# Lower Sioux Indian Community
# Riverbank Stabilization

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## Section 203 Tribal Partnership Program
## Integrated Feasibility Report and Environmental Assessment

August 2023

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# EXECUTIVE SUMMARY

The Feasibility Study (Study) with Integrated Environmental Assessment investigates the feasibility of alternative measures to address problems and opportunities associated with preservation of cultural and natural resources in partnership with the Lower Sioux Indian Community through a Riverbank Erosion Stabilization (Project), under the Tribal Partnership Program (TPP). The Integrated Feasibility Report contains information relevant to both a Planning and Design Analysis used as a planning document by the U.S. Army Corps of Engineers (USACE) and an Environmental Assessment (EA) to satisfy the National Environmental Policy Act (NEPA).

The Study is being carried out under the authority of Section 203 of the Water Resources Development Act (WRDA) of 2000, as amended, (33 U.S.C. § 2269). Section 203 authorizes the Secretary of the Army to carry out the Tribal Partnership Program (TPP), consisting of water–related planning activities, and activities related to the Study, design, and construction of water resource development projects that substantially benefit federally recognized Indian tribes. Authorized activities include projects for flood damage reduction, environmental restoration and protection, and preservation of cultural and natural resources; watershed assessments and planning activities; and other projects the secretary, in cooperation with Indian tribes and the heads of other federal agencies, determines to be appropriate. This Study evaluates actions to protect and preserve cultural and natural resources along the Minnesota River in the Lower Sioux Indian Community in Redwood County, Minnesota.

The non-federal sponsor is the Lower Sioux Indian Community (LSIC). The Study area is located in Redwood County, Minnesota, along the right descending bank of the Minnesota River near the Lower Sioux Indian Community. The Federally recognized community is located 95 miles southwest of Minneapolis, Minnesota and two miles south of Morton, Minnesota. Approximately 1,500 linear feet of riverbank is actively eroding along the outer bend of the Minnesota River. Aerial imagery indicated that the bank has moved laterally approximately 180 feet since 1992. The eroded face of the bank varies throughout the study area, but at its maximum is approximately 18 feet in height from the ground surface to the channel bottom. The sandy silt bank material is highly erodible and will continue to encroach on the tribal land without remediation. The severity of the erosion varies along the bank. Some portions are lined with trees and some portions are exposed. The exposed section is riddled with concave vertical face slope failures that are caused by the routine rise and fall of the river. The LSIC has a finite land resource, and the continued erosion has led to loss of tribal land. The tribe uses the land for hunting activities and fishing from the riverbank.

The purpose of the Study is to investigate and determine the feasibility of potential actions to protect natural and cultural resources from erosion within the study area. This includes assessing opportunities, evaluating alternatives, and selecting a plan from those alternatives to address identified problems. The selected plan must be technically sound, environmentally acceptable, economically feasible, and supported by the non-Federal sponsor, the Lower Sioux Indian Community, and the Federal Government.

The objectives are:

1. To reduce erosion and land loss related to high flows and velocity of the Minnesota River.
2. Preservation of natural resources, including the finite tribal resource of Lower Sioux lands susceptible to continued erosion and wetlands adjacent to the Minnesota River.
3. Improve access to the Minnesota River to support cultural practices.

The study area, along approximately 2,000 linear feet (LF) of the river, has been separated into four river reaches. The reaches were determined based on distinct characteristics of the river and geology. The alternatives only include action along 1,500 LF of actively eroding riverbank in Reaches 1 -3. Based on historical imagery and data analyzed during the evaluation of the existing conditions, the team concluded that there was no observable erosive threat in Reach 4.

Five alternatives, including the No Action Alternative, that addressed or partially addressed the planning objectives were identified and are described below.

The No Action alternative is defined as no implementation of a project to protect the stream bank in the study area. The No Action alternative is required under NEPA for comparison of proposed actions to a baseline condition. No Action is expected to result in continued erosion and loss of approximately 8 to 13 acres of land adjacent to the river or 2 acres of land due to channel migration over the 50-year planning horizon.

Alternative 1 consists of sixteen bendway weirs and a longitudinal stone toe at the banks of Reach 1 and Reach 2. Riprap would be used to protect the unvegetated vertical banks of Reach 3.

Alternative 2 consists of riprap built out into the river from the bank of Reaches 1, 2, and 3 at a 2H:1V slope. No grading, bedding, or geotextile is proposed for this alternative.

Alternative 3 consists of riprap built out into the river from the bank of Reaches 1, 2, and 3 at a 2H:1V slope. This alternative would include seven bendway weirs in Reach 1 and Reach 2. No grading, bedding, or geotextile is proposed for this alternative.

Alternative 4 consists of cutting back the vertical banks in Reach 1, 2, and 3 to create a 3H:1V slope and placing geotextile, bedding, and finally riprap on the bank.

Alternative 3 was identified as the plan that best meets the planning objectives and was selected as the Tentatively Selected Plan (TSP). Alternative 3 has been coordinated with the Tribe and has their support. A formal letter of support will be provided in the final document.

The estimated Project first cost for the TSP at the fiscal year 2024 price level is $2,544,000. The federal cost share is projected to be $2,485,400. The non-federal cost share is projected to be $58,600. Upon completion, the LSIC would be responsible for operation, maintenance, repair, replacement, and rehabilitation at an estimated annual cost of $2,000. Total average annual Project costs amount to $92,252.

This draft Integrated Feasibility Report revises and replaces the draft IFR the Corps released in September 2021. That report was fully coordinated with the public, tribe, Bureau of Indian Affairs, and resource agencies. After the review period concluded, the Corps determined that the FEMA flood stage model was applied incorrectly, causing some alternatives (Alternatives 2 and 3) to be screened from detailed consideration due to flood stage impacts. Alternative 4 was previously recommended as the TSP. The Corps updated its analysis to correctly apply the FEMA flood stage model, and Alternatives 2 and 3 no longer showed flood stage impacts. This draft IFR reflects the correct application of the FEMA flood stage model and analyzes Alternatives 1 through 4 in detail in addition to the No Action alternative. This draft IFR has been coordinated with the tribe and is being circulated to the public, Bureau of Indian Affairs, and resource agencies for review and comment.

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# FEASIBILITY REPORT AND INTEGRATED ENVIRONMENTAL ASSESSMENT

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# 1. Introduction

## 1.1 Study Authority

This feasibility study (Study) is being carried out under the authority of Section 203 of WRDA 2000, as amended, (33 U.S.C. § 2269). Section 203 authorizes the Secretary of the Army to carry out the TPP, consisting of water–related planning activities, and activities related to the Study, design, and construction of water resource development projects that substantially benefit federally recognized Indian tribes. Authorized activities include projects for flood damage reduction, environmental restoration and protection, and preservation of cultural and natural resources; watershed assessments and planning activities; and other projects the secretary, in cooperation with Indian tribes and the heads of other federal agencies, determines to be appropriate. This Study evaluates actions to protect and preserve cultural and natural resources from erosion along the Minnesota River in the Lower Sioux Indian Community in Redwood County, Minnesota.

## 1.2 Purpose and Need

The primary purpose of the Study is to investigate and determine the feasibility of potential actions to protect natural resources within the study area. This includes assessing opportunities, evaluating alternatives, and selecting a plan from those alternatives to address identified problems. The selected plan must be technically sound, environmentally acceptable, economically feasible, and supported by the non-Federal sponsor, the Lower Sioux Indian Community (LSIC), and the Federal Government. The need for action is caused by a loss of riverbank stability and continued loss of land along the banks of the Minnesota River that threaten natural resources of the Lower Sioux Indian Community.

## 1.3 Non-Federal Sponsor

The Cansayapi Otunwe or, Lower Sioux Indian Community (LSIC) in the State of Minnesota is the Non-Federal Sponsor (NFS) for the Study.

### 1.3.1 History of the Lower Sioux Indian Community and Reservation

The LSIC is a federally recognized tribe in southwest Minnesota, located in Redwood County near Redwood Falls and Morton. The LSIC is part of the Mdewakanton Band of Dakota. The original reservation was established in 1851 by treaty as a portion of land surrounding the Minnesota River. Prior to the US-Dakota War of 1862, the Minnesota Dakota consisted of four bands known as the Mdewakanton, Wahpekute, Sisseton, and the Wahpeton. This community was dissolved by Congress in the aftermath of the US-Dakota War of 1862. The four current Dakota communities, which includes the Lower Sioux, were reestablished in their current locations by Congress in 1886 and their respective reservations are segments of the original reservation.

The existing LSIC reservation is 2,261 acres (Figure 1) and the tribe has a 10-mile service area for its members. There are approximately 1,110 enrolled members in the Lower Sioux Indian Community, including 145 families living on tribal land. Approximately 980 residents live on the

reservation or within the 10-mile service area.

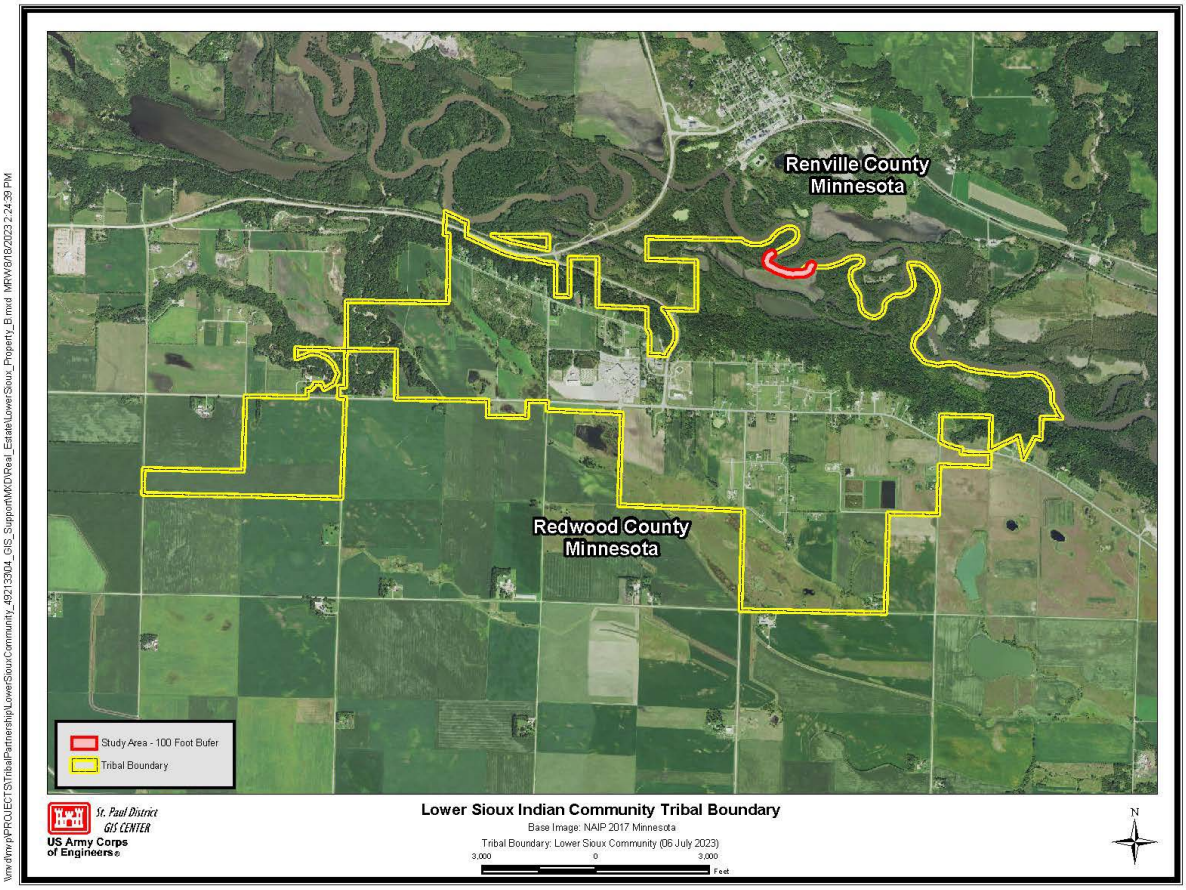


**Figure 1. Lower Sioux Indian Community Tribal Boundary**

## 1.4 Tribal Significance

The Lower Sioux Reservation covers approximately 2,000 acres, a drastic reduction of lands compared to pre-European settlement. The land's significance is directly tied to both the enhancement/protection of cultural practices by its members and its historical and cultural significance as a small portion of Dakota lands under governance by the Lower Sioux.

