System-Scale Geomorphology and Vegetation 2023 Update

Introduction

In June of 2022, a comprehensive document, *2021 System-Scale Geomorphology and Vegetation Monitoring Report (2017-2020),* was prepared for the Governance Committee. The purpose of this document was to track long-term trends in morphology and in-channel vegetation within the Associated Habitat Reach (AHR) of the Central Platte River and how these trends might affect Platte River Recovery Implementation Program (PRRIP) target species. A diversity of metrics were derived to assess these trends using methods including landcover classification, hydrodynamic modeling, and volume change analyses. All of these analyses utilized high resolution topobathymetric LiDAR and multispectral imagery collected annually within the AHR.

In late-2022, this project was handed off to a new project manager to continue this long-term trend analysis. Due to this transition, the primary focus of the 2021-2022 update was to replicate previous years' analyses to ensure standardization in comparisons across all study years. Herein, we will provide updates to the original *2021 System-Scale Geomorphology* document using data from 2021 and 2022. Results presented within this update are preliminary and will be incorporated into a formal update document once finalized.

Methods

Three different analysis methods were used to assess system-scale trends in geomorphology and vegetation within the AHR. These analyses include an object-based landcover classification, hydrodynamic modeling, and volume change analysis. Specific methods used in each of these analyses can be reviewed in the *2021 System-Scale Geomorphology* report.

Results and Discussion

Object-based Classification

The object-based classification was completed in May 2023 following completion of 2022 flights for both LiDAR and multispectral aerial imagery. Upon completion of the object-based analysis, an accuracy assessment was performed by comparing validation points collected in the AHR within 2 weeks of the LiDAR flight to the classified data. Agreement between classes varied by year analyzed (Table 1). Generally, accuracy of all classes was approximately 70%. Accuracy of obstructive classes was lower than previous years (~90%) in 2021 and similar to previous years in 2022.

Table 1. Accuracy Assessment Results from 2021 and 2022 Object-Based Landcover Classification.

Class	Accuracy	
	2021	2022
Water	42%	90%
Sand	95%	45%
Veg <2	92%	47%
Veg 2-6	39%	89%
Veg 6-15	76%	100%
Veg >15	78%	100%

Table 1. Accuracy Assessment Results from 2021 and 2022 Object-Based Landcover Classification.

Obstructive Classes	56%	92%
All Classes	69%	71%

Once the classification was complete, maximum unobstructed channel width (MUCW) was calculated to assess potential Whooping Crane (*Grus americana*) habitat suitability. Generally, mean MUCW was consistent with previous years (Figure 1).

