PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM (PRRIP -or- Program)

TO: Governance Committee (GC)
FROM: Technical Advisory Committee (TAC)
RE: *Whooping Crane (Grus americana) use patterns in relation to an ecotope classification in the Central Platte River Valley. Nebraska, USA.* (Ecotope Article)
DATE: August 29, 2023

A 2022 article in *Avian Conservation and Ecology* (Baasch et al. 2022; Ecotope Article) focused on whooping crane (WC) diurnal (daytime) use of the Program's Associated Habitat Reach (AHR), specifically addressing prior Program research (Howlin and Nasman 2017; WEST Report) that concluded WC select corn over wet meadows. The Ecotope Article authors hypothesized that these results were due to the Program's definition of wet meadows (Land Plan Table 1) that includes both upland and wetland landcover. The authors' developed new landcover classes that separated wetland and upland components of wet meadows and croplands, finding WC occurrence to be positively associated with wetland components of wet meadows and agricultural fields and negatively linked to upland landcovers (prairie and cropland).

The authors, many of whom have some affiliation with the Program, attended the TAC meeting in April 2023 to discuss data, methods, and results. The TAC revisited the topic in July 2023 to further discuss recommended paths forward and to further clarify the differences between Baasch et al. 2022 and Howlin and Nasman 2017. Major differences are 1) different whooping crane use points used by the two papers 2) different set of available points used by the two papers 3) different temporal scales 4) different land cover types and 4) the Baasch et al. 2022 exclusion of diurnal sites within the river channel. Based on that discussion the TAC recognizes it is difficult to directly compare the two papers and it is not clear that direct comparison of the papers is necessary. The EDO had provided to the TAC a synopsis of differences between the two papers around which the TAC had extensive discussion, the synopsis and TAC minute excerpt are attached as additional information for the GC.

Based on the discussions and available information the TAC recommends:

- Integrate the finer scale landcover classification data used in the Ecotope Article into ongoing WC habitat analysis efforts (e.g., riverine roost site selection). The TAC sees no risk in using the refined classifications in Program analyses as they can be rolled-up or generalized to match old classifications if necessary.
- Re-run the WEST Report diurnal use analysis substituting the finer-scale Ecotope landcover classes in place of PRRIP landcover classes. This would clarify whether different findings are the result of landcover classes or other differences in WC use data, analysis methodology, etc.
- Use the results of all relevant science in combination with the recently completed evaluation of wet meadow hydrology to refine land management plans **if** warranted.

In addition, the discussion around these two papers has led the TAC to recognize the need to address the term "wet meadow" and the broad range of conditions currently falling under the umbrella of "wet meadow" to better evaluate site specific management. **We are not proposing a change to the Program's past definition of wet meadows (Land Plan Table 1) or the agreed upon complexion of Program lands.** Instead, the group focused on the potential to expand understanding of the range of

conditions in Program defined “wet meadows” to address their importance to whooping cranes as both use sites and buffer as defined in Land Plan Table 1, value to other species of interest, and management for potential future listed species**.** It is unlikely that the issues associated with definitions of land cover will be resolved as long as the term “wet meadow” covers such a wide range of conditions. The current wet meadow hydrology study better defines this range of conditions. The TAC and LAC have initiated efforts to evaluate the overall ecological value of grassland areas as use sites by whooping cranes including as a buffer, their importance to other species, and management actions for potentially future listed species. The impetus behind those efforts is to develop a process that protects all past land purchases, can aid in evaluation of any future purchases if needed and better informs management of individual sites.

This memo provides a set of recommendations to the GC on how to incorporate science done outside the Program, while leaving the door open to the GC on how this study or others may be evaluated as part of any future questions. TAC evaluation of science will be an ongoing effort as new information becomes available, as new questions arise and second increment planning occurs.