Cultural practices in the vicinity of the actively eroding riverbank include hunting, fishing, gathering plants, and accessing the Minnesota River. The tribe currently accesses the river via an improvised staircase.

## 1.5 Study Area

The Study area is located in Redwood County, Minnesota, along the right descending bank of the Minnesota River on the lands of the Lower Sioux Indian Community. The Federally recognized community is located 95 miles southwest of Minneapolis, Minnesota and two miles south of Morton, Minnesota.

The study area, along approximately 2,000 linear feet (LF) of the river, has been separated by the project delivery team (PDT) into four river reaches. The reaches were determined based on distinct characteristics of the river and geology. Figure 2 shows the four study reaches (starting downstream and working upstream). The following briefly describes the four reaches.

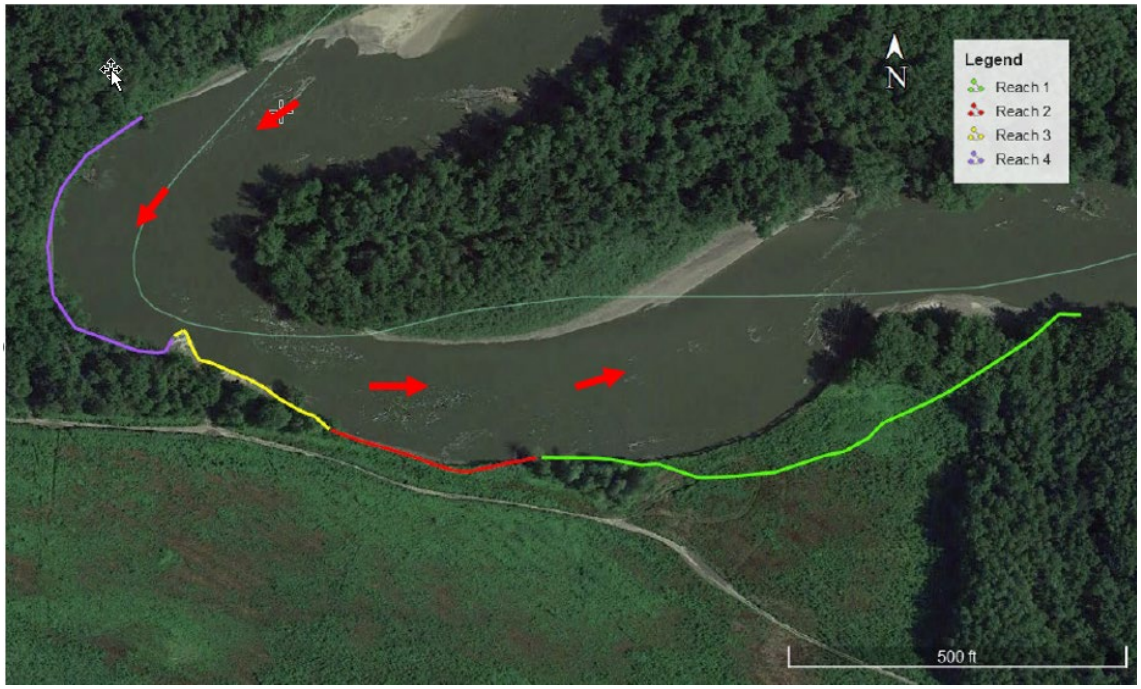


**Figure 2. Study Area Reaches (2015 aerial imagery)**

**Reach 1** – This reach includes 830 LF of river bend and has no signs of exposed bedrock (Photo 1). The slopes are vertical and up to 18 feet in height. Soils in this area consist of silty clay underlain by sands. Existing forest stands within the reach are eroding and there are limited grasses on the bank. The lowest point within the channel (thalweg) is migrating laterally. It is unclear if the thalweg is migrating vertically, which would be indicative of channel scour. The land adjacent to this reach is classified as wetland.

**Photo 1. LSIC Reach 1**

**Reach 2** – This reach consists of approximately 300 LF of river bend (Photo 2). Up to 18-foot vertical banks transition into a sloped vegetated bank from downstream to upstream in this reach. The land adjacent to this reach is classified as wetland. Soils in this area consist of silty clay underlain by bedrock.

**Photo 2. LISC Reach 2**

**Reach 3** – This reach is about 320 LF in length along the river bend. A bedrock outcropping is located within this reach (Photo 3), where unvegetated banks up to 18 feet in height appear to be partially stabilized by tree roots. Soils in this area consist of silty clay underlain by bedrock. Currently, there is an improvised staircase cut into the bank in this reach which provides access to the river (Photo 4).

**Photo 3. LSIC Reach 3 showing bedrock outcropping**

**Photo 4. LSIC Reach 3 showing staircase**

**Reach 4** – This reach contains a meandered pool with relatively low top of bank elevations at the location where overland flow discharges into the river (Photo 5). The reach is approximately 460 LF with varying slopes up to 18 feet in height.

**Photo 5. LSIC Reach 4**

## 1.6 Existing Studies and Water Resources Projects

*Minnesota River Basin Interagency Study* – The Corps, along with other federal, state, local and tribal nations, completed the Minnesota River Basin Interagency Study in August 2019. The study identified problems on the watershed level, identified strategies to combat the identified problems, and made recommendations for future studies and projects. No federal water resource projects were recommended as part of the study. Key takeaways from the Interagency Study relevant to this LSIC TPP Feasibility study include updated discharge frequency statistics, an understanding of how changes in land use and land cover influence hydrology, and how peak discharge has increased along the Minnesota River over time.

Discharge frequency curves were updated as part of the Interagency Study. The frequency curves provide updated estimates for hydrologic analysis and design at multiple locations throughout the watershed. Findings from the discharge frequency curves for the main stem sites along the Minnesota River indicate that flood risk has increased in the Minnesota River watershed when looking at recorded annual peak flows at Mankato, MN USGS gage (05325000) from 1903 to 2015.

A review of peak discharge data within the Minnesota River basin conducted as a part of the Interagency study found that all USGS gages on the Minnesota River showed evidence of increasing annual peak discharge when compared to a 2001 Section 22 study of flows along the Minnesota River (USACE, 2001). Flood discharge trends at tributaries were mixed, but the analysis indicated that the increasing trend was slightly greater across all river flows for larger, less frequent flood events. The 1% AEP event at Montevideo, MN (gage nearest the project area) increased from 45,000 cfs to 47,000 cfs or 4.4% when compared to the peak flow in the

2001 study. The 10% AEP event increased from 12,000 cfs to 12,800 cfs or 6.7%. This trend indicates that the project area could be subjected to larger flow events more frequently than it has in the past. This increasing trend would likely continue or accelerate the observed bank erosion and lateral migration observed at the study area.

The study also noted that climate change and land use changes each play a role in the increase in expected discharge within the Minnesota River watershed. Much of the landscape has been changed from its natural condition to agricultural land with improved surface and subsurface drainage. The alterations to the landscape and improved field drainage act to accelerate runoff to the tributaries and main stem of the Minnesota River. The USACE Engineer Research and Development Center (ERDC) modeled the impact of a subsurface drain tile network in the Seven Mile Creek watershed. The model indicates that drain tile increases flow out of the groundwater system which sustains the tail end of the event hydrograph. This results in higher flows out of the system for a longer duration than if the tiles were not present in the watershed. This response was noted particularly in the spring months and after large rainfall events.

The study noted that known Nonstationarities exist in the watershed and that the statistical properties of annual peak floods along the Minnesota River are in flux. These findings highlight the importance that landscape changes and climate change have had in the watershed and the need to incorporate resilience to a variety of design flows for future projects.

*Natural Resources Conservation Service Streambank Erosion Study* – The Natural Resources Conservation Service (NRCS) conducted a study to determine the feasibility of streambank stabilization measures to reduce the erosion at the same location with a comparable length of riverbank that this Study is evaluating. The study was completed in 2017. NRCS recommended that the right descending bank be cutback and rocked for approximately 1,500 feet. The project did not move forward due to the scope of the problem and solution being too large for NRCS to further participate.

*Conservation Reserve Program (CRP) on LSIC Lands* – In 2019 approximately 37 acres of LSIC land was enrolled into the CRP. The CRP “provides technical and financial assistance to eligible parties to address soil, water, and related natural resource concerns” (Natural Resources Conservation Service, n.d.). This program “encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filter strips, or riparian buffers.” The tribe intended to plant the area with native grasses using the NRCS’s prescribed mixture, but only 5 acres in the southern part of the LSIC land was planted. Flooding has been so frequent that soil preparation and planting has not been able to occur on 32 of the 37 acres. The area is now in natural regeneration, and the tribe has planted black walnut trees and shrubs in the remaining 32 acres. Invasive plants and noxious weeds are present throughout the area. The Tribe conducts treatment and removal of invasive plants and noxious weeds present throughout the area on an annual basis. The LSIC coordinated this study and potential impacts on CRP land with the NRCS.

## 1.7 Existing Conditions and Future Without Project Conditions

The Existing and Future Without Project (FWOP) condition is developed to describe the current and most likely future condition in the study area if no federal action is taken to address the identified problems. It forms the baseline for identifying the effects of the alternatives and is the No Action Alternative. The future is inherently uncertain, and conditions change over time. The land loss is a direct impact to the tribe and community. The tribe has a long-standing fishing location at the outcropping that continues to be threatened by the erosion.

### 1.7.1 Data Collection

The PDT visited the site in September 2020. Following the site visit, topographic and hydrographic surveys were obtained in November 2020 (see Appendix B). Soil borings were collected in January 2021 (see Appendix E). These datasets defined the existing site conditions.

### 1.7.2 Hydraulics and Hydrology

Hydraulic modeling was performed to describe existing conditions using the collected survey data. Hydrologic analyses were performed based on the available streamflow data at gages on the Minnesota River. Please see Appendix C for more information.

Without erosion countermeasures constructed at the study site, it is estimated that the stream bank will continue to erode, and the tribe will continue to lose their land. Roughly 3 acres of land has been lost since 1992, a rate of 0.1 acres per year. Half of this loss has occurred since 2015, an erosion rate of 0.25 acres per year. Were streambank erosion to continue at either rate, the tribe could see between 8 and 13 acres of tribal land loss over the next 50 years under FWOP conditions.

The process above describes land loss associated with lateral erosion of the streambank. There is also a possibility of the formation of a channel cutoff under FWOP conditions. The formation of a new channel would result in the direct erosion of approximately 2 acres of land and significantly reduce access to the forested area shown in Figure 3. Further, Figure 3 illustrates where these channel cutoffs may form. The formation of a channel cutoff would also limit the tribe's ability to access portions of their land. While the formation of a channel cutoff would not directly result in as much erosion as the streambank erosion described above, without some protection against continued erosion the Lower Sioux Indian Community would face significant loss of access to a portion of their land.

Reducing energy dissipation within the project area through bank stabilization may increase energy downstream of the project area, but given the dynamic nature of the Minnesota River, both within and downstream of the project area, it is difficult to determine what impacts bank stabilization features may have on downstream morphological processes. Additional information regarding the geomorphology of the Minnesota River can be found in Section 3.0 of the H&H Appendix (Appendix C).

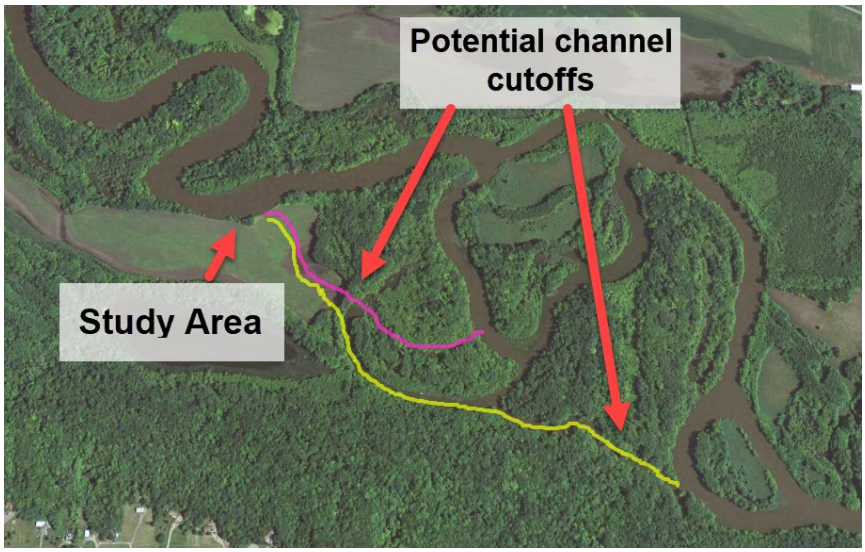


**Figure 3. Potential future channel cutoff routes (2015 aerial imagery)**

A Flood Insurance Study (FIS) of the Minnesota River provided by the Federal Emergency Management Agency (FEMA) defines the 100-year flood event and the boundary of the 100-year flood. A regulatory floodway is defined within the 100-year flood boundary on the Minnesota River. On Figure 4**,** the 100-year floodplain has a light blue color, and the regulatory floodway has a blue and red shading.