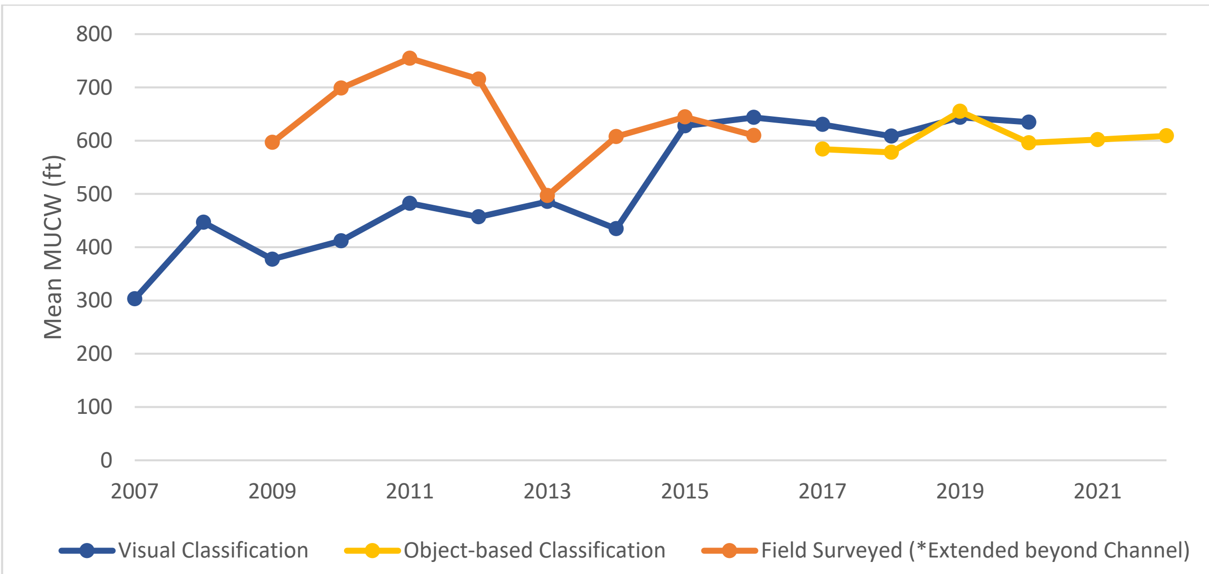

Figure 1. Mean MUCWs by classification method 2007-2022.

Hydrodynamic Modeling

An SRH-2D modeling framework was used to generate predictive water surface models for 2021 and 2022. Modeled water surface elevations were compared to LiDAR or survey data to validate each model. Water surfaces were slightly higher in 2021, but still less than 0.5 feet (Table 2). The Lexington_Overton model reach had the highest error, however, this is likely explained by hydrocyling at the J2 Return.

Table 2. Modeled water-surface elevations minus LiDAR or surveyed water surface elevations (ft) for all models 2017-2022

Reach	2017	2018	2019	2020	2021	2022
GI_Chap	NA	NA	0.18	-0.07	0.21	0.17
She_GI	-0.07	-0.09	0.09	-0.01	-0.11	-0.08
Kea_She	0.17	-0.04	-0.1	-0.06	0.01	0.11
Od_Kea	0.23	-0.07	0.13	-0.06	0.26	-0.02
Ov_Od	NA	-0.15	0.11	0.1	0.15	-0.13
Lex_Ov	NA	0.14	0.06	-0.02	0.30	0.20

Volume Change Analysis

The AHR net sediment balance analysis indicated a significant net increase in bed volume in the J2 to Overton reach between 2020-2022 (Figure 2). Additionally, a significant net increase in bed volume was also observed between 2021-2022 in the Overton to Chapman reach (Figure 3). Generally, bed degradation remained stable and aggradation increased across the AHR.

