GEOMORPHOLOGY & IN-CHANNEL VEGETATION MONITORING

Program Context: The goal of this effort is to track long-term trends in morphology and in-channel vegetation in the Associated Habitat Reach (AHR) of the Central Platte River, with a focus on changes that may affect habitat for the PRRIP target species. The identification of salient trends in habitat conditions can bolster management decisions on an annual basis. However, the rich and complex dataset presents many opportunities for developing a deeper understanding of geomorphological and ecological dynamics on the Platte. Going forward through the First Increment Extension, the remote sensing data will be integral to answering the following Extension Science Plan Big Questions:

- EBQ # 1 – How effective is it to use Program water to maintain suitable whooping crane roosting habitat?
- EBQ #2 – How effective is Program management of *Phragmites* for maintaining suitable whooping crane roosting habitat?
- EBQ #3 – Is sediment augmentation necessary to create and/or maintain suitable whooping crane roosting habitat? [1]

This presentation represents the first implementation of the PRRIP System-Scale Geomorphology and Vegetation Monitoring effort utilizing remote sensing methods.

Looking Back: From 2009 – 2016 the Program implemented a field-based system-scale monitoring protocol that included topographic transect surveys, vegetation plot surveys, and sediment size/transport sampling. That approach was abandoned after 2016 due to low spatial coverage, increasing cost, and the recognition that much of the vegetation and sediment data was not useful for addressing priority uncertainties.

In 2017 the Program pivoted to a remote-sensing approach based around collection of high-resolution aerial imagery and topobathymetric LiDAR data. To our knowledge, this is the first-ever collection of aerial bathymetric LiDAR at this scale, frequency, and resolution. The use of this burgeoning technology for effective habitat monitoring represents a notable contribution to the remote sensing, geomorphology, and conservation management communities.

The remote sensing data is analyzed through three principal methods: hydrodynamic modeling, object-based land cover classification, and LiDAR-derived DEM differencing. These methods are used to quantify a variety of metrics associated with target species habitat, including channel wetted width and depth, channel width that is unobstructed by tall vegetation, sediment volume change, and channel area suitable for whooping crane roosting. Additionally, data are presented concerning the primary factors that drive habitat change—hydrology and management. When possible, older data collected with other methods from 2007-2016 are used in tandem with remote sensing data from 2017-2020 in order to capture longer-term trends.

Looking Forward: The high-resolution aerial imagery and topobathymetric LiDAR data will continue to be collected on an annual basis throughout the First Increment Extension. The EDO will provide annual

[1] Suitable whooping crane roosting habitat is defined as channel areas with unobstructed width greater than 650 ft and depth less than 1 ft

reports to update the PRRIP community on changing AHR riverine habitat conditions. These annual reports will follow the methods described in the new remote sensing based protocol.

An important task for the EDO in 2022 will be to determine which specific remote sensing-based products are needed to best support analyses designed to address Extension Big Questions and establish a streamlined workflow to prepare the necessary data.

Discussion Questions: After reviewing the report in depth, we ask that the ISAC provide feedback on the system-scale vegetation and geomorphology monitoring effort in the following areas:

1) We have so far not estimated the error of area-based measurements, or classified area-derived metrics like MUCW and TUCW. What is the best way to estimate error for those measurements—taking into account both LiDAR accuracy and field vegetation data?

2) The volume change error estimation process involves a probabilistic threshold based on LiDAR ground check accuracy assessments, which vary from year to year. This means that each year, a variable elevation difference magnitude is required to pass the threshold, resulting in varying total areas of significant elevation change. Does this complicate effective interannual comparisons of net volume change, and is there a way to account for that?

3) Are any types of data or analyses that are needed to comprehensively capture changing channel conditions and habitat for target species missing from this report?

4) Are there any types of data or analyses in this report that are extraneous to comprehensively capture changing channel conditions and habitat for target species, and should be omitted in future years?