A Minnesota Department of Transportation (MN DOT) report on the US-71 bridge, located roughly 1.5 miles upstream of the project area, calculated the 2% Annual Chance Exceedance (ACE) event at 26,470 $ft^3$/sec (MN DOT, 2001). A duration analysis using period of record data at a USGS gage station at Morton, MN indicated that a flow of 24,000 $ft^3$/sec was exceeded 1% of the time. This flow was close to the 2% ACE identified by the MN DOT, but as it utilized more recent data the flow of 24,000 $ft^3$/sec was used to design alternative features.

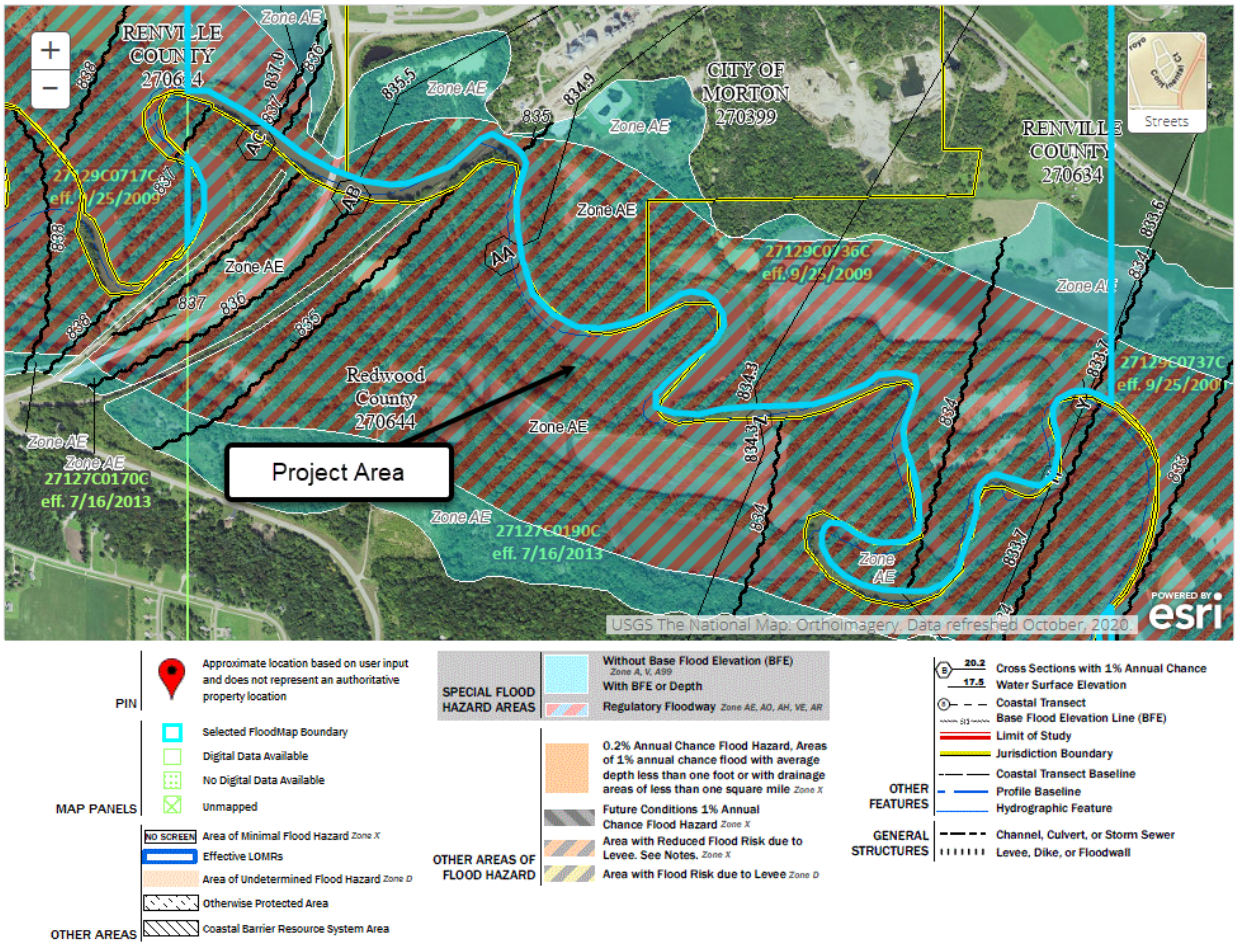


**Figure 4. Floodplain mapping as specified by the FEMA Flood Map Service Center**

### 1.7.3 Climate Change

Climate change impacts on the hydrology of the Minnesota River Basin and Lower Sioux TPP streambank protection project are considered per the USACE Engineering Construction Bulletin (ECB) 2018-14 (rev 2) Guidance for Incorporating Climate Change Impacts to Inland Hydrology in Civil Works Studies, Design and Projects and USACE Engineering Technical Letter (ETL) 1100-2-3 Guidance for Detection of nonstationarities in Annual Maximum Discharges. Current USACE policy interprets and uses climate change information for hydrologic analysis through a Tier 1 assessment of climate change risks and impacts relevant to the project.

Peer-reviewed literature regarding trends in observed hydrometeorology in the Minnesota River Basin indicates increases in observed temperature and precipitation in the watershed. Temperature and precipitation are projected to continue increasing in the future. There is an observed shift towards an extended warm season and a shorter cold season, resulting in more precipitation falling in the form of rain rather than snow. The frequency of extreme rainfall events is projected to increase. A first-order regression analysis of observed annual peak streamflow data shows that annual peak streamflow has increased in the basin. This finding is supported in peer-reviewed literature. Peer-reviewed literature lacks consensus regarding trends in projected

streamflow. In some cases, streamflow is projected to increase; however, projected increases in temperature and evapotranspiration may offset increases in runoff and streamflow.

There is evidence of nonstationarities within the Minnesota River Basin in 1942 and 1990. The annual peak streamflow record indicates that the statistical properties of peak flow are also currently in flux. These nonstationarities may be attributed to land use changes, natural climate, anthropogenic climate change, or a combination of these factors. For example, the 1942 nonstationarity could be the result of a transition between drought conditions of the 1930s Dust Bowl era to wetter conditions. It could also be related to changes from small grain agriculture to row crop agriculture which occurred around 1940. The 1990 nonstationarity could be attributed to noted increases in the frequency of heavy precipitation events in the early 1990s.

The land use of the Minnesota River has also changed substantially after European settlement began in the 1800s. Much of the native landscape was changed from deciduous forest, prairie, and wetlands to agricultural land for row crops. Vast modifications to the surface and subsurface drainage network were also made after European settlement started. This accelerated and increased runoff from the landscape as well as connected previously disconnected prairie potholes and wetlands. Appendix I contains more information on changes in the Minnesota River watershed.

The climate change assessment in Appendix I provides information about the projected climate that will influence the FWOP. There is strong consensus that large increases in temperature will occur in the basin. Precipitation events are anticipated to increase in magnitude and frequency of occurrence. Projections of mean annual maximum monthly streamflow show statistically significant increases in discharge for the 2006-2099 period. The evidence indicates that increases in runoff are likely which will continue to exacerbate erosion conditions at the site. The potential for increased erosion in the future reaffirms the need for the Lower Sioux Indian Community Riverbank Stabilization project. To improve the project's resiliency to the effects of climate change, a conservative factor of safety of 1.5 is incorporated in the riprap design. This leads to a larger riprap size than would otherwise be required to withstand velocities from the design flood event, allowing the project to function under an increased range of hydrologic conditions.

### 1.7.4 Geology

The Lower Sioux Community is in the Minnesota River Valley. The pertinent geology and stratigraphy are related to the last glacier that retreated the area approximately 14,000 years ago.

As the glacier retreated north, the melting ice margin headed the ancestral Minnesota River. The glacier eventually retreated north of the topographic divide, near Browns Valley, and meltwater ponded behind the divide to form Glacial Lake Agassiz. When the meltwater raised the lake enough to overtop the drainage divide, a southern outlet stream, the River Warren, discharged from the lake. The River Warren carved the present oversized valley now occupied by the Minnesota River. Lake Agassiz ultimately drained to the northeast, allowing the Minnesota River to aggrade and adjust to the local conditions.

Pertinent to the project, the site is south of Morton, MN, which is known for continuous gneiss and granite mining operations dating back to 1884 and the Morton Outcrops Scientific and Natural Area (SNA). Due to this unique geology, granite and gneiss are often used as riprap in this area.

An outcrop of weathered rock is exposed on the western portion of the project site. Jointing is visibly present. Samples from this outcrop were field identified as granite, which is common for the area.

Recent, upper-level soils consist of stream sediments of the Minnesota River, channel fill of clays, silts, and wetland sediments south of project site. Appendix E contains more information on the study area site geology and physiography.

### 1.7.5 Environmental Resources

The LSIC landscape and its adjacent areas have experienced significant changes over time. Extensive lush native prairies once covered the area; however, the landscape is now dominated by the agricultural industry and ancillary businesses. The Minnesota River and its tributaries continue to experience degradation in both water quality and ecological health due in large part to sediment loading, nutrient pollution, and elevated bacteria levels. The regional land use is predominantly agricultural.

The project area consists of wetland and floodplain forest along a bend of the Minnesota River and falls within the Regulatory Floodway (Figure 4). The National Wetland Inventory shows a large area of emergent and a small area of forested wetland within the project area (Figure 5) Emergent wetland areas were in agricultural production until 2015 when the area was enrolled in CRP. The area has been allowed to revegetate naturally and is dominated by smartweeds, water hemp and cottonwood seedlings. Wildlife in the area would include birds, small mammals and deer and the area is used by the tribe for deer hunting. Over 63 species of fish have been found in the Minnesota River and the bedrock outcropping in Reach 3 is an important fishing area for the tribe.

Increased stream flows through the project area have led to erosion of the streambank (approximately 3 acres of land since 1992) and turbid water. The Minnesota Pollution Control Agency lists this reach of the Minnesota River as impaired with turbidity being one of the major stressors. Erosion of the streambank has led to some loss of habitat and wetlands at the top of the bank and turbid conditions can negatively impact fish, particularly during the spawning season. Without intervention, the continued erosion of the streambank would result in the loss of 8 to 13 acres of wetlands at the top of the bank or a loss of 2 acres of wetland due to a channel cutoff formation over 50 years.