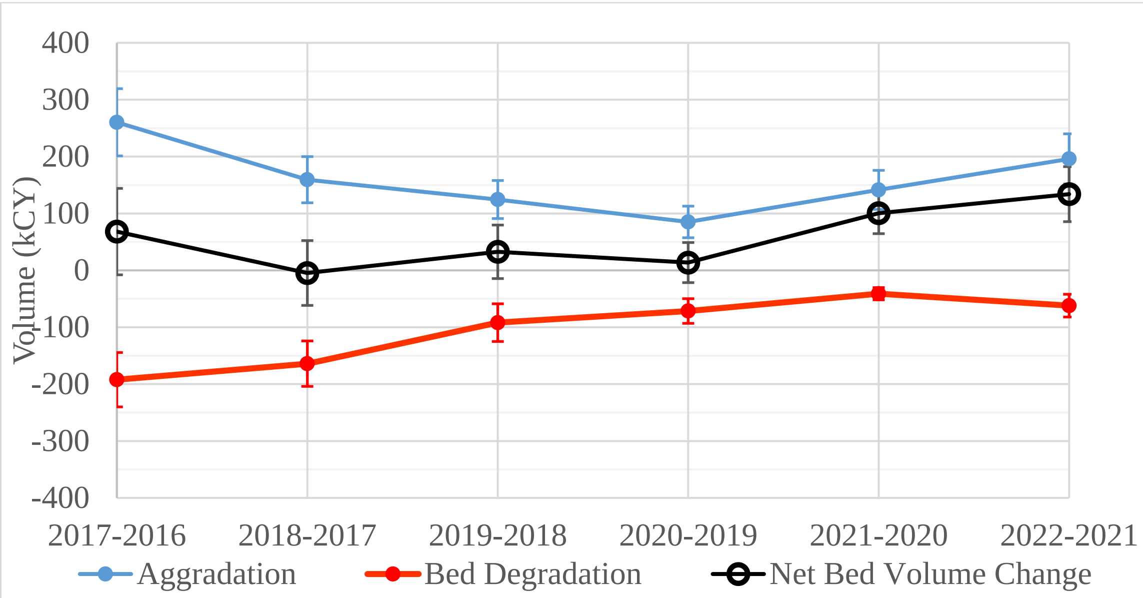

Figure 2. Total volumes of significant elevation change (points), and error (bars), classified as either aggradation or bed degradation, with net bed volume change, for all channels from the J2 to Overton reach.

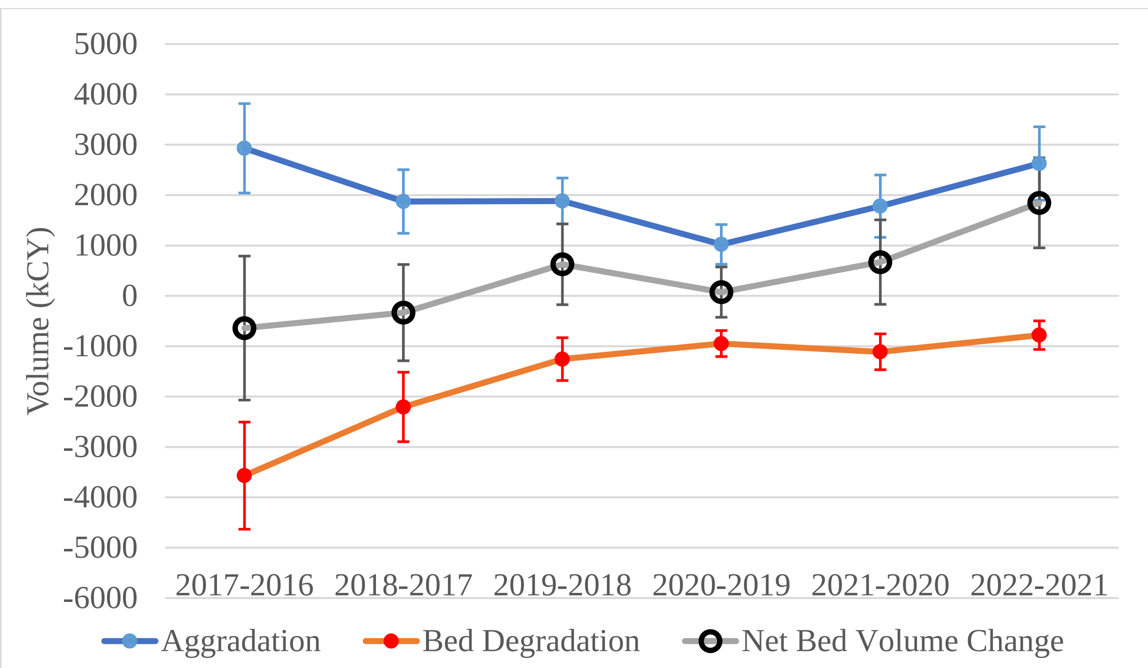

Figure 3. Total volumes of significant elevation change (points), and error (bars), classified as either aggradation or bed degradation, with net bed volume change, for the Overton to Chapman reach.

Future Work

The Executive Directors Office will continue to analyze data and compile results into a formal report update document. The EDO will also compare current methods to other industry-accepted methods. This includes examining differences between SRH-2D and HEC-RAS modeling frameworks and using open-source methods for landcover classification rather than relying on eCognition software. Lastly, the EDO will examine methods used on similar projects (e.g.; sediment augmentation) to determine if they should be adopted by system-scale geomorphology work. As such, results could be more easily comparable across PRRIP projects.