September 2021 ISAC Check-in with PRRIP GC

ISAC feedback on recent EDO work on Whooping Cranes (WC)

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ISAC review of recent EDO work on WC

Goal: ISAC feedback on

- working draft Big Questions for WC in the Extension Science Plan
- technical tools developed by the EDO related to WC stopovers and channel width

Main topics

- **Draft Big Question 1**: What are the conditions that influence whether a WC will stop or flyover the Central Platte River?

- **Draft Big Question 2**: Can we use water to maintain unobstructed channel width for WC use?

- PRRIP Science Plan for program water in the extension related to WC.

Draft Big Question 1: What are the conditions that influence whether a WC will stop or flyover the Central Platte River?

- EDO Technical Tool: statistical model to predict if birds stop or not
  - Analysis is both worth doing and technically sound

Is it getting dark, time to stop soon?

Is the wind right for stopping?

Does that river flow look “just right”? Hard to tell from here…

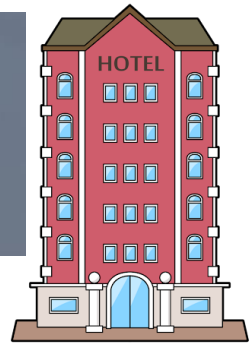
Is that river channel wide enough that I can see predators?

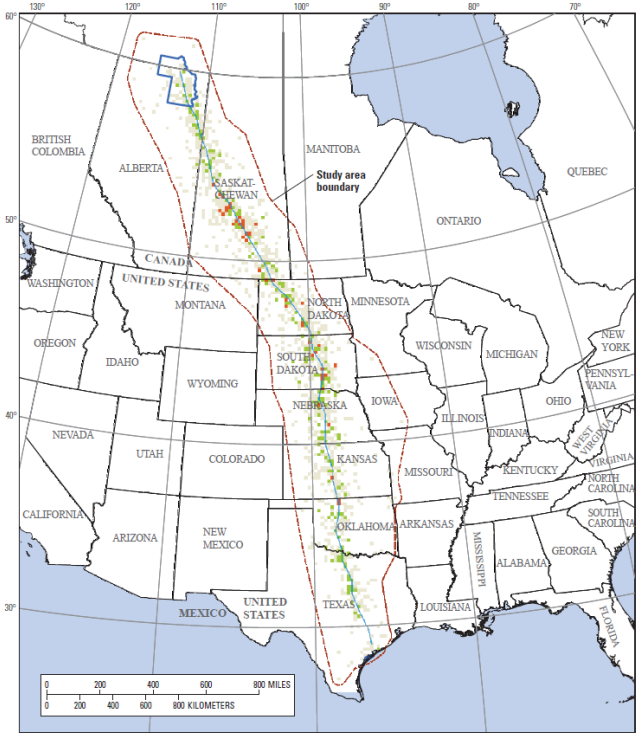
Is there food to eat on those fields?

Draft Big Question 1: What are the conditions that influence whether a WC will stop or flyover the Central Platte River?

ISAC recommendations

- Platte data:
  - Great data, but small sample size (51 birds, 9 stopovers)
  - Focus on the "*stopping window*" (last ~4 hours before dark). Not interested in birds that fly over at noon.
- Consider larger data set covering bigger area:
  - Will reveal insights on factors related to stops; increase statistical power.
  - Where did birds stop that were in the stopping window but didn't stop in the Platte?
  - About 8% of birds flying over the Platte stop. How does that compare with other areas?
  - Collaborate with other entities who have collected these data; develop a data sharing agreement and do joint publications.