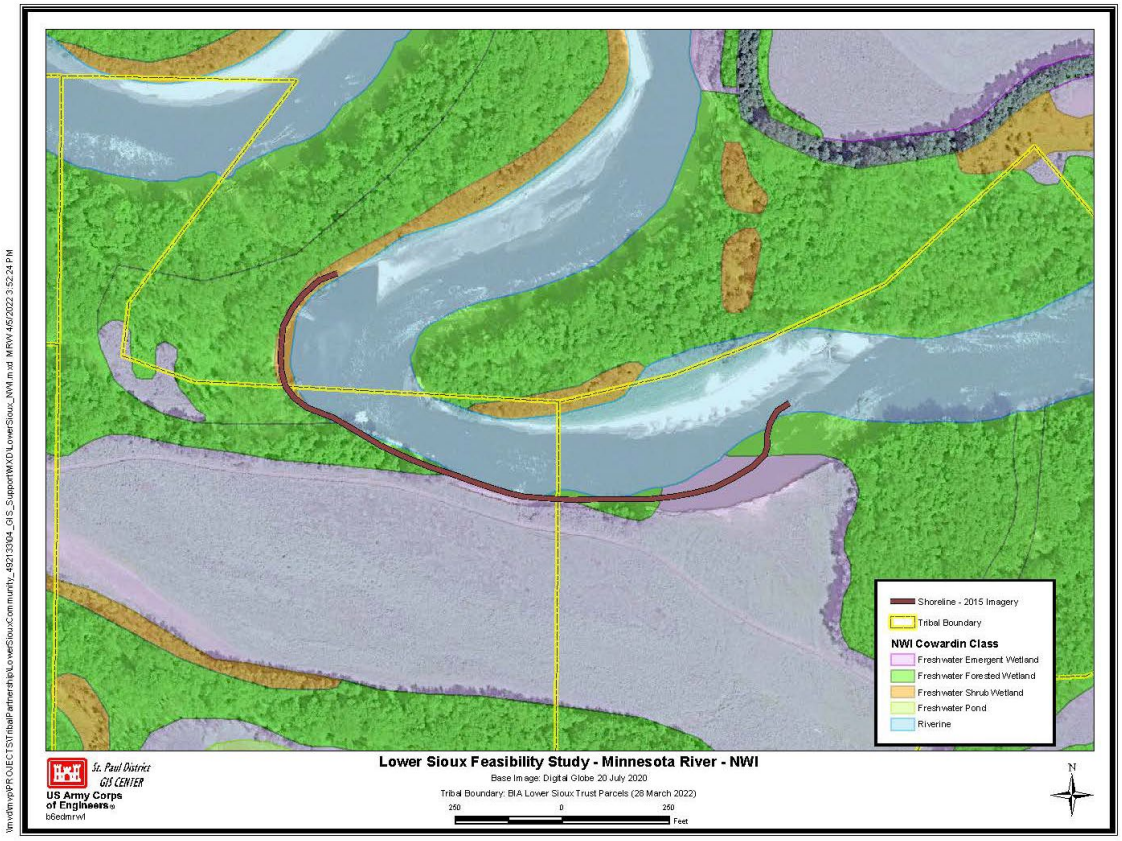


**Figure 5. National Wetland Inventory**

### 1.7.6 Cultural Resources

The study area is situated in the Minnesota River Valley physiographic area. The Minnesota River valley cuts through the Altamont ground moraine, a landform shaped by the wasting of the Des Moines Lobe ice during the Wisconsin glaciation. The Minnesota River trench was formed during drainage of Glacial Lake Agassiz through its southern outlet of Glacial River Warren between about 13,500-9,400 years before present (BP) (Wright 1972:575; Wright et. al. 1998). In the study area, the underfit Minnesota River meanders through the wide valley, characterized by floodplain, crystalline rock (gneisses) outcrops, colluvial slopes and alluvial fans from tributaries. Precontact vegetation in the adjacent uplands consisted of tallgrass prairie with deciduous forest along the valley slopes and floor. Cutoff channels (oxbows), wetlands, and backwater lakes and ponds occupy the floodplain. The study area is in the floodplain along the right-descending bank along an actively eroding outside bend of the river. The downstream portion of the study area is alluvial bottomland while the upper portion is on a low terrace.

The Minnesota River Valley and surrounding environs has been a focus of human use and occupation for thousands of years as evidenced by the many archaeological sites associated with the diverse landscape and contemporary use of the valley. The cultural sequence of the area includes Paleo, Archaic, Woodland, Mississippian/Plains Village, Oneota, proto-historic, and historic periods, reflecting approximately 13,000 years of continued human settlement

(Anfinson 1997; Buhta et. al. 2015; Gibbon 2012). Archaeological and linguistic evidence indicates that Siouan peoples lived in this portion of Minnesota for thousands of years (e.g., Springer and Witkowski 1982). The French were the first Europeans to explore the area in the mid-17th century although the effects of contact, such as trade goods, disease, and displaced peoples, were felt prior to direct interaction. Native American groups living in the area at the time of French contact included various Sioux groups (e.g., Mdewakanton, Sisseton, Wahpekute, Wahpeton). Other groups passed through the area for various reasons, such as the Fox, Sac, Kickapoo, Miami, and Mascoutin, while others were invited into the region, such as the related Oto and Ioway. For most of the seventeenth and eighteenth centuries, French, Spanish, and British presence in the region was limited and scattered. Widespread agriculture and development coincided with American occupation of the area after the Dakota ceded most of southern and western Minnesota in the Treaties of Traverse de Sioux and Mendota in 1851, leaving a reservation along the Upper Minnesota River 20 miles wide extending from Big Stone Lake to Fort Ridgeley (e.g., Folwell 1956; Gibbon and Anfinson 2008).

With continued American encroachment on Dakota lands, ineffective management of annuity payments and food distribution by the US Government, and other issues, the Dakota War occurred in 1862 across southern Minnesota and elsewhere (e.g., Carley 1961; Schultz 1992). During this event most of the structures at the Lower Agency, established in 1853 to administer the terms of the 1851 treaty, were burned. Other actions in the area include the battles at Redwood Ferry and Birch Coulee. Following cessation of the war, most of the Dakota were removed from or fled the area and placed on reservations in Nebraska, South Dakota, North Dakota, and Montana or interned at Ft. Snelling. While over 300 Dakota were condemned to death, President Lincoln commuted the sentence for all but 38 who were hanged in Mankato on December 26, 1862 (Folwell 1961). In the late nineteenth century Dakota began returning to the area joining the small groups that remained. The current Lower Sioux reservation was established in 1888.

The study area is within the Prairie Lakes South Archaeological Region. A total of five archaeological sites have been identified within one mile of the project area (MNOSA Files 2021). The nearest recorded site is lithic debris (21RW60) situated approximately one-half mile to the south/southwest along the bluff of the valley. Other sites within one mile along the bluff include Site 21RW65, a find spot (Prairie du Chien core), 21RW6 (burial mound) and the Lower Sioux Agency (21RW11). Site 21RN5 is a single burial mound located along the opposite bluff to the north/northeast in Renville County.

Archaeological investigations in the area have been ongoing since 1887 when the Hill-Lewis Northwestern Archaeological Survey mapped several burial mounds in the area in 1887 (Finney 2001; Winchell 1911:115, 201). Lloyd Wilford with the University of Minnesota visited the area in 1940 (MNOSA Files 2021). During the late 1960s, the Minnesota Historical Society commissioned several excavations at the Lower Agency when developing the historic site, including several field schools from Normandale Community College (e.g., Arnott 1998 and 1997, George 1981, Lothson 1973, McFarlane and Clouse 1996, Nystuen 1968). The Bureau of Indian Affairs have also conducted surveys in the area for various projects (e.g., Myster 2004).

# 2. Plan Formulation

## 2.1 Planning Process

Plan formulation for this project has been conducted in accordance with the six-step planning process described in *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies* (1983) and the *Planning Guidance Notebook* (ER 1105-2-100).

The six steps in the iterative plan formulation process are: 1) specify the water and related land resources problems and opportunities of the study area; 2) inventory and forecast existing conditions; 3) formulate alternative plans; 4) evaluate alternative plans; 5) compare alternative plans; and 6) select a plan. The basis for plan selection is fully documented below, including the logic used in the plan formulation and selection process.

A project kickoff meeting was held on October 15th, 2020 with a representative from the LSIC to identify problems, objectives, and measures for this study.

## 2.2 Problems and Opportunities

USACE's planning process starts with identifying problems and associated opportunities within the geographic scope of the study area. The following section describes and documents the problems and opportunities that were developed for this study.

Problem Statement: Finite natural resources are being threatened by erosion occurring along the Minnesota River.

River migration and eroding banks cause loss of wetlands and Tribal Trust Land utilized for cultural practices. The river is experiencing greater flows that are accelerating river migration and creating erosion of land that varies in both amount and rate along the project bank.

Approximately 1,500 feet of riverbank is actively eroding along the outer bend of the Minnesota River. Aerial imagery indicated that the bank has moved laterally approximately 180 feet since 1992 (Figure 6). The eroded face of the bank varies throughout the 1,500 feet, but at its maximum is approximately 18 feet in height from the ground surface to the channel bottom. The sandy silt material is highly erodible and will continue to encroach on the tribal land without remediation. The severity of the erosion varies along the bank. Some portions are lined with trees and some portions are exposed (Photo 6). The exposed section is riddled with slope failures that are caused by the routine rise and fall of the river, erosive forces, debris/ice jams, and tree blowdowns (Photo 7). The LSIC has a finite land resource, and the continued erosion has led to loss of tribal land. The tribe uses the land for hunting activities and fishing.

The opportunities identified for the study include:

1. Decrease invasive plant species where possible.
2. Increase streambank resiliency to future climate and land use changes.
    - Based on findings in the Climate Assessment in Appendix I, there have been observed increases in discharge, air temperature, water temperature, and drought conditions in the Minnesota River watershed. Increased discharge promotes streambank erosion. High air and water temperatures provide unsuitable habitat for aquatic plants and wildlife.
3. Increase community awareness of water quality issues related to fish and pollutants.

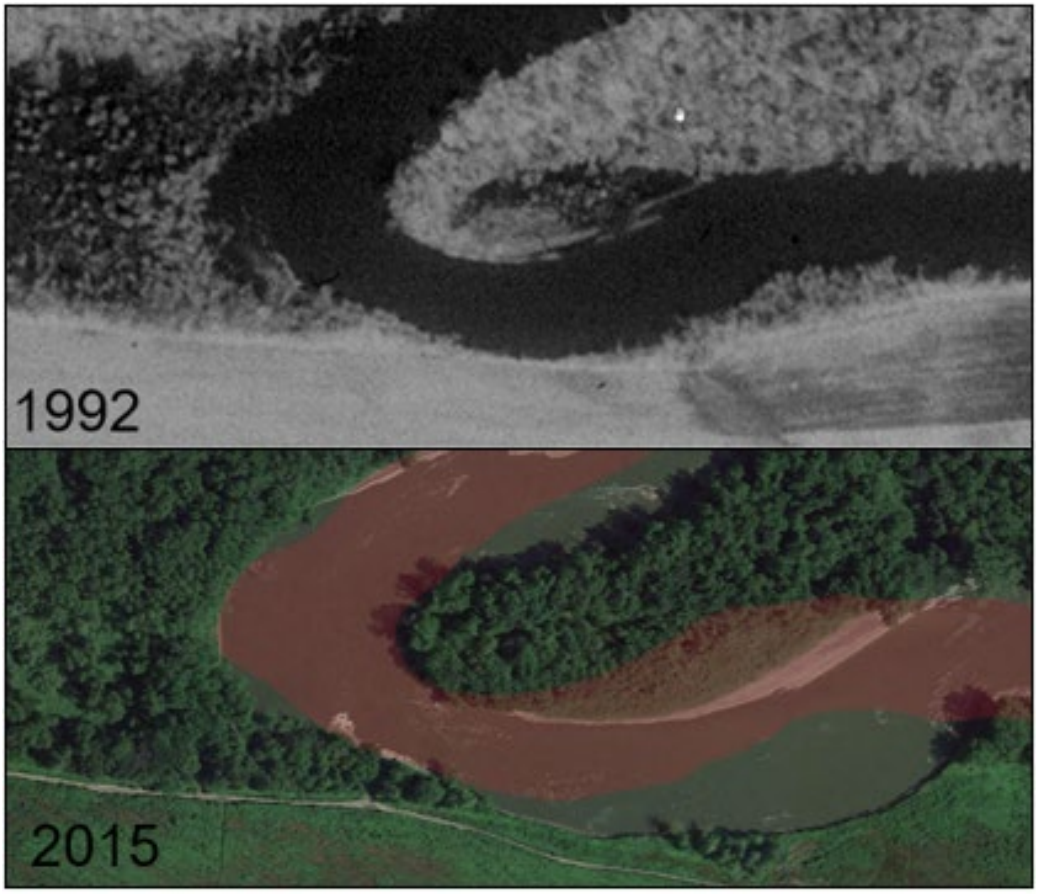


**Figure 6. Change in Study Area (1992-2015)**

**Photo 6. Eroded riverbank with trees reinforcing the slope, looking upstream (August 2019)**

**Photo 7. Slope Failure in Reach 1**

## 2.3 Project Objectives

USACE provides planning guidance (ER 1105-2-100) for developing objectives and specifies that objectives must be clearly defined and provide the effect desired, the subject of the objective, the location where the effect will occur, and the timing and duration of the effect. For the purpose of this report, the timing and duration of the objectives is the 50-year period of analysis (2025–2075), and the location is within the study reach of the Minnesota River.

