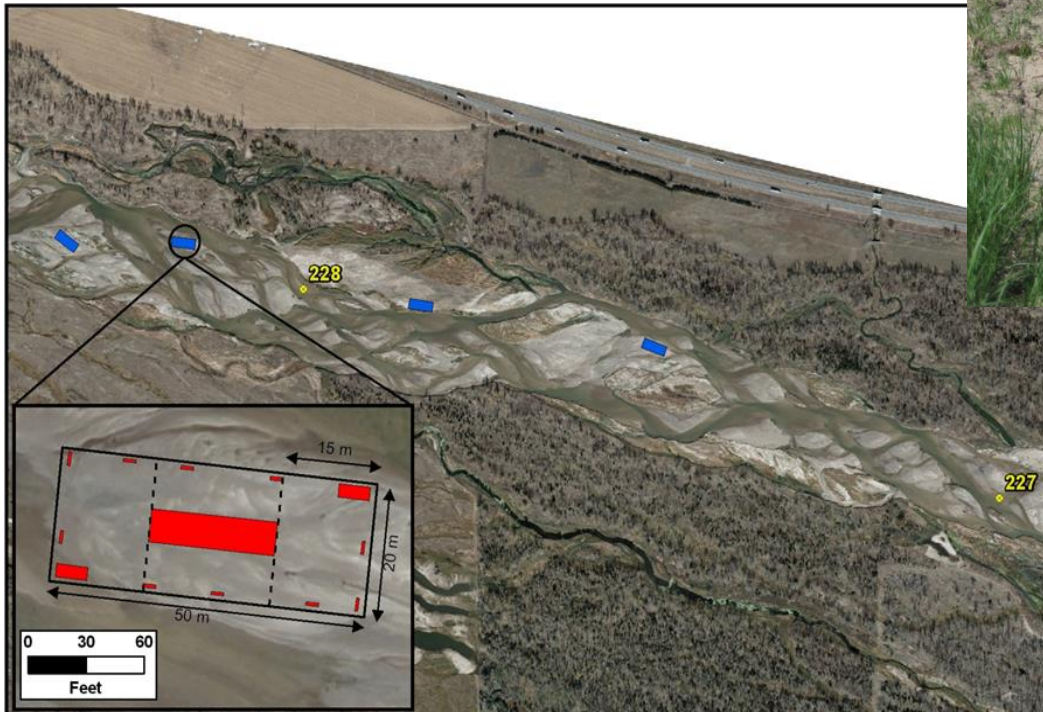


## Sand Bars



# AM Step 4 – Monitor

# Vegetation Monitoring



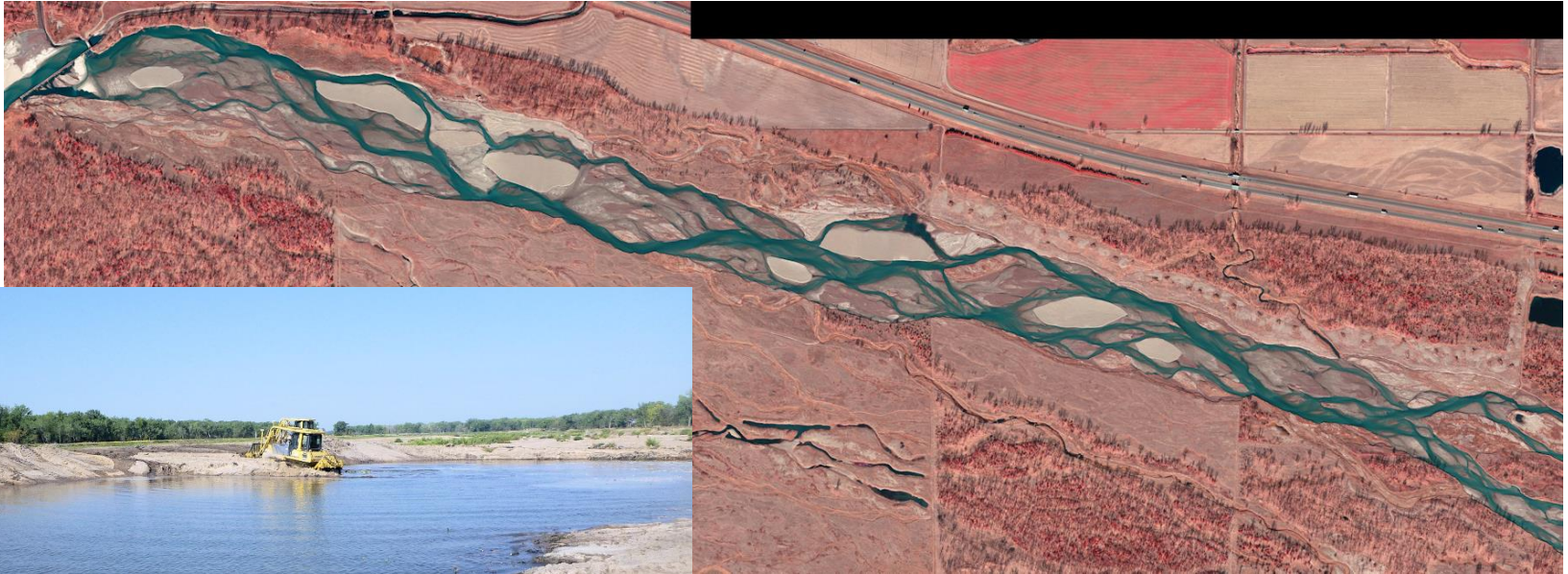
	Assessment Plot (20m x 50m)	River Mile Marker
	Sample Quadrat (5m x 20m), (2m x 5m), (0.5m x 2m)	