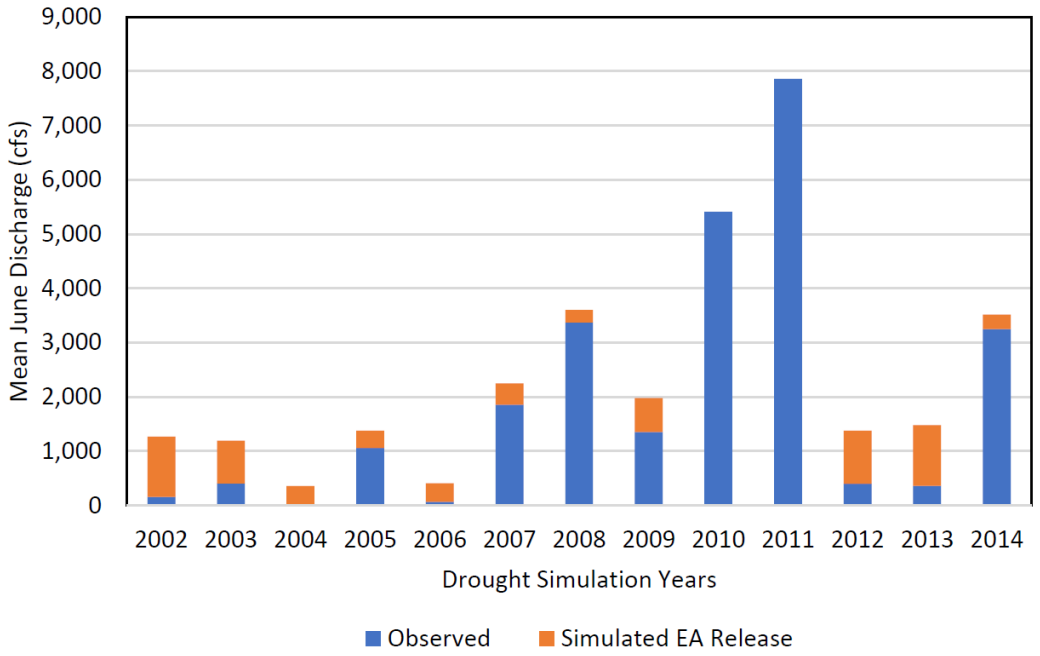




Pearse et al. 2015 WC stopover use intensity

Draft Big Question 2: Can we use water to maintain unobstructed channel width for WC use?

- ISAC: this draft big question yields a *YES* or *NO* answer which isn't that helpful to the Program
  - Suggested rewording: *What combination of flow and mechanical actions is the most ecologically-effective and cost-effective approach to maintaining unobstructed channel width for WC use?*