Planning objectives for the study are:

1. To reduce erosion and land loss related to high flows and velocity of Minnesota River.
2. Preservation of natural resources, including the finite tribal resource of Lower Sioux lands susceptible to continued erosion and wetlands adjacent to the Minnesota River.
3. Improve access to the Minnesota River to support cultural practices.

## 2.4 Constraints

USACE established the following planning constraints to guide and set boundaries on the formulation and evaluation of alternatives. The following planning constraints were identified for this Study.

1. Project features must cause no more than a 0.005-foot increase in water surface elevations during the 100-year flood event as required by the FEMA No-Rise Certification for Floodways per MN DNR guidance (MN DNR, 2021).
2. Any measures must be primarily within Indian Country per the Section 203 authority.

In addition to the planning constraints listed above, the Tribe also desired to identify a solution that would not further cut back the current bank.

## 2.5 Initial Array of Measures and Screening

Plan formulation is the process of building alternative plans that meet the planning objectives of the study within the planning constraints. First, management measures are formulated. These measures are features that can be implemented at a specific geographic site to address the planning objective(s). A measure can be a structural element that requires construction or a nonstructural action. Then alternative plans are developed, comprising a set of one or more management measures functioning together to address the planning objective.

The following documents the specific measures that were developed for this study.

- Longitudinal Stone Toe Protection – This measure includes a stone dike placed at the toe of the eroding bank that provides toe stability and bank protection.
- Slope Banks with Ground Cover – This measure includes sloping the banks to a point that allows the bank to stabilize and then the slopes would be planted with ground cover to protect against erosion.
- Riprap Slopes – Riprap is a layer of stones used to armor, stabilize, and protect against erosion and scour.
- Root wads and Boulders – This measure involves burying a dead tree with the root system still attached into the bank. This measure protects the streambank from erosion.
- Wooden Cribs – Large pieces of timber are used to reinforce banks and increase stability.
- Bendway Weirs – A bendway weir is a low-level rock structure positioned along the outside bank of the river bend and angled upstream toward the flow. A bendway weir alters the pattern of spiraling currents through the bend and pushes the main energy of flow towards the center of the channel, away from the toe of the bank, thus reducing erosion.
- Integrated Bank Treatments – This measure involves using rock on the lower portion of a bank and then transitioning to vegetation on the higher section. This measure would be used to stabilize the bank.
- Longitudinal bank lowering – This measure involves lowering the bank on one or both sides of a river to enlarge the channel capacity at higher flows. This can provide some near-bank riparian habitat and reduce channel depth, velocity, and shear stresses along the bank toe.
- Toe Wood with Sod Mats – This measure involves filing in the bank with a bankfull bench of logs, branches, brush, roots, etc. as fill. This is then topped with sod mats.
- Vegetation – Vegetation can be used to stabilize banks. Native vegetation would be used where possible.
- Erosion Control Barriers – This measure would reduce the velocity of flow in the overbank and reduce rill formation and reduce soil mobilization.
- Staircase – This measure would improve access to the Minnesota River.

Measures were screened using the following evaluation criteria: effectiveness, efficiency, acceptability, and completeness. Professional judgement was also used during the measure screening process. Descriptions of the criteria are below.

- Effectiveness is the extent to which a measure contributes to achieving the planning objectives.

- Efficiency is the extent to which a measure is a cost-effective means of addressing the problems and realizing the objectives. At this point in the study professional judgement based on prior projects was used to evaluate each measure for efficiency, no formal cost was developed for individual measures.
- Acceptability is workability and viability of the measure with respect to acceptance by Federal and non-Federal entities and the public, and compatibility with existing laws, regulations, and public policies. Specific consideration was given to acceptability by the Sponsor.
- Completeness is the extent to which a given measure provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. Completeness alone was not used as a justification for screening of measures, as it is possible that some measure could be combined in alternative development to address project objectives.

Table 1 summarizes the full array of measures and the screening of the measures. Measures highlighted in light gray were screened from consideration.

Note about Reach 4 - Based on historical imagery and data analyzed during the evaluation of the existing conditions, the team concluded that there was no observable erosive threat in Reach 4.

**Table 1. Full Array of Measures**

| Measure | Screening Justification | Reaches |
|---|---|---|
| Longitudinal Stone Toe Protection | Measure would likely be an effective solution for the problem. This measure would allow for riparian buffer plantings, launchable toe stone provides protection from additional channel scour/thalweg migration. Retained for further consideration. | 1 |
| Slope Banks with Ground Cover | If thalweg shifts or if river velocities increase, this measure would not reduce erosion long-term. Screened from further consideration. | 1 |
| Riprap Slopes:<br>1. Riprap slope built in the river<br>2. Riprap slope with cutback | This measure is a common design for this type of problem. The riprap slope with cutback design would include grading to reduce slopes to a stable angle. This measure would be long-term solution. Retained for further consideration. | 1, 2, 3 |
| Root wad / Boulders | This measure would require significant bank shaping/excavation and would likely require continued maintenance to ensure it remains effective. It is not an effective long-term solution for the problem. Screened from further consideration. | 1 |
| Wooden Cribs | This measure would initially solve the problem but would likely deteriorate over time and require continued maintenance to ensure it remains effective. It is not an effective long-term solution for the problem. Screened from further consideration. | 1 |
| Bendway Weirs | This measure is a common design for this type of problem. This measure diverts the channel thalweg and creates aquatic habitat. Retained for further consideration. | 1, 2, 3 |

| | | |
|---|---|---|
| Integrated Bank Treatment | This measure is a variation from riprap and would be more environmentally friendly than riprap but provides less erosion resistance (less effective) within the study area. Screened from further consideration. | 1, 2, 3 |
| Toe Wood with Sod Mats | This measure would be environmentally friendly but would likely deteriorate over time and would not be a long-term robust solution. Screened from further consideration. | 1, 2 |
| Vegetation - incorporate where possible | Vegetation should be considered where possible. It is a cost-effective action to improve habitat. Retained for further consideration. | 1, 2, 3 |
| Longitudinal Bank Lowering | This measure would allow flow to expand earlier, reducing near bank velocities and potentially reduce bank erosion, but given the sandy nature of the soil and the observation that erosion of the toe of the bank was driving bank erosion this measure would not be a long-term solution. Screened from further consideration. | 2, 4 |
| Vegetated Geogrids | This measure would provide additional native vegetation but may be negatively impacted by larger flow conditions and would not be a long-term solution. Screened from further consideration. | 2, 3 |
| Integrated Bank Treatment | This measure is a variation from rip rap and would be more environmentally friendly but is less erosion resistant (less effective) and would not be a long-term solution. Screened from further consideration. | 1, 2, 3 |
| Longitudinal Bank Lowering | This measure would involve using rock on the lower portion of the bank and then transitioning to vegetation on the higher portion. Based on historic images and flows it was determined that there was no erosion problem in reach 4. It is not recommended that any action is taken in this reach and any further changes on this reach would not negatively impact reaches 1-3. Screened from further consideration. | 4 |
| Erosion Control Barriers | This measure would reduce the velocity of flow in the overbank and reduce rill formation and reduce soil mobilization. However, based on historic images and flows it was determined that there was no erosion problem in this reach. It is not recommended that any action is taken in this reach and any further changes on this reach would not negatively impact reaches 1-3. Screened from further consideration. | 4 |
| Staircase | This feature would improve access to the Minnesota River to support culturally significant activities such as fishing. It is assumed any action in Reach 3 would include a staircase. Retained for further consideration. | 3 |

## 2.6 Final Array of Measures

The following documents the measures that were retained as well as initial design considerations that were used to formulate alternative plans.

**Longitudinal Stone Toe Protection** – This measure includes a stone dike placed at the toe of the eroding bank that provides bank protection (Photo 8). This measure is effective against small, frequent erosive events and would allow for vegetation to be established post-construction. This measure was carried forward to provide the same toe stability in Reach 1 that is present in Reach 2.


**Photo 8. Photo of a constructed longitudinal stone toe**

**Bendway Weirs** – The Upper Mississippi Restoration Environmental Design Handbook describes a bendway weir as a low-level rock structure positioned along the outside bank of the river bend and angled upstream toward the flow (Figure 7). A bendway weir alters the pattern of spiraling currents through the bend and pushes the main energy of flow towards the center of the channel, away from the toe of the bank (USACE, 2012). Pushing the secondary currents away from the bank would reduce the amount of energy being exerted upon the toe, subsequently reducing the risk of erosion and further lateral bank retreat. There have also been significant environmental benefits associated with this measure. Bendway weir fields have been shown to provide habitat for a number of fish species.

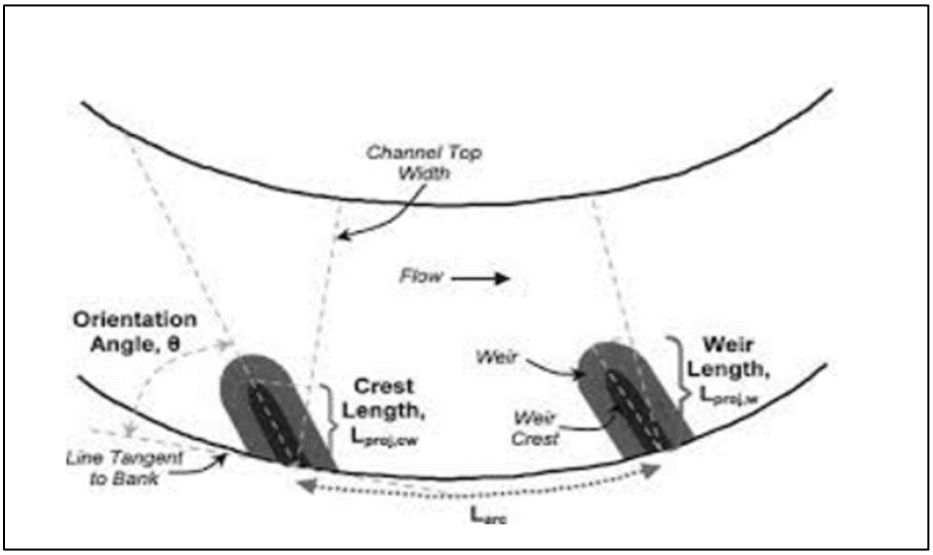


**Figure 7. Conceptual Bendway Weirs**

**Riprap Protection** – Riprap is a layer of stones used to armor, stabilize, and protect against erosion and scour (Figure 8). This measure is a durable, well-understood design that would protect the unvegetated vertical banks and large trees while minimizing impacts to the areas of the outcropping used by members of the LSIC. Although riprap could induce downstream impacts, the team determined downstream impacts would likely be minimal. See Appendix C for additional analysis of downstream impacts.

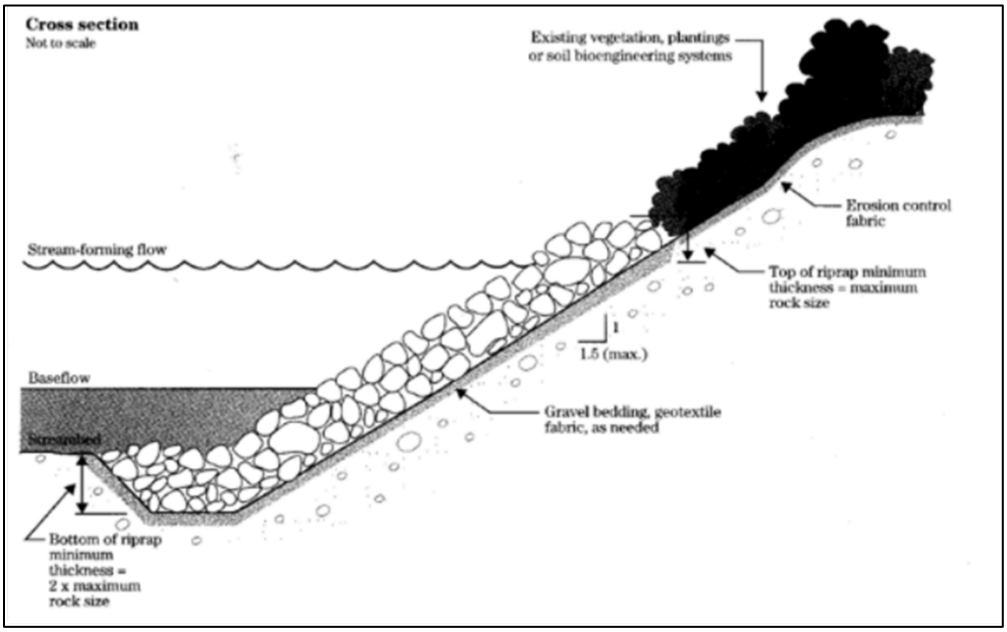


**Figure 8. Conceptual Riprap Protection**

**Vegetation –** Native species plantings will be incorporated where possible. Consideration will be given to species of tribal significance. The vegetation plan would be further defined in the design phase.