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM (PRRIP -or- Program)

Technical Advisory Committee (TAC) Virtual Meeting

Meeting held in-person at ED Office in Kearney, NE

Day 2: Wednesday, July 19, 2023; 8:00 AM – 12:00 NOON CST

Technical Advisory Committee (TAC)

State of Wyoming
Michelle Gess – Alternate
Jeremy Manley – Alternate

State of Colorado
Kara Scheel – Member

State of Nebraska
Caitlin Kingsley – Member
Jennifer Schellpeper – Alternate

Upper Platte Water Users
n/a

Downstream Water Users
Brandi Flyr – Member
Jim Jenniges – Member
Dave Zorn – Member

Bureau of Reclamation (Reclamation)
Brock Merrill – Member

U.S. Fish and Wildlife Service (Service)
Matt Rabbe – Member

Environmental Entities
Rich Walters – Member
Amanda Hegg – Member
Bethany Ostrom – Alternate
Melissa Mosier – Alternate

Colorado Water Users
Jason Marks – Member

Executive Director's Office (EDO)

Jason Farnsworth, ED
Chad Smith
Malinda Henry
Justin Brei
Tim Tunnell
Patrick Farrell
Mallory Jaymes
Kaley Keldsen
Jason Bruggeman
Jonathan Wentz
Seth Turner
Sarah Fancher
Helen Davis
Kristen Cognac
Libby Casavant

Other Participants

David Baasch – Crane Trust
Avery Dresser – NE DNR
Melissa Marinovich – NGPC
Joel Jorgensen – NGPC
Brett Roberg – NGPC

RELEVANT SCIENCE ONBOARDING

Relevant Science Articles

Henry reminded the TAC that the Ecotope article was discussed at the April TAC meeting and was brought back to the TAC at their request for further discussion. The goal for the discussion was to recap the information contained within the article so everyone was on the same page, decide if and why this article is important for the Program, decide how to convey this information to the GC, and decide if the TAC would like to make any formal recommendations to the GC with regard to onboarding the science presented in the article.

Jenniges said the ISAC already dealt with this issue at the Reporting Session by saying there would always be contradictory science. They advised to recognize it exists; if relevant, address; if no changes in Program management, move on. Smith asked what was meant by address it, that is what we are trying to get at here. Scheel asked if there were any management implications. Jenniges said the implication is on the Program's definition of a wet meadow. We need to address what is a wet meadow, it is at the heart of the issue. Farnsworth said the ISAC thinks in terms of science, that is their job, but the EDO and the TAC need to focus on providing information to the GC on how to allocate resources moving forward into the 2nd Increment. We do not want to get into a situation where we have competing science without a clear path indicating which way to move forward. Schellpeper said it is a TAC obligation to provide decision-makers with information as it comes in. In the ISAC Report from the Reporting Session they provide a framework for evaluating this science as it comes in. It is the TAC's job to do a technical evaluation. Jenniges asked what is the question the GC will have to answer relevant to this article? Will there be more land acquisition? Do you want it to be more wet meadow? Jenniges said no information is "off-limits" in negotiations. Redoing analysis with new landscape is waste of time. We do not know the conditions of wetlands experienced when cranes were there. Jenniges said maybe we wait for the telemetry to see what whooping cranes actually use. Baasch said we may not have enough data from telemetry. Jenniges pointed out that saying this article is not relevant to the Program because it used different methods or because Program analyses say whooping cranes don't use wet meadows is a very different argument than saying the article isn't relevant because there are no more wet meadows to buy, or we are not changing management anyway so it isn't relevant. Schellpeper asked if we changed management because of the WEST diurnal analysis. Baasch asked if wet meadows got left out of the Science Plan because Program study said whooping cranes didn't use it. Jenniges said yes, management was based upon vegetation height instead of wetland components. Farnsworth said we used the regulatory definition of wet meadows (tract-level) instead of other definitions. Results indicated non-selection of wet meadows. Whooping cranes selected the river and corn more often than wet meadows for diurnal use. From then on wet meadows were no longer a focus for target species. Jenniges said the Land Plan still requires 640 acres of wet meadow at each complex. No one is promoting getting rid of wet meadows. Farnsworth said wet meadows became more important for the benefit of other species. The Ecotope article says that whooping cranes use the wet part of wet meadows. What can we do to help the GC understand what these differences in study findings mean? Are wet meadows important for whooping cranes or not? Rabbe asked what management actions you could take either way? Look for and acquire more wet meadows. Restore wet meadows or make them wetter by adding water over the top. Management intensity and cost will determine how much certainty is needed around whether that action will benefit whooping cranes or not. Other species can benefit from maintenance of wet areas off-channel. Jenniges asked, but are whooping cranes going to use them? We never saw use of these. Broadscale recharge has lots of waterbird use when its full, but not whooping cranes. Dippel and Johns have some, but not a lot. Baasch said the Ecotope article suggests a different definition for wet