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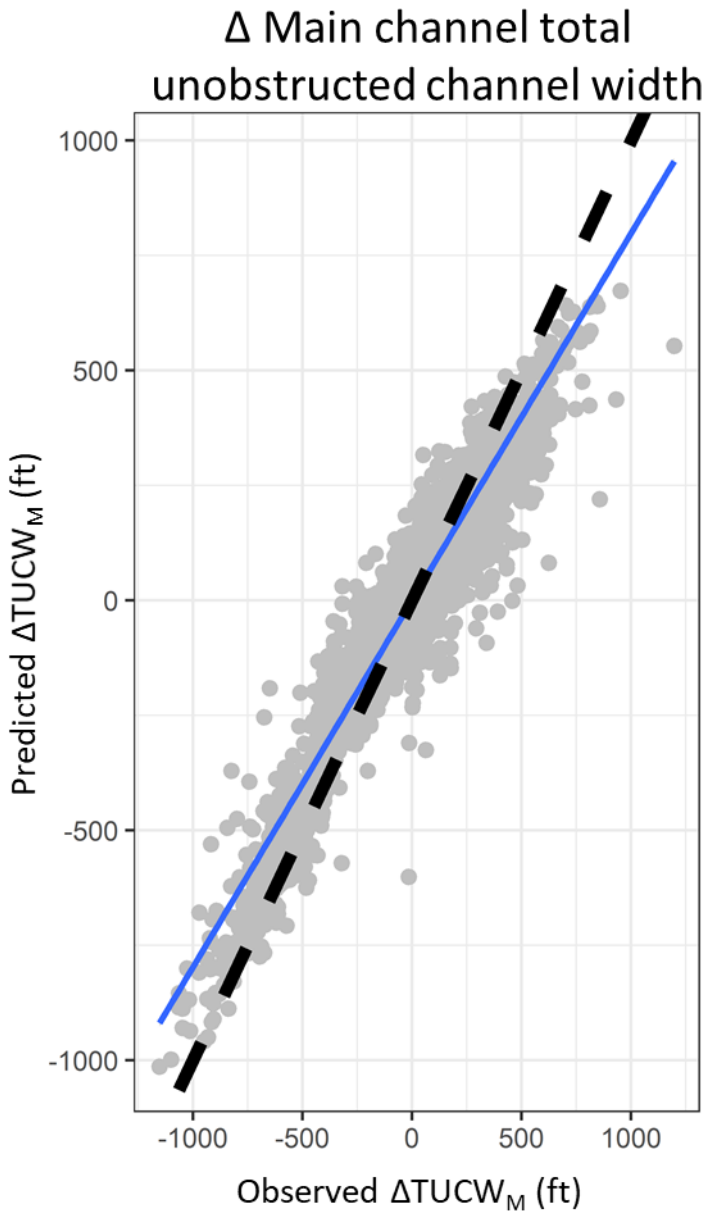
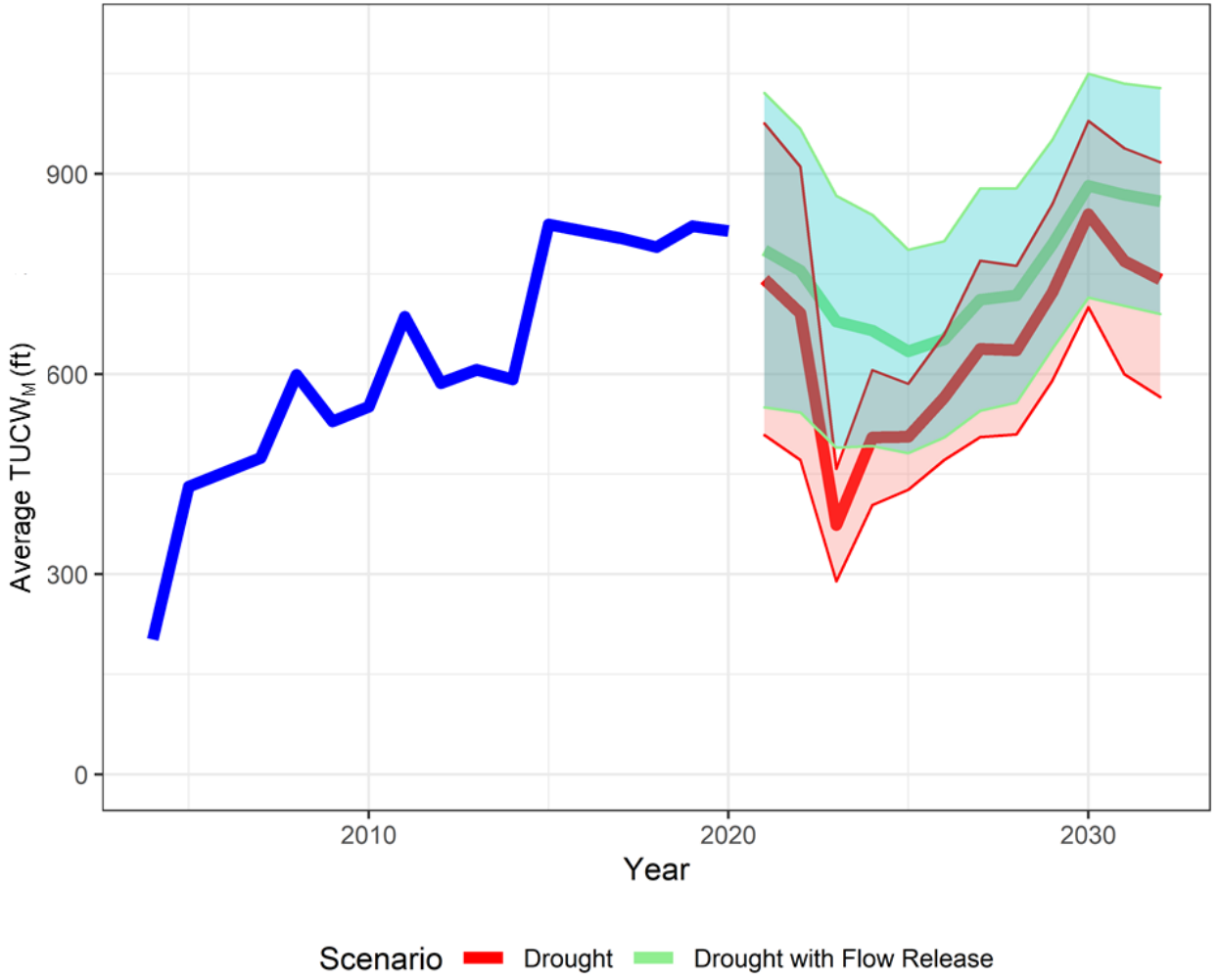
Draft Big Question 2: Can we use water to maintain unobstructed channel width for WC use?