**River Access -** Previously cut stairs in the clay slopes near the outcropping currently exist. New stairs constructed in Reach 3 would be beneficial as they would provide access to the bedrock outcropping which is an important fishing area for the LSIC.

## 2.7 Alternative Plans

Alternatives are combinations of measures that would contribute to attaining the planning objectives. A measure may stand alone as an alternative plan that can be implemented independently or in combination with other measures. Four action alternatives and the No Action alternative were formulated for the study from the measures carried forward (Table 1).

Other components that are assumed to be included with any of the action alternatives include site preparation and site restoration. A new staircase is also included in all action alternatives. A primitive road currently exists that was deemed insufficient to support the construction equipment needed for project construction. For all alternatives, a temporary access road would be needed to support project construction. The access road will need to be temporary and

removed post-construction to avoid permanent impacts to wetland and potential conflicts of the land in the CRP. Note that the aerial photo is from 2015 and erosion has continued since then.

**No Action Alternative** - No action is defined as no implementation of a project to protect the stream bank in the study area. The No Action alternative is required under NEPA for comparison of proposed actions to a baseline condition. No Action is expected to result in continued erosion and loss of approximately 8 to 13 acres of land adjacent to the river or 2 acres of land due to channel migration over the 50-year planning horizon. In the absence of a Federal project, no other entity is anticipated to pursue measures to stabilize the bank.

**Alternative 1** – Alternative 1 consists of sixteen bendway weirs and a longitudinal stone toe at the banks of Reach 1 and Reach 2. The longitudinal stone toe would provide stability to the toe of Reach 1 and Reach 2, allowing for a naturally stable angle to be reached that can then be vegetated, either manually or through natural recruitment. Intermittent tiebacks would connect the longitudinal stone toe to the riverbank to reduce flanking of the toe during a flood event. The vertical bank in Reach 3 would be cut back to a 3H:1V slope, geotextile would be placed on the bare soil, and bedding and riprap protection would be placed over top of that (Figure 9).

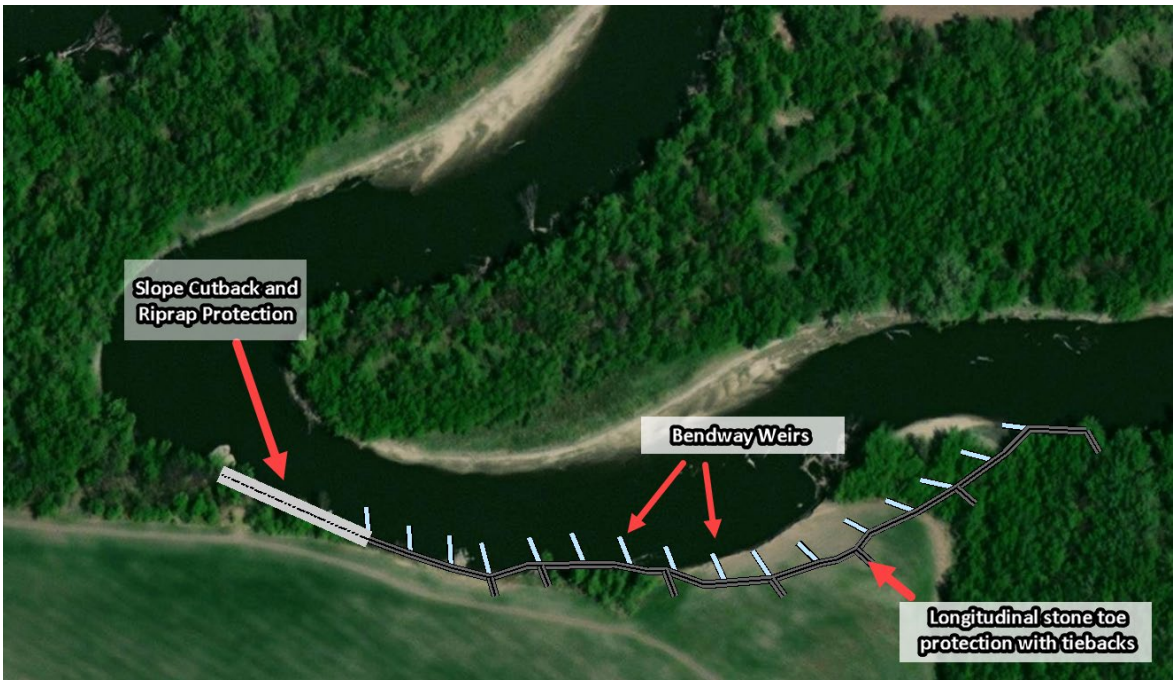


**Figure 9. Alternative 1 (2015 aerial imagery)**

**Alternative 2** – Alternative 2 consists of riprap built out into the river from the bank of Reaches 1, 2, and 3 at a 2H:1V slope (Figure 10). No grading, bedding, or geotextile is proposed for this alternative. No action is proposed for Reach 4.


**Figure 10. Alternative 2 (2015 aerial imagery)**

**Alternative 3** – Alternative 3 consists of riprap built out into the river from the bank in Reaches 1, 2, and 3 at a 2H:1V slope (Figure 11). This alternative would also include three bendway weirs in Reach 1 and four bendway weirs in Reach 2. Bendway weirs have been shown to provide habitat for numerous fish species.

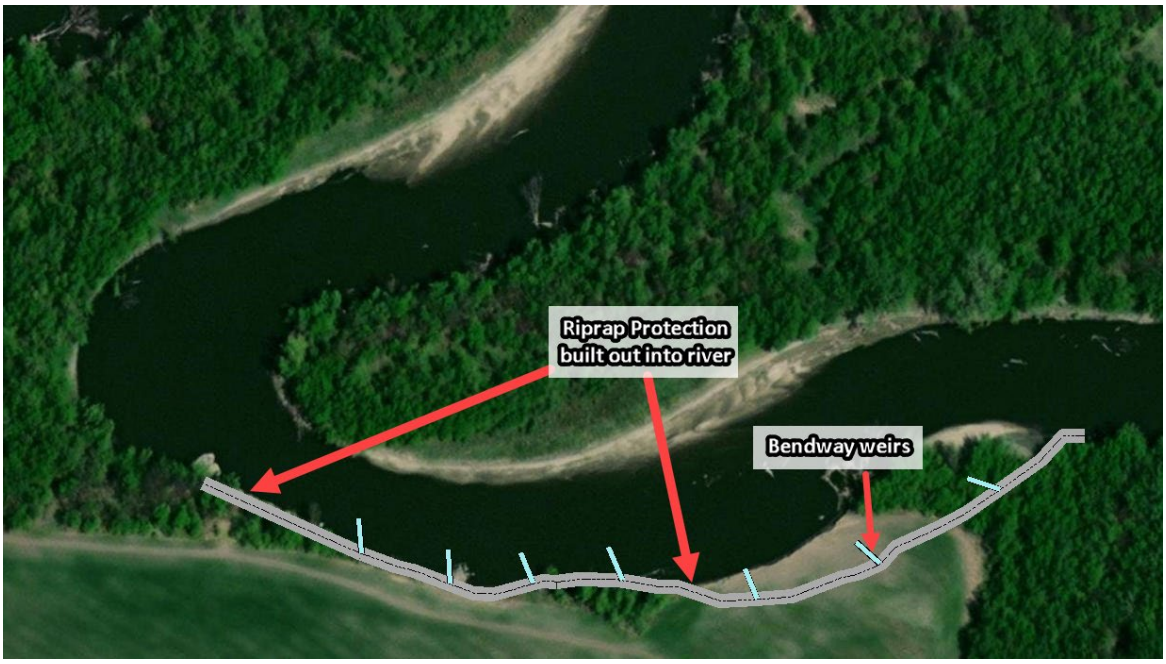


**Figure 11. Alternative 3 (2015 aerial imagery)**

**Alternative 4** – Alternative 4 consists of cutting back the vertical banks in Reaches 1, 2, and 3 to create 3H:1V slopes (Figure 12), placing geotextile, bedding, and finally riprap.

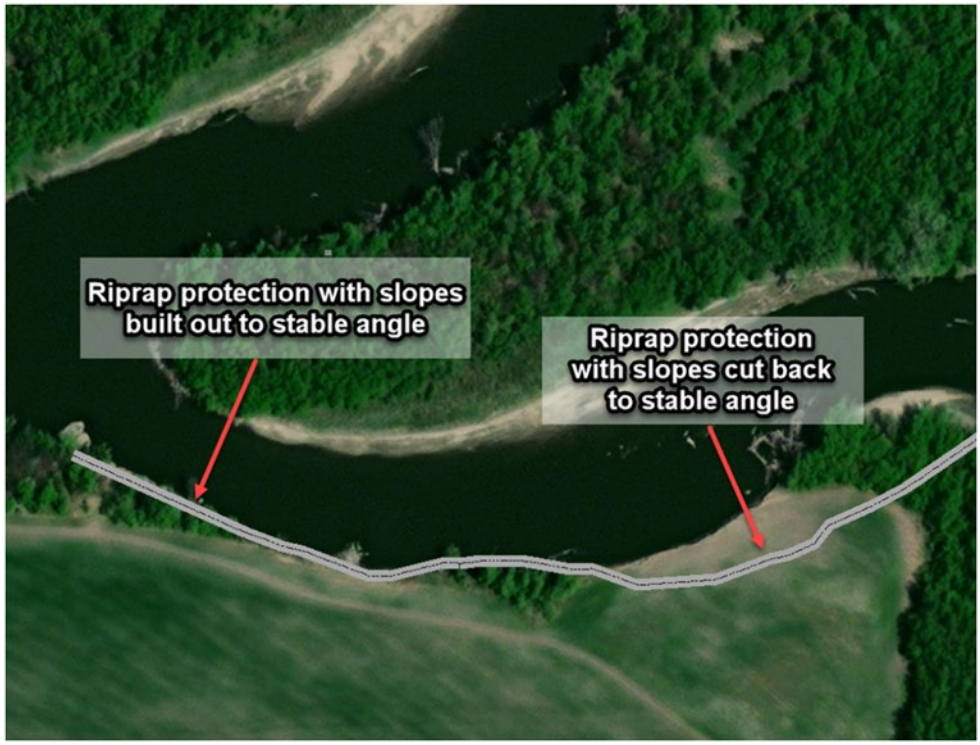


**Figure 12. Alternative 4 (2015 aerial imagery)**

# 3. Alternative Plan Evaluation and Comparison

This section describes the evaluation and comparison of the No Action alternative, and the four action alternatives. It also documents the process used to determine the costs and benefits for each alternative.

This draft Integrated Feasibility Report revises and replaces the draft IFR the Corps released in September 2021. That report was fully coordinated with the public, tribe, and resource agencies. After the review period concluded, the Corps determined that the FEMA flood stage model was applied incorrectly, causing some alternatives (Alternatives 2 and 3) to be screened from detailed consideration due to flood stage impacts. Alternative 4 was previously recommended as the TSP. The Corps updated its analysis to correctly apply the FEMA flood stage model, and Alternatives 2 and 3 no longer showed flood stage impacts. This draft IFR reflects the correct application of the FEMA flood stage model and analyzes Alternatives 1 through 4 in detail in addition to the No Action alternative.

## 3.1 Alternatives Cost Estimates

Parametric (or rough order of magnitude) costs associated for each alternative are shown in Table 2 (note numbers have been rounded). Items included in the costs estimate are construction cost, preconstruction, engineering, and design (PED, with a 20% contingency), supervision and administration (S&A, with a 10% contingency), and contingency (30%).