# AM Step 4 – Monitor

# Sediment and Discharge
















- Bars were not cleared according to plan in November 2011 because of flow conditions
- Some bars downstream from Kearney Diversion were being graded during August survey; affected several bars.

Summary of performance measure evaluation results.

Hypothesis	Performance Measure	Benchmark Met?			
		2011		2012	
		Upstream	Downstream	Upstream	Downstream
Flow #1	Mean and maximum sand bar height relative to peak stage of formative flow event	Partially	Partially	No	No
Flow #1	Mean and maximum sand bar height relative to 1,200-cfs stage for flow events of 5,000 to 8,000 cfs	No	No	No	No
Flow #1	Unvegetated sand bar area exceeding height of 1.5 feet above 1,200-cfs stage per one-fourth mile of river channel	No	No	No	No
Flow #3	Elevation of green line above 1,200-cfs stage for flow event of 5,000 to 8,000 cfs (ILT and PP nesting)	Partially	Partially	No	No
Flow #3	Unvegetated channel width following flow event of 5,000 to 8,000 cfs (WC roosting)	Partially	Partially	No	No
Flow #5	For flows of 5,000 to 8,000 cfs, is 90 percent of vegetation scoured in any inundated sand-bar area 1.5 feet above 1,200 cfs?	No	No	No	No
Flow #5	For flows of 5,000 to 8,000 cfs, channel width at which 90-percent vegetation scour is achieved	No	No	No	No
Flow #5	Can sustain releases necessary to inundate 750-foot wide channel >0.25 feet deep for period exceeding inundation mortality threshold?	1	1	1	1

<sup>1</sup> Not evaluated because the duration of inundation needed for plant mortality is not known.

PRRIP Big Questions = What we don't know but want to learn	2012 Assessment
<b><u>Implementation</u> – Program Management Actions and Habitat</b>	
1. Will implementation of SDHF produce suitable tern and plover riverine nesting habitat on an annual or near-annual basis?	
2. Will implementation of SDHF produce and/or maintain suitable whooping crane riverine roosting habitat on an annual or near-annual basis?	
3. Is sediment augmentation necessary for the creation and/or maintenance of suitable riverine tern, plover, and whooping crane habitat?	
4. Are mechanical channel alterations (channel widening and flow consolidation) necessary for the creation and/or maintenance of suitable riverine tern, plover, and whooping crane habitat?	
<b><u>Effectiveness</u> – Habitat and Target Species Response</b>	
5. Do whooping cranes select suitable riverine roosting habitat in proportions equal to its availability?	
6. Does availability of suitable nesting habitat limit tern and plover use and reproductive success on the central Platte River?	
7. Are both suitable in-channel and off-channel nesting habitats required to maintain central Platte River tern and plover populations?	
8. Does forage availability limit tern and plover productivity on the central Platte River?	
9. Do Program flow management actions in the central Platte River avoid adverse impacts to pallid sturgeon in the lower Platte River?	
<b><u>Larger Scale Issues</u> – Application of Learning</b>	
10. How do Program management actions in the central Platte River contribute to least tern, piping plover, and whooping crane recovery?	
11. What uncertainties exist at the end of the First Increment, and how might the Program address those uncertainties?	



**1. Will implementation of SDHF produce suitable tern and plover riverine nesting habitat on an annual or near-annual basis?**

**2012 Review**

Program monitoring and retrospective analyses indicate that short-duration high flows (SDHF) will likely not build sandbars to a height that is suitable tern and plover nesting habitat with or without sediment balance.

**What's New?**

- Monitoring of bird response to sandbars created by 2011 high flow event
- Lower Platte River sandbar height publication
- 2013 SDMF – data still being processed
- Shifting perceptions about the  $Q_{1.5}$ -driven habitat paradigm

**Changes in Answers/Methods, Length of Time to Answer**

- Continue monitoring and data analysis efforts
- Need to implement an SDHF of 8,000 cfs for three days?

**Governance Committee decision-making Q&A:**

- 1) Do these results mean the Program shouldn't attempt to make SDHF releases?
- 2) Do these results mean the Program shouldn't augment sediment?
- 3) What management actions could conceivably produce islands that meet suitable nesting habitat criteria?

# Questions & Discussion