meadows, and if adopted, would break wet meadows into drier and wetter components. In the past, if a large block of grassland remained it was assumed it would be too wet to farm, and was defined as a wet meadow. Maybe a 300 acre wet meadow tract becomes 60 acres of true wet meadow with the rest being upland grassland. Walters asked if we should use the Ecotope definition of a wet meadow. Jenniges said it provides a more defined wet area within grasslands, and we could manage those areas differently. The wet meadow hydrology study could be used also to help delineate wet meadows. Farnsworth asked what is the downside of doing the WEST-Ecotope comparison? Jenniges said both have the same temporal mismatch, don't know how much water was at a location at the time of use. Jenniges thought we would probably get the same result as the Baasch Ecotope paper. The original study by WEST did not use the hydrology piece with no minimum wetland component to it. Schellpeper asked how a wet meadow was defined originally. Rabbe said that goes back to the joint study with the intent of protecting remaining grasslands next to the river. Some whooping cranes used these areas, but protection of grasslands was priority. They were hooked up to whooping cranes to protect them. Thought of as a 5th Program species with ¼ of all land complexes supposed to be wet meadows. Rabbe said the GC should memorialize existing wet meadow grassland in the Program. Jenniges said these grasslands are more valuable for other species that may enter into ESA. Walters said we need to refine the land plan definition of wet meadows and how to manage these areas. Baasch said the implication of the Ecotope article is how we define a wet meadow. Henry said she does not expect a re-do of the WEST analysis to provide same results as the Ecotope paper given the differences in dataset and analysis framework and scale. Studies were done differently with the Program pairing up use sites with available locations within 10 miles as a discrete choice, but Ecotope considered the entire AHR as available. Jenniges said we should keep the discrete choice framework. Baasch supported this as well. Farnsworth asked if we need to find out why there are differences and how to explain those differences. Rabbe said the results are not surprising given whooping crane's preference for water. Ostrom asked whether Program results back this up. Henry said the WEST study found the most important explanatory variable explaining whooping cranes diurnal use sites was the river. The Ecotope article eliminated all diurnal use of the river to ask what was important for diurnal use off the channel only. Rabbe said there was also a temporal difference between the studies, the WEST study was conducted earlier under a different set of climate conditions and amount of habitat wetness. Baasch said the Program use dataset is tied to 1st observation of the day which is riverine. Farnsworth said diurnal use was defined by a set time cut off. Flyr said that 10 years from now new folks will need reference to solid foundational documents that provide context and perspective, 1–2-page document that provides a solid background on what we know. How do we communicate these steps and decisions so new people can be up to speed when they first enter the Program for their entity? Ostrom supported re-running the WEST analysis with the updated landcover product, using the Program's previous analysis framework to do a better job with updated landcover classes. The results from that updated analysis will then be the Program's answer. Jenniges reinforced Rabbe's comment for the GC to memorialize the importance of wet meadows for their own sake. Schellpeper summarized what she had heard from the TAC thus far in an attempt to develop definitive statements for the GC:

1) The Ecotope article is a peer-reviewed, published paper.
2) If separate the wet portion of wet meadows from the tract as a whole you will get a different answer.
3) This moves us to redefine a wet meadow from a science and land management perspective. We need to add clarity to the definition as all wet meadows are not alike. What is a wet meadow in relation to whooping cranes? What is a wet meadow in relation to the regulatory definition?