**Table 2. Action Alternatives Cost Estimates (FY2023 price level)**

| | Alternative 1 | Alternative 2 | Alternative 3 | Alternative 4 |
|---|---|---|---|---|
| Construction Cost | $1,400,000 | $1,100,000 | $1,426,000 | $1,530,000 |
| PED | $280,000 | $219,000 | $286,000 | $306,000 |
| S&A | $140,000 | $110,000 | $143,000 | $153,000 |
| **Subtotal** | $1,820,000 | $1,429,000 | $1,855,000 | $1,989,000 |
| Contingency | $546,000 | $427,000 | $557,000 | $597,000 |
| **TOTAL** | **$2,366,000** | **$1,856,000** | **$2,412,000** | **$2,586,000** |

## 3.2 Ability to Meeting Project Objectives

This section summarizes the alternatives' ability to meeting the project objectives, constraints and considerations. Project objectives are listed in section 2.3 and 2.4.

No Action Alternative: Based on evidence from previous years, the No Action Alternative would allow high flows and erosive threats to continue, progressing the land loss until it reaches a state of equilibrium. The No Action Alterative would not meet any of the planning objectives.

Alternative 1: The design for Alternative 1 is reliant on natural river processes to effectively build a floodplain bench, reduce erosion rates, and effectively reverse land loss due to streambank erosion. The bank would continue to collapse into a catchment area behind the longitudinal stone toe until it assumed a stable slope and eventually matured into a vegetated floodplain bench. This process would effectively restore the lost riparian habitat, though it would be susceptible to invasive species if not closely monitored. Although objective 1 would eventually be met, it would not be achieved at construction completion. Additional erosion of the existing slope would occur until an equilibrium is reached. Objective 2 would be marginally met. The bank would eventually stabilize, and erosion would stop, although this process can take many years. This alternative would result in 2.1 acres of temporary wetland impacts, no permanent wetland impacts and 1.0 acre of permanent riverine impacts. Downstream impacts are expected to be minimal from this alternative as erosive flow energies would likely be dissipated by riparian vegetation at the site. Objective 3 would be met with the construction of a new staircase in Reach 3. This alternative would not violate the planning constraints. This alternative would cut back the bank in Reach 3 which is a consideration that would be violated.

Alternative 2: This alternative would provide streambank protection by placing rock in the channel along the bank in Reaches 1, 2, and 3. Objective 1 would be met, erosion would be reduced, and land loss would not continue once constructed. Objective 2 would be met; the preservation of the natural resources would occur at construction completion. This alternative would result in 2.1 acres of temporary wetland impacts, no permanent wetland impacts and 1.06 acres of permanent riverine impacts. This alternative would be built out into the river and would not require cutting back the bank. Objective 3 would be met with the construction of a new staircase in Reach 3. This alternative would not violate the planning constraints and would not cut back the bank.

Alternative 3: This alternative provides the same streambank protection as Alternative 2 but adds seven bendway weirs in Reaches 1 and 2. The bendway weirs would push flow away from the bank. The bendway weirs would increase the resiliency of the bank protection design, especially under projected future climate conditions. The bendway weirs have been shown to provide beneficial habitat for fish species. Objective 1 would be met; erosion would be reduced, and land loss would not continue once constructed. Objective 2 would be met; the preservation

of the natural resources would occur with construction completion. This alternative would result in 2.1 acres of temporary wetland impacts, no permanent wetland impacts and 1.22 acre of permanent riverine impacts. This alternative would be built out into the river and would not require cutting back the bank. Objective 3 would be met with the construction of a new staircase in Reach 3. This alternative would not violate the planning constraints and would not cut back the bank.

Alternative 4: Alternative 4 would provide streambank protection and prevent additional land loss. Objective 1 would be met; erosion would be reduced, and land loss would not continue once constructed. Objective 2 would be met; the preservation of the natural resources would occur with construction completion. This alternative would temporarily impact 2.1 acres and temporarily impact 0.7 acres of wetland and permanently impact 1.8 acres of riverine habitat. This alternative would require cutting back the existing bank. Objective 3 would be met with the construction of a new staircase in Reach 3. This alternative would not violate the planning constraints. This alternative would cut back the bank which is a consideration that would be violated.

Additionally, the opportunities identified in section 2.2 were considered in the evaluation and comparison of the alternatives. Vegetation would be incorporated at the top of the bank through the first couple feet of the riprap as much as practicable. Alternatives 1 and 3 provide resiliency to future climate and land use changes with the incorporation of the bendway weirs as these would redirect erosive energies away from the toe of the bank and towards the center of the channel. While not explicitly addressed, it is assumed that all action alternatives would increase community awareness of water quality issues related to fish and pollutants. Alternatives 1 and 3 would provide additional fish habitat with the incorporation of bendway weirs which would facilitate traditional cultural practices of fishing within the project area as described in section 1.4.

## 3.3 Evaluation of Alternatives Using the Principles & Guidelines Criteria

The evaluation criteria suggested by the Principles and Guidelines (P&G) (completeness, effectiveness, efficiency, and acceptability) were also used to aide in the evaluation of the alternative plans. Descriptions of the P&G criteria can be found in section 2.5. Table 3 documents the evaluation of the alternatives using the P&G criteria.

**Table 3. Principles and Guidance Criteria Alternative Evaluation**

| | **Completeness** | **Effectiveness** | **Efficiency** | **Acceptability** |
|---|---|---|---|---|
| **No Action** | No – doesn't meet the objectives, erosion would continue. | Objective 1 – Low, would not stop erosion or reduce land loss.<br>Objective 2- Low, would not preserve natural resources and impacts to wetlands would occur.<br>Objective 3 – Low, new stairs would not be constructed and access would remain as is. | $0 | Low, acceptable in terms of laws and regulations. Does not have support from sponsor as the alternative does not address the problem. |

| | Completeness | Effectiveness | Efficiency | Acceptability |
|---|---|---|---|---|
| **Alternative 1** | Yes – no other actions are needed to meet the objectives. | Objective 1 – Moderate, would reduce erosion and reduce land loss after construction.<br>Objective 2 – Moderate, would stop erosion, but would likely result in some continued bank erosion, bendway weirs could provide habitat for aquatic species. Vegetation would eventually grow behind toe stone and on eroded banks, rebuilding land that has been lost to erosion, bendway weirs could provide habitat for aquatic species.<br>Objective 3 – High, includes new staircase. | $2,366,000 | Low, acceptable in terms of laws and regulations. Does not have support from the sponsor as the alternative cutback the bank. Bendway weirs provide unquantified aquatic habitat and increase the resiliency of the alternative. |
| **Alternative 2** | Yes – no other actions are needed to meet the objectives. | Objective 1 – High, would stop majority of erosion, land loss would stop where riprap is constructed.<br>Objective 2 – High, would stop erosion, no bank cut back, no wetland impacts, 1.06 acres of river impact.<br>Objective 3 – High, includes new staircase. | $1,856,000 | Moderate, acceptable in terms of laws and regulation. Has sponsor support as there is no bank cutback. Missing the opportunity for unquantifiable aquatic habitat and the additional resiliency that the bendway weirs provide. |
| **Alternative 3** | Yes – no other actions are needed to meet the objectives. | Objective 1 – High, would stop majority of erosion, land loss would stop where riprap is constructed.<br>Objective 2 – High, would stop erosion, no bank cut back, no wetland impacts,1.22 acres of river impact, bendway weirs could provide habitat for aquatic species.<br>Objective 3 – High, includes new staircase. | $2,412,000 | High, acceptable in terms of laws and regulations. Fully supported by the sponsor as there is no bank cutback. Bendway weirs provide unquantified aquatic habitat and increase the resiliency of the alternative. |
| **Alternative 4** | Yes – no other actions are needed to meet the objectives. | Objective 1 – High, would stop erosion.<br>Objective 2 – Moderate, would stop erosion, but require the bank to be cut back (removing some current land), impact 0.7 acres of wetland and 1.8 acre river impact.<br>Objective 3 – High, includes new staircase. | $2,586,000 | Low, acceptable in terms of laws and regulations. Does not have support from the sponsor as the alternative cutback the bank and there is no additional resiliency. |

Effectiveness ranked using: High – objective is met, Moderate – objective is met but there are qualifications to meeting the objective, Low – objective is not met.

Effectiveness ranked using alternative cost estimates.

Acceptability ranked using: High - the alternative is acceptable in terms of laws and regulation and has support from the sponsor and partners, Moderate - the alternative is acceptable in terms of laws and regulation and in minimally acceptable to the sponsor and partners.; and Low - the alternative is acceptable in terms of laws, regulations and would not be acceptable to the sponsor or the public.

## 3.4 National Economic Development

The National Economic Development (NED) account displays changes in the economic value of the national output of goods and services displays changes in the economic value of the national output of goods and services. The objective of NED is to maximize increases in the net value of the national output of goods and services. Per the 2018 Implementation Guidance for Section 1121 of WRDA 2016, TPP projects whose primary purpose is the preservation of cultural or natural resources related to water resources development can be justified under the Social Effects account as defined in ER 1105-2-100, rather than under the National Economic Development account. This TPP project would incur NED costs and does not have beneficial or adverse NED effects.

## 3.5 Regional Economic Development

The Regional Economic Development (RED) account registers changes in the distribution of regional economic activity that result from each alternative plan. Regional Economic Development considers the changes in regional economic activity that result from each alternative plan. RED benefits impact a region, not the nation as a whole.

A regional economic impact modeling tool, RECONS (Regional ECONomic System), that provides estimates of jobs and other economic measures such as labor income, value added, and sales that are supported by USACE programs, projects, and activities, was run for all action alternatives. As the costs for all action alternatives varied slightly, the regional benefits would also vary. However, the percentage of Federal expenditure to regional benefits would be largely equivalent and not useful as criteria for comparison.

See Appendix J RECONS for additional information.

## 3.6 Environmental Quality

The Environmental Quality (EQ) account displays non-monetary effects on significant natural and cultural resources. EQ criteria includes both beneficial and adverse changes in the ecological, aesthetic, and cultural attributes of natural and cultural resources.

**Preservation of Wetlands.** Wetland habitat exists adjacent to the riverbank (Figure 5). Increased flows have contributed to turbid water and the erosion of an estimated 3 acres of land since 1992. An estimated 2 acres of wetlands are at risk of being lost by continued erosion over the 50-year period of analysis.

**Aquatic Benefits.** Alternatives 2, and 4 would not have any positive impact on the aquatic habitat immediately adjacent to the eroding slope. Alternatives 1 and 3 include bendway weirs, which would support higher population densities of large fish which would be an added benefit

to the area. Bendway weirs create both slack water aquatic habitat within the eddies downstream of weirs and low-flow habitat at scour holes that form at the tips of the structures (Kinzi, 2009). Research has found that reaches with bendway weir structures support significantly higher population densities of large fish compared to other treatments due to hydraulic diversity (Shields Jr, Knight, & Cooper, 2000). Alternatives 1 and 3 would provide an additional 0.25 acres of the unique fish habitat described above compared to Alternatives 2 and 4 which would provide 0 acres of unique fish habitat. This also supports the cultural practice of fishing within the project site as described in section 1.4.

## 3.7 Other Social Effects

The Other Social Effects (OSE) account includes urban and community impacts; life, heath, and safety factors; displacement; long-term productivity; and energy requirements and energy conservation. Other criteria can be added to this category based on feedback from stakeholders. Per the 2018 *Implementation Guidance for Section 1121 of WRDA 2016*, TPP projects whose primary purpose is the preservation of cultural or natural resources related to water resources development can be justified under the Other Social Effects account as defined in ER 1105-2-100.

The protection of the culturally significant Tribal lands and the continuation of cultural practices are of particular importance and significance for this Study. OSE benefits to the Lower Sioux Community include:

**Reduction of erosion of Tribal Lands.** The Lower Sioux Tribal lands are a finite resource that currently cover 1,700 acres. The erosive threat in the project area has caused a loss of almost 3 acres of land since 1992, with over half of the loss occurring since 2015. There were 5 events in 2019 that exceeded the channel's capacity. It is expected that the erosive energy of the river will continue or increase in the future condition. At the current rate of erosion, 2 acres of land is at risk of being lost over the 50-year period of analysis from lateral bank retreat. There is also the possibility of the channel realigning with an older flow path which would result in 8 to 13 acres of potential land loss. The alternatives proposed would help reduce the erosive threat to preserve tribal lands.

