Summer Germination Prevention Flow and Ice Scour Monitoring Protocol

It has previously been shown that plant species vary in response to longer periods of inundation. Early proponents of germination prevention flow releases in the central Platte recommended that a release be sustained during the entire month of June in order to prevent cottonwood seed germination (Johnson 1994). This timing is slightly later than the Service's late spring pulse period of May 20 to June 20. Two-dimension hydrodynamic modelling was used to bracket the range of flows necessary to inundate sandbars in areas where the channel has been maintained for whooping crane roosting. Based on a May 15, 2019 river survey and 2D hydrodynamic modeling, it appears a flow bracket of 1,800 – 2,100 cfs would be adequate to inundate approximately 95% the channel leaving a minimal area of sandbars exposed one to three inches above the water surface. Water affects plant growth directly by reducing respiration and photosynthesis during inundation. Sandbar inundation is hypothesized to minimize or prevent the establishment of vegetation.

Plant ecologists have often focused their studies on the summer period, largely ignoring the fact that processes during winter also impact vegetation dynamics. Ice dynamics is an important factor affecting vegetation in streams and rivers. Ice is an important driver of riverine dynamics and may cause stress and disturbance to riparian and aquatic vegetation as moving ice can damage and mechanically remove riparian vegetation. During cold, icy winters with high flows, seedling mortality is highest when seedlings establish on exposed sandbars, which cause them to be highly exposed to ice disturbance. Combining the potential of summer flows preventing establishment of vegetation on inundated sandbars while elevated sandbars in the channel become vegetated and the effects of ice scour on removal of seedling vegetation on elevated sandbars could potentially help drive the maintenance of wide unobstructed channel widths. The objectives of this study are two-fold. The first objective is to determine if sandbar inundating flows are effective at reducing vegetation establishment within the channel. The second objective is to determine the efficacy of ice-scour at removing established 1–2-year old vegetation within the channel. Results of this study will be used to inform Program water management and modeling activities.

METHODS

In April of 2019, the Program began developing an updated Adaptive Management Plan (AMP) to be implemented during the First Increment Extension, 2020-2032. Early discussions indicate that a late-spring to early-summer long-duration flow release of moderate magnitude may be effective in suppressing vegetation germination for the purpose of maintaining suitable unobstructed channel widths. In addition, the role ice scour plays on creating and maintaining wide unobstructed channel widths emerged as an area of interest. As such, sandbar inundation and vegetation establishment will be monitored throughout the summer and fall to determine the efficacy of this strategy at controlling vegetation establishment and during the winter months (October – March) to document the efficacy of ice scour at removing established vegetation.

Vegetation Establishment and Sandbar Inundation Monitoring

Two or three time-lapse cameras will be placed at each Program complex to monitor sandbar inundation and vegetation germination June–September. Each camera will be strategically placed to monitor higher elevation sandbars that will be inundated by the least amount as to capture the effects of inundating flows and hydrocycling on seedling germination. These cameras will be set to record a photograph of emergent sandbars every hour during the daytime. Where possible, the time-lapse cameras will be set on the south bank of the main channel and will face norward perpendicular to flow.

Channels will also be monitored with GoPro cameras near the 1st and 15th of each month (May–September), photographs of emergent vegetation within the channel will be taken, and documentation of vegetation composition and height will be recorded during each of these surveys. Photographs will be taken and vegetation surveys will be conducted within the time-lapse cameras' field of view to provide species-specific information about vegetation captured on the time-lapse cameras. Water surface elevations will be measured on Program Habitat Complexes during the summer to validate the modeled flow range and verify bar inundation in the channel.

Ice Scour Monitoring

During October–March, two or three time-lapse cameras will be placed at each Program complex to monitor the effects of ice scour on low and mid-elevation sandbars with established vegetation. Each camera will be placed to monitor higher elevation sandbars with newly established (<2-years) annual and perennial vegetation. These cameras will be set to record a photograph of vegetated sandbars every hour during the daytime. The time-lapse cameras will be set on the bank of the main channel and oriented perpendicular to the channel.

SYSTEM-SCALE GEOMORPHOLOGY AND VEGETATION MONITORING

In addition to field data collection efforts, the Program collects imagery and bathometric LiDAR data annually during June/July and again during October/November when flows are low. This data will be used in conjunction with the Program's system-scale geomorphology and vegetation monitoring protocol to document annual changes in vegetation distribution and height and unobstructed channel widths.

STUDY IMPLICATIONS

After 12 years of study (2007–2018), the Program has concluded short duration high flows (SDHF; 5,000–8,000 cfs for three–five days days) are highly unlikely to create or maintain suitable least tern and piping plover nesting habitat or whooping crane roosting habitat. As a result, the Program has opted to abandon the construction of in-channel islands for interior least terns and piping plovers in favor of off-channel options. Contrarily, the Program has observed little use of off-channel habitats (palustrine wetlands and wet meadows) by whooping cranes and has committed to maintaining ≥650-foot unobstructed channel widths on Program complexes where possible. Results from this study will help to identify river processes that are most effective at maintaining these wide unobstructed channel widths. If found to be effective, germination prevention

Environmental Account (EA) flow releases could be considered for a potential Second Increment flow management action. Secondly, an evaluation of the influence of ice scour on established vegetation will be incorporated into modelling exercises to better understand the influence of winter-time river processes on the persistence of vegetation within the channel.