4) if all grasslands are not equal in terms of whooping crane habitat, can we manage the wetter portions of them differently, focus management on those wetter portions rather than just managing them for structure?
5) Rerun WEST analysis with updated landcover information to better compare results of Ecotope and WEST studies. Jenniges asked if the EDO would need additional staff to re-run the WEST analysis. Farnsworth said no, Farrell can do the analysis. For clarification Scheel recapped that no one was talking about getting rid of wet meadows, there were not many of them out there to acquire, and the TAC was not proposing excavation for wetland restoration.
6) The Science Onboarding process is not a one-time thing. It is something the TAC will need to deal with as new information comes along. The process will need to be question specific and problem specific.
Gess asked the TAC to clarify whether or not the TAC was looking to redefine wet meadows in terms of land goals. How would redefining a wet meadow impact the Program's land goals? Jenniges and Rabbe agreed that this would not change policy-level definitions, goals, or the Land Plan. Redefining wet meadows would mean to do so in terms of science and management only. Steps moving forward today from the TAC discussion are for the EDO to take a first shot at revising document 10 (below) sent out as a pre-read for this discussion to reflect TAC discussion today. The TAC will review/revise that memo. If needed, the TAC can participate in a virtual meeting to resolve any disagreement or modify approach. Then the memo will go to the GC for their September meeting. Schellpeper asked why the Ecotope research was done outside the Program? She asked if the TAC had been made aware of or discussed the research prior to publication. Baasch said there was a question around why the meadow marsh signal was different in the AHR when compared to a corridor-wide analysis. The wet meadow polygons used by the Program seemed inappropriate and they wanted to adjust for the discrepancy. Rabbe said there had been no real consensus on the definition of a wet meadow, rather the Program's definition was agreed upon as a compromise between several different definitions from many perspectives, so they did it on their own.

Documents:
09_Baasch et al. 2022 Whooping Crane (*Grus americana*) use patterns in relation to an ecotope classification in the Central Platte River Valley, Nebraska, USA. https://doi.org/10.5751/ACE-02311-170235
10_DRAFT 2023 PRRIP Ecotope Article Onboarding Memorandum

EDO ACTION ITEMS:

- Draft a memo to summarize information TAC would like to provide to the GC with regard to the Baasch et al. 2022 Ecotope paper and potential implications this paper may have for Program science, management, and policy. Memo will contain a list of TAC recommendations to the GC. By **July 28, 2023**.
- Incorporate TAC feedback to finalize memo by **September 11, 2023.**
- Onboarding of Baasch et al. 2022 Ecotope paper presented to the GC at September meeting.
- Pending GC guidance from September meeting, rerun the WEST analysis with updated, finer scale landcover product from the Baasch et al. 2022 Ecotope paper.

TAC ACTION ITEMS:

- TAC review of EDO draft memo to summarize information and make TAC recommendations to GC with regard to the Baasch et al. 2022 Ecotope paper by **Aug 15, 2023**.

TAC MOTION: No motion made at this time.

ARTICLE INFORMATION AND RESEARCH COMPARISON

ARTICLE INFORMATION

Citation:

Baasch, D., Caven, A., Jorgensen, J., Grosse, R., Rabbe, M., Varner, D., & LaGrange, T. (2022). Whooping Crane (Grus americana) use patterns in relation to an ecotope classification in the Central Platte River Valley, Nebraska, USA. *Avian Conservation and Ecology*, *17*(2).