The design for Alternative 1 would allow for the bank to continue to collapse before the bank stabilized, allowing additional land loss to occur but offsetting that loss with accumulation of sediment and eventual re-vegetation of a floodplain bench at the toe of the bank. The amount of additional land loss has not been estimated but is assumed to be less than the FWOP condition. As tribal land is the primary resource of significance, it is not viewed as acceptable to allow for continued post-construction bank erosion.

The design for Alterative 2, 3, and 4 are demonstrated to be resilient and would provide streambank protection and prevent additional land loss.

Alternatives 2 and 3 would not require the bank to be cut back, no additional land would be lost if constructed.

**Increased likelihood that access to adjacent land and the river will continue in the future.** All the action alternatives would stabilize the 1,500 linear foot section of the riverbank that is eroding. All the action alternatives include a new staircase that would maintain access to the river. This land is used for cultural practices including, hunting, fishing, gathering plants, and accessing the Minnesota River.

**Alternative Resiliency**. Given the aggressive erosion occurring within the study area, confidence in project resiliency was given a high priority. Alternative 1 includes longitudinal stone toe protection which is intended to reduce bank erosion while minimizing disturbance of the project area. This aligns well with a desire to construct environmentally conscious bank stability projects but results in less direct protection of the banks and can result in a higher risk of project failure. Alternatives 2, 3, and 4 include riprap revetment which has a long history of successful use in bank stability projects and design guidelines that can easily adjust to desired levels of resiliency. Alternative 3 has added resiliency over Alternative 2 and 4 with the inclusion of bendway weirs. The bendway weirs push erosive energies away from the toe of the bank and towards the center of the channel. This reduces the amount of sediment being mobilized at the toe of the bank and reduces the likelihood of toe rock launching to fill any resulting scour holes. In a system that is predicted to see increases in flood frequency and magnitude the inclusion of bendway weirs increases resiliency under future hydraulic and climate conditions. The resiliency relates to improving the long term viability of the community.

## 3.8 Comprehensive Benefits

The Comprehensive Documentation of Benefits in Decision Documents, dated 5 January 2021, notes that all four accounts must be equally considered in plan formulation. The following table (Table 4) summarizes the alternatives across the four accounts.

**Table 4. Comprehensive Benefits**

| Alternative | Accounts | | | |
|---|---|---|---|---|
| | NED | RED | EQ | OSE |
| No Action | No change since there would be no project. | No change since there would be no project. | Continued loss of wetlands due to no action and continues erosion and loss of land. | Would experience continued land loss. |
| Alternative 1 | Same across all action alternatives: No NED analysis completed, see OSE account. | Same across all action alternatives: Potential regional employment associated with project construction, expenditures by contractors, and increased economic activity in the community by contractors during construction. | No permanent wetland impacts. Support higher population of fish due to hydraulic diversity. | Would allow for the bank to continue to collapse before the bank stabilized, allowing additional land loss to occur. Bendway weirs increase resiliency under future hydraulic and climate conditions. |
| Alternative 2 | | | No permanent wetland impacts. | Would stabilize the bank immediately and stop land loss. |
| Alternative 3 | | | No permanent wetland impacts. Support higher population of fish due to hydraulic diversity. | Would stabilize the bank immediately and stop land loss. Bendway weirs increase resiliency under future hydraulic and climate conditions. |
| Alternative 4 | | | Permanently impact 0.7 acres of wetlands though bank cutback. | Would stabilize the bank immediately and stop land loss. Would reduce overall land due to bank cutback method of construction. |

All action alternatives are very similar when compared across all four accounts. While all action alternatives would eventually stabilize the bank, Alternative 3 would immediately reduce the erosion, preserve tribal land, and provide additional resiliency with the addition of bendway weirs and the bendway weirs provide a benefit to the tribe and are responsive to the tribe's expressed interests because this alternative avoids the bank cutting.

Alternative 3 is the plan that best meets the planning objectives and does not violate the constraints. The benefits of Alternative 3 outweigh the costs. For the given level of non-monetary output (extent to which objectives were met), no other plan yields more output for less money. This alternative is responsive to the tribes needs, improves the long term viability of the community and is consistent with the TPP authority.

# 4. Tentatively Selected Plan

Based on the discussion and criteria outlined in Section 3, Alternative 3 was determined to be the tentatively selected plan (TSP). Figure 13 shows a plan view of Alternative 3, more details on Alternative 3 can be found in Appendix B.

Project features, construction, operation, maintenance, repair, rehabilitation, and replacement considerations are discussed in this section. The Project has been developed to a detailed feasibility level of design. Further details will continue to be refined in the plans and specifications (P&S) stage.


**Figure 13. Alterative 3 Feasibility Plan View**

## 4.1 Plan Features

Table 5 documents the features of the Tentatively Selected Plan.

**Table 5. Summary of Project features**

| Feature | Description |
|---|---|
| Riprap Slopes | Riprap resistant to the erosive forces caused by flow, debris, and ice would be installed from the top of bank to the toe of the bank at a 1V:2H slope to help slow down further erosion and sliding activity. The length of bank to be covered with riprap is approximately 1,500 feet. Following EM 1110-2-1601, a riprap with a $D_{30}$ of 4.4 inches was identified as appropriate for protecting against velocities during the 24,000 cfs flow event. A gradation of R20 was found to match the required $D_{30}$ and would be used. For additional details see Appendix C and Appendix E. |
| Bendway Weirs | After the rock fill is placed along the bank, bendway weirs would be constructed perpendicular to the bank. |
| Planting | Native species plantings would be incorporated in and adjacent to the bank stabilization where appropriate. Consideration will be given to species of tribal significance. The specific vegetation plan will be further defined in the design phase of the study. Vegetation would be incorporated at or near the top of slope and extend landward by a distance to be determined by the design team. |
| Staircase | A new staircase would be constructed in Reach 3, replacing the existing stairs. The stairs would allow for continued access to the river for the tribe. The location would be determined during the design phase. |
| Temporary Road Access | Construction at the site would require a temporary access road that would overlay the existing dirt road and extend to the downstream limit of the project. This 1.1-mile temporary roadway is assumed to consist of geotextile overlain by a 10-inch thick by 12-foot-wide aggregate section. The aggregate sizing will be finalized during the design phase. |
| Seeding, Clearing, and Grubbing | Clearing and grubbing of heavy stumps would be required for project construction. Approximately 2.1 acres of emergent wetland would also be disturbed for temporary construction access and staging. Disturbed wetland areas would be revegetated with Minnesota state seed mix 34-261 for riparian areas. A cover crop of oats would be used if construction is completed later in the year. |

*$D_{30}$= Riprap size of which 30% is finer by diameter

### 4.1.1 Consistency with USACE Campaign Plan

The USACE has developed a campaign plan with a mission to “deliver vital engineering solutions, in collaboration with our partners, to secure our Nation, energize our economy, and reduce risk from disaster”. This Campaign Plan shapes the USACE command priorities, focuses transformation initiatives, measures and guides progress, and helps the USACE adapt to the needs of the future by improving the current practices and decision-making processes of USACE. The USACE Campaign Plan is available at the following address: http://www.usace.army.mil/about/campaignplan.aspx. The goals and objectives outlined in the latest USACE Campaign Plan (FY21) include:

1. Support National Readiness
2. Modernize USACE

3. Improve Partnering and Strengthen Relationships
4. Revolutionize Program and Project Delivery

This project supports Goals 1 and 3 of the USACE Campaign Plan by addressing:

- Campaign Plan Goal 1: USACE is trusted by DA, DoD, our partners / stakeholders, and the Nation to deliver quality projects and programs, on time and within budget, that enable the National Command Authority to secure the homeland, project national power, and pursue our Nation's vital interests.
    - Carrying out and delivering the Program.
- Campaign Plan Goal 3: USACE is the most trusted advisor and valued "partner of choice" for our International Allies and Partners, the Federal Government, industry, academia, State and local agencies, and the public through aggressive partnering that builds and maintains strong, meaningful, and lasting relationships.
    - Building and maintaining trust and understanding with customers, stakeholders, teammates, and the public through strategic engagement and communication.

### 4.1.2 Consistency with USACE Environmental Operating Principles

In 2002 and again in 2012, the USACE reaffirmed its commitment to the environment by formalizing a set of Environmental Operating Principles (EOP) applicable to all of its decision-making and programs. The formulation of alternatives considered for implementation met all of the EOPs (U.S. Army Corps of Engineers, 2012). The seven EOPs are:

- Foster sustainability as a way of life throughout the organization
- Proactively consider environmental consequences of all the USACE activities and act accordingly
- Create mutually supporting economic and environmentally sustainable solutions
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE, which may affect human and natural environments
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of the USACE actions in a collaborative manner
- Employ an open, transparent process that respects the views of individuals and groups who are interested in the USACE activities.

These principles are available at the following address: http://www.usace.army.mil/Missions/Environmental/Environmental-Operating-Principles/.

The principles are consistent with the NEPA, the Army Strategy for the Environment, other environmental statutes, and the WRDA of 2007. The EOPs are considered at all stages of the study process at the same level as economic issues. Environmental consequences, sustainability, risk management, and stakeholder involvement were integral parts of the study process. The EOPs were considered during plan formulation and outreach. The selection of the Tentatively Selected Plan (Alternative 3) is consistent with the EOPs. Alternative 3 promotes sustainability and economically sound measures by incorporating natural and least cost methods where possible for addressing erosion in the project area. Additional detail can be found in Section 5.

## 4.2 Design Considerations

Alternative 3 has been developed to a feasibility level of design. Details are included in Appendix B – Civil Engineering. As with all feasibility level studies, these details will be refined in the Design and Implementation Phase of the project. Appendix E contains a list of questions that should be addressed during the design phase of the project.

## 4.3 Construction Implementation

How features are constructed is generally left to the discretion of the contractor. The contractor is responsible for providing the finished product. The contractor would be allowed to use available technologies, so long as they are able to meet all the other conditions, including any necessary LSIC permits and/or water quality certifications and the restrictions included in this integrated feasibility report and summarized in Section 4.5.

To address potential for unanticipated discovery during construction, archaeological and cultural monitoring would occur during construction and the shoreline would be periodically inspected for cultural materials.

### 4.3.1 Construction Restrictions

Construction restrictions could be applied for any number of reasons. Restrictions are generally applied to minimize the adverse effects of construction and to protect valuable habitats. Anticipated Best Management Practices (BMPs) could include sediment fencing and floating silt curtain to prevent movement of soil and sediment outside the project area, along with other requirements of Section 401 water quality certification. The following are basic construction restrictions that would be applied in the construction of the Project features.

To minimize effects to fish species, no instream work would occur during spawning season (March 1 – June 15).

To avoid potential impacts to northern long-eared and triclolored bats, no tree clearing will occur between March 31 – November 1.

### 4.3.2 Construction Schedule

It is assumed the project could be completed in one year. A detailed construction schedule would be developed during the P&S phase of the project.

### 4.3.3 Permits

The following certification would be required for the proposed project:

- Section 401 Water Quality Certification (U.S. Environmental Protection Agency): For the discharge of fill material into the Minnesota River and wetlands within the tribal reservation boundary.

## 4.4 Operation, Maintenance, Repair, Replacement, and Rehabilitation

The purpose of assigning operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) costs is to ensure commitment and accountability by the Project sponsor. An OMRR&R manual would be drafted following project construction.

The LSIC would be responsible for conducting periodic inspections and maintenance for the project to remain functional along with notifying USACE of the inspection along with

recommendations for any features in need of repair. There are no operable features in this project, and the project is designed to reach a stable equilibrium with riverine shaping processes and require normal maintenance and repair. Table 6 documents the features that may require maintenance, repair, replacement, and rehabilitation and the intervals at which the actions are assumed to occur. There is no operation activities associated with Alternative 3.

The present value and estimated average annual OMRR&R costs for the Lower Sioux Indian Community are estimated to be $2,000 annually. The LSIC would be responsible for 100 percent of the operation and maintenance of the Project features.

**Table 6. Maintenance, Repair, Replacement, and Rehabilitation**

| Action | Interval of MRR&R |
|---|---|
| Herbicide application | As needed |
| Woody vegetation and or brush removal | Every other year or as needed |
| Replacement of rock | As needed |

## 4.5 Project Cost Summary

A more detailed cost estimate was prepared for the Tentatively Selected Plan (Alternative 3). Costs increased primarily due to the addition of an access road that would have been part of all action alternatives and inflation. The detailed estimate of the Project design and construction costs are provided in