- EDO Technical Tool - Random Forest model
  - A big step forward in modeling factors that affect change in channel width
  - Excellent examination of predictions with realistic drought scenario based on 2002-2014
  - Model provides better understanding of factors that impact river width and the potential for using water for germination suppression, disking, herbicide



Draft Big Question 2: Can we use water to maintain unobstructed channel width for WC use?

- Germination suppression flow increases average $TUCW_M$ (physical metric)
- ISAC recommendations:
  - Show effect of such flows on % of the 436 cross-sections with UOCW > ~600' (preferred by WCs; biological metric)
  - Consider triage approach: flow not needed in wet years, not enough water in very dry years, use water in the intermediate years
  - Explore effect of a large flow event (e.g., 2015) as well as a prolonged drought on model predictions – still reasonable?



PRRIP Science Plan for program water in the extension related to WC

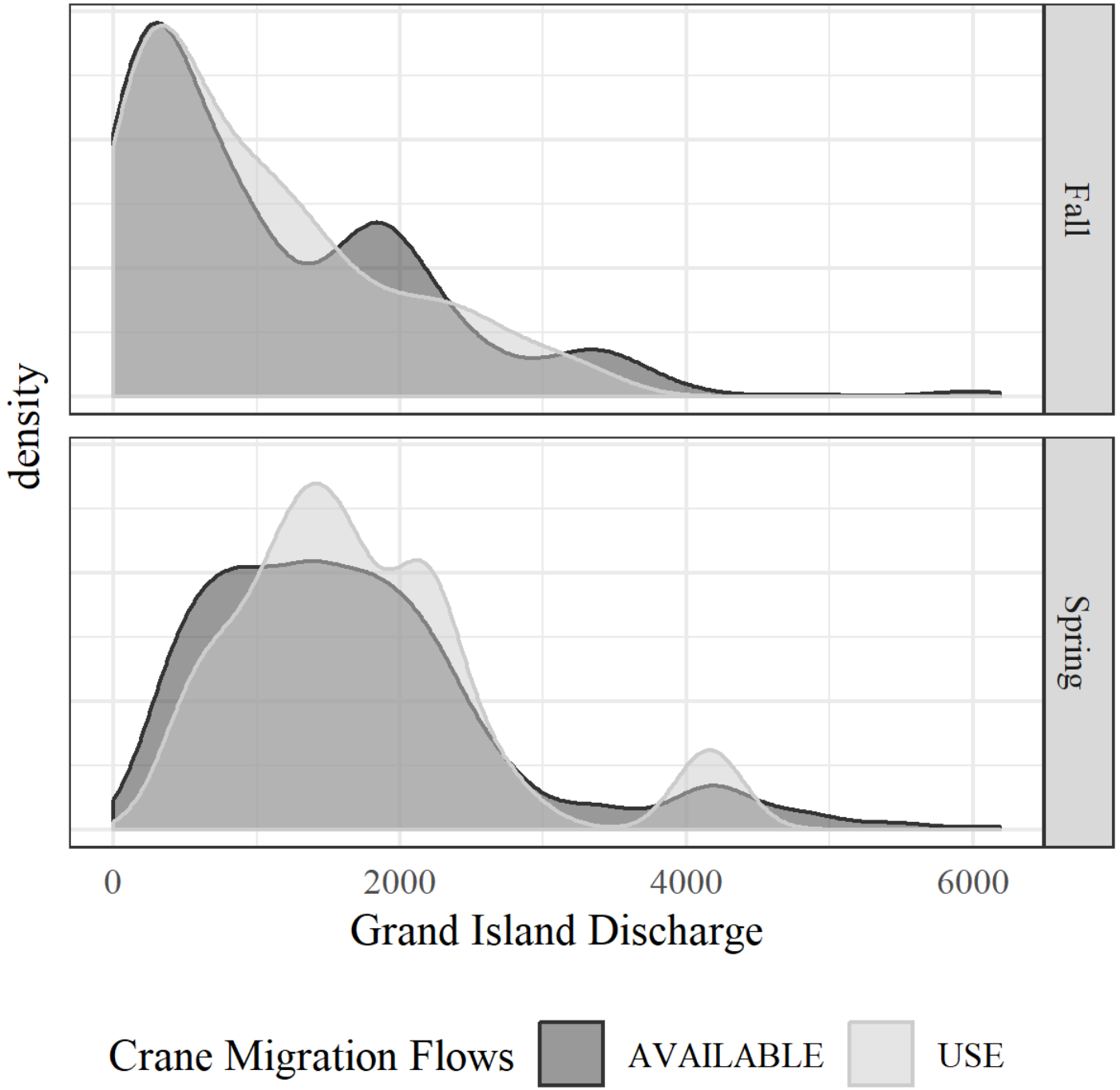
EDO questions for ISAC

1) How important is it to keep water in the channel for WC during migration vs. using water later in the season to keep the channel clear in the spring and summer?
2) How do we address the gap in Program learning on low flows during both WC migration and under existing wide channel conditions?