Abstract or Summary:

A portion of the Aransas-Wood Buffalo population of Whooping Cranes (Grus americana) stopover within the Central Platte River Valley (CPRV) annually. Past studies have found Whooping Cranes select herbaceous wetlands over agricultural fields when evaluated at a migration-corridor scale. However, recent studies conducted within the CPRV have reported Whooping Cranes selected agricultural fields and avoided herbaceous landcover classes. We hypothesized that much of this discrepancy was due to differences in landcover classifications used in previous studies, particularly those related to wetland designations. We used multiple existing, fine-scale geospatial data sources considering both landcover and hydrological factors to define unique and regionally specific ecotopes, which are the smallest homogenous and biologically relevant mappable units of analysis in landscape ecology (e.g., meadow-marsh, upland agriculture, etc.). We examined whether ecotope-based landcover, when evaluated at multiple spatial scales (i.e., 400 m and 1000 m), predicted terrestrial Whooping Crane occurrence within the CPRV. We used generalized linear mixed models within an information-theoretic approach to assess Whooping Crane occurrence within the CPRV. We found distinct ecotopes at the 1000-m scale explained nearly 40% of the variation in Whooping Crane occurrence. Ecotope models outperformed models including only their component parts such as flooding frequency and wetland designation. Whooping Cranes occurred more frequently within wetland portions of both agricultural fields and natural herbaceous communities and were less likely to use analogous upland components. We also found that occurrence was positively associated with proximity to the main channel of the Platte River and that Whooping Cranes avoided roads and developed areas, as several other studies have reported. Our findings indicate herbaceous and agricultural wetland areas should be targeted for Whooping Crane conservation efforts within the CPRV and perhaps regionally.

Relevant PRRIP Research:
Howlin, S., and K. Nasman. 2017. Correlates of Whooping Crane habitat selection and trends in use in the Central Platte River, Nebraska. Prepared for the Platte River Recovery Implementation Program. Western EcoSystems Technology, Inc., Cheyenne, Wyoming, USA, 140 pp.

COMPARISON TO RELEVANT/REFERENCED PRRIP RESEARCH	
Ecotope Article (2022)	**WEST Report (2017)**
Research Objective	
Analysis of off-channel whooping crane diurnal habitat use with a focus on finer-scale (ecotope-based) herbaceous and agricultural wetland landcover classes to evaluate selection of wetland versus upland components of the landscape as a potential explanation for discrepancies between AHR and corridor-wide diurnal habitat selection results.	Analysis of diurnal habitat selection by whooping cranes for the purpose of informing PRRIP habitat management.
Study Area	
PRRIP Associated Habitat Reach	PRRIP Associated Habitat Reach
Methods	
<u>General:</u> Use-availability likelihood using binomial family Generalized Linear Mixed-Effects Models (GLMM).	Use-availability likelihood using penalized regression splines to approximate functional response within a General Additive Model (GAM) framework.
<u>Use Data:</u> USFWS public sightings database & PTT-marked crane locations 1995-2015 &. All sightings >10 m outside high banks of any river channel with location accuracy estimated at ≤ 400 m. Total 306 public sightings and 41 PTT-marked locations.	PRRIP systematic aerial monitoring protocol fall 2022 to spring 2023. Limited to systematically detected WC groups with continuous observation data. Continuous data subsampled to include 1 roost location per crane group per day. Diurnal observations determined to be independent if separated by 2.5 hrs. Multiple observations weighted by length of time WC group spend in land cover type. 247 spring observations and 131 fall observations (378 total).
<u>Choice Set:</u> 20 available locations per use location distributed randomly throughout the AHR (use/available not linked).	50 random locations per use location distributed within a radius of 3 miles from each use location (use/available linked).
<u>Landcover Classes:</u> Percent of landcover classes at two scales: 400 m (minimum locational accuracy of use data) and 1,000 m of use and available locations (similar to Niemuth et al. 2018). Landcover classes (see Table 1): agricultural, agricultural wetland, development, invasive dominated wetland, meadow-marsh, open water, other, prairie, wet prairie, river channel, shrubland, and woodland.	Point-based landcover at use and random locations. Landcover classes: Corn, alfalfa, soybeans, wheat, channel, developed, grassland, trees, palustrine wetlands, and wet meadow.

Other Variables: Distance to nearest paved road & proportion developed as fixed effects. Landcover class and population density within a 2.6 km^2 area as random effect.	Nearest obstruction (trees > 1.5 m), nearest disturbance (house, town, road or railroad), proximity of use location to previous night roost location as fixed effects.
Results	
Top Model: Ecotope models at 1000-m scale performed best. Top model included proportion agricultural wetland, meadow-marsh, prairie, river channel, woodland, development and distance to nearest road as fixed effects. Likelihood of occurrence increases with values of meadow marsh, agricultural wetland and river landcovers. Decreasing likelihood of occurrence with increased woodland and developed landcovers within a 1000-m buffer. A 1% increase in meadow-marsh would increase probability of use by 5.1%. A 1% increase in agricultural wetland would result in 17.4% increase in use. A 1% increase in riverine would result in 27.9% increase in use. A 1% increase in woodland = 3.8% decrease in use and 1% increase in developed = 3.9% decrease in use. Pseudo R^2 values were 0.39 for whole model and 0.19 for fixed effects only.	Full model with all 4 covariates was most likely. Model contained effects of nearest obstruction, nearest disturbance, proximity to roosting location and land cover. Selection ratios increased with distance to nearest disturbance (highest = 1,339 ft). Parametric function for nearest obstruction was not statistically significant. Selection ratio decreased with increasing distance from roost location. Relative selection ratio approaches 0.0 at 10,000 ft. Model results for land cover interpreted relative to corn. Selection ratio significantly higher for in-channel cover relative to corn. All remaining categories had lower relative selection ratio than corn. USE LOCATIONS: corn 45%, channel 45%, soybeans 4%, wet meadow 2%, grassland 2%. AVAILABLE LOCATIONS: corn 44%, grassland 13%, soybeans 12%, wet meadow 10%, trees 8%, developed 7%, channel 4%, alfalfa 1%, wheat <1%.
Author Interpretation: “Similar to other studies, we found areas with increased wetland components (i.e., meadow-marsh and wetland agriculture) located near the Platte River and decreased densities of roads and development had a higher likelihood of occupancy for diurnal use by Whooping Cranes than drier components of the landscape. Our top model explained 39% of the variance in Whooping Crane occurrence within terrestrial landscapes in the CPRV.” “Contrastingly, Howlin and Nasman (2017) found Whooping Cranes avoided wet meadows as compared to agricultural fields within the CPRV.	“The diurnal habitat model presented here indicates whooping cranes were selecting in-channel and corn cover categories that were close to the previous night roost location and did not have the possibility of disturbance in the form of houses, towns, roads, or railroads. The model results did not indicate whooping cranes show avoidance of vegetation greater than 1.5m during diurnal habitat use. Relative to the corn cover category, the relative selection was significantly lower for grassland, soybean, and wet meadow cover categories.”

However, their demarcations of wet meadows were based on PRRIP's (2012) delineations, which included all riparian grassland landcover types regardless of relative wetland composition or wetland size. Contrastingly, we found Whooping Crane occurrence was positively associated with meadow-marsh and negatively linked to upland prairie habitats. Therefore, the coarser mapping scale used by Howlin and Nasman (2017) likely masked ecologically important differences in landcover types that are predictive of Whooping Crane occurrence" "Whooping Cranes appear to be more likely to occupy wetland components of both herbaceous and agricultural landscapes, so occurrence and selection models that treat all grasslands or agricultural lands equally likely fail to detect important and biologically relevant habitat associations for this species."	"During the day whooping cranes used cornfields that were close to the previous night's roost with no possibility of disturbance; selection ratios were greatest at 1,339 feet from the nearest disturbance (i.e., house, town, road, or railroad) with distances between 1,009 and 1,635 feet resulting in statistically similar selection ratios." "During the day whooping cranes were significantly more likely to choose riverine habitat over corn cover, but chose corn cover significantly more than grassland, soybean, and wet meadow cover."