Next 3 slides: what does the science say?

WC use a wide range of flows

2001-2017 PRRIP WC monitoring data suggest birds use whatever flow is available



Channel width is important (older data)

Baasch et al. 2019:

1. Platte River AHR aerial survey data for spring 2001 to spring 2017 (85 unique whooping crane groups) found that:
   - unobstructed channel width and distance to the nearest forest were the best predictors of whooping crane use
   - Note: Top model also included flow as a predictor (unit discharge)

2. To increase WC stopovers they recommend:
   - Remove in-channel vegetation to increase the unobstructed width of narrow channels (those <200m, or 650’)
   - Remove trees within areas where the unforested corridor width is <330 m (or 1080’).

Channel width is important (recent data)

- Data:
  - whooping cranes migrating through the AHR, Fall 2017 – Fall 2020
  - data from the WC Cellular Telemetry Tracking Partnership

- Results: when looking over entire day, what predicts stopovers?
  - Time of day is most important predictor
  - Channel width is somewhat important
  - Flow doesn't seem very important based on this small sample

Source: August 2021 ISAC quarterly meeting "02 - WC Stopover_Flyover ISAC Summary.pdf "

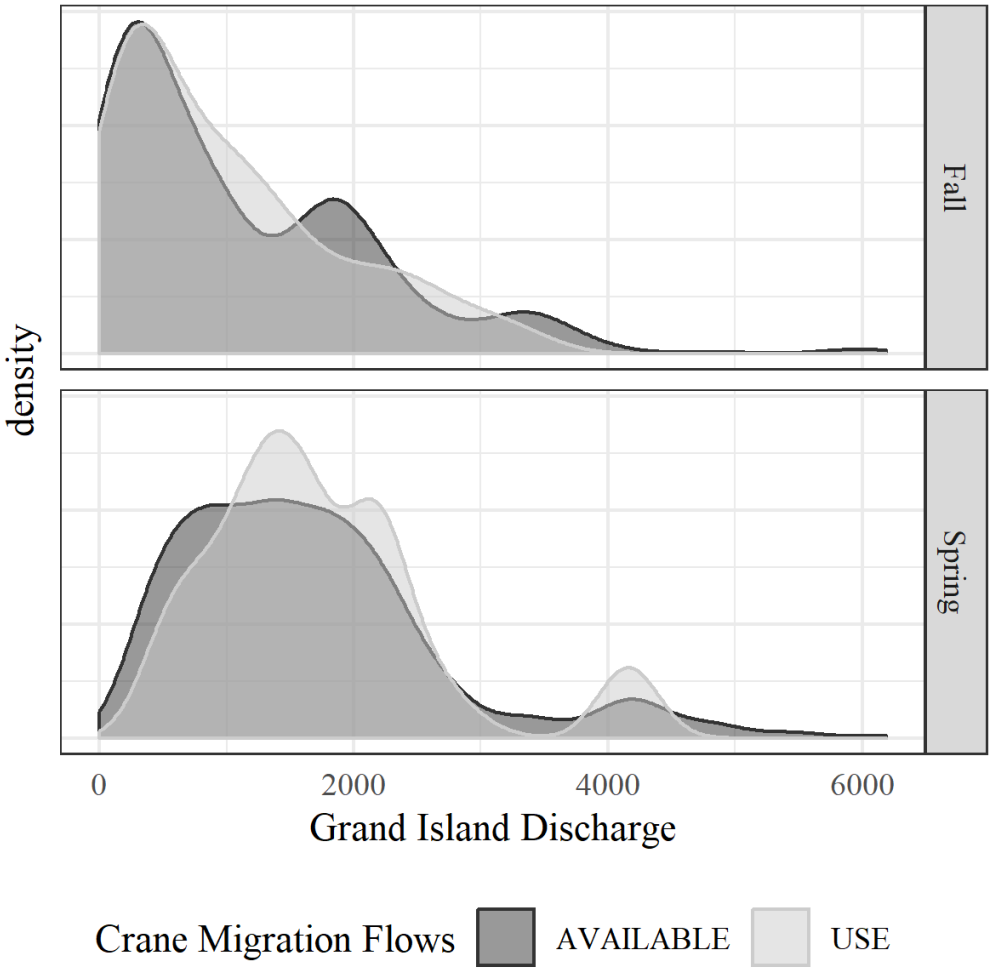
ISAC answer to EDO question:

How important is it to keep water in the channel for WC during migration vs. using water later in the season to keep the channel clear in the spring and summer?

- Given that birds seem to use river at all levels, using water to keep the channel clear seems to be more important
- One possible approach: change water use with water availability, considering **all** species objectives and management actions [further discussed on slide 16]
- Important caveat: can you prove that river water suppresses germination?
  - Is it more important to use water for Pallid Sturgeon and other uses?
  - Is it cheaper to use mechanical methods to remove vegetation?
  - What is the most sustainable practice over multiple water years?

ISAC answer to EDO question:
How do we address the gap in Program learning on low flows during both WC migration and under existing wide channel conditions?

- Not a high priority for investigation given that past data suggest birds use available water
- Worth monitoring discharge and WC stopovers using cellular telemetry to see if this pattern holds with future flows



ISAC recommendations:
Next steps to investigate water use tradeoffs

- Develop testable hypotheses that address the optimal allocation of water and other management actions, across different water years, in achieving two objectives:
  - increasing WC stopovers; and
  - maintaining channel width for WC
- Evaluate the cost-benefit of various combinations of flow, mechanical and herbicides as effective management actions to maintain channel width.
- Revisit the Baasch et al. 2019 recommendation "*Remove trees within areas where the unforested corridor width is <330 m*"

ISAC recommendations:
Next steps to investigate water use tradeoffs

- One way of thinking about the decision problem: *What's the optimal allocation of management actions across different water years to achieve multiple objectives? How can the program use contrasts to test hypotheses, learn, and improve this allocation?*

Management Actions	**Management Objectives**									
	Increase WC stopovers			**Maintain channel width**			**Assist pallid sturgeon**			**Other objectives …**
Water Years →	Dry	Avg.	Wet	Dry	Avg.	Wet	Dry	Avg.	Wet	
Flow										
Mechanical (e.g., disking)										
Herbicide										
Other actions (e.g., sediment augmentation)										

Main takeaways

Specific

1. Increase use of broader WC database (beyond the Platte) to better understand site selection and stopovers vs. flyovers
2. Continue to develop testable hypotheses about water and channel width
3. Analyze tradeoffs across multiple actions, water years and objectives.

General

1. EDO doing high quality analyses with excellent technical tools.
2. With each new technical tool, make sure that the scientific and management questions of interest are being answered.
3. Continue to explore sensitivity of predictions to different assumptions and climate scenarios.
4. Transform questions into testable hypotheses.

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QUESTIONS?

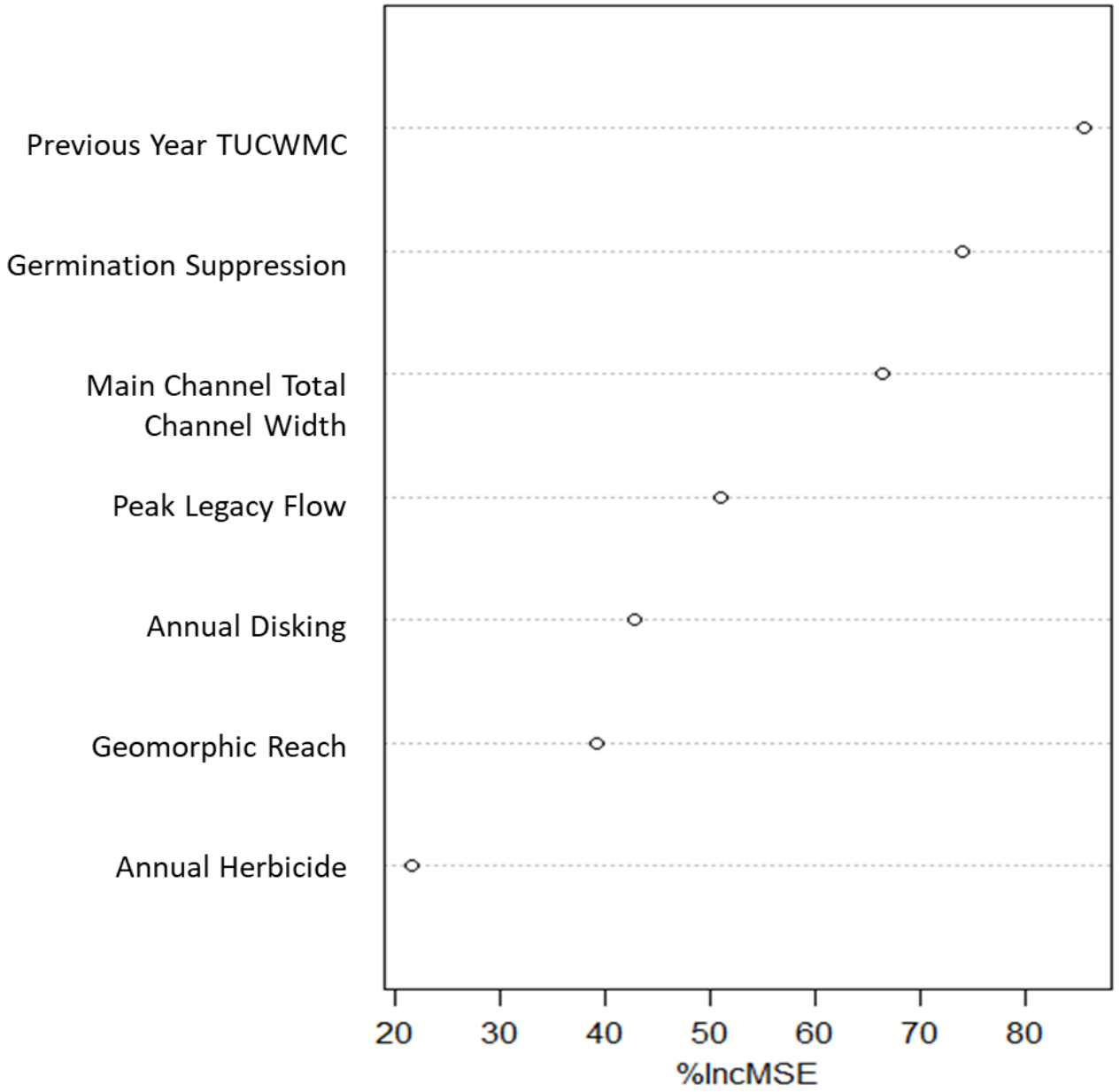
Relative importance of different factors in explaining stopovers

Table 1. Whooping crane stopover decision model selection in the Associated Habitat Reach.

Model Rank	Variables	AICc	ΔAICc	weight
1	Time of Day * MUOCW	31.3	0	0.199
3	Time of Day	31.8	0.5	0.157
2	Time of Day * MUOCW + Flow	33.5	2.2	0.066
4	Time of Day + Flow	33.9	2.6	0.054
5	MUOCW	56.8	25.5	0
6	Flow	59.3	28	0

From “02 - WC Stopover_Flyover ISAC Summary” – 4 page document distributed for August 9th , 2021 ISAC meeting

Relative importance of different factors in explaining annual changes in total unobstructed main channel width



More important factors at the top

From “03 – Random Forest Machine Learning ISAC Summary V2” – 10 page document distributed for August 9th , 2021 ISAC meeting

Relationships between different factors and annual changes in total unobstructed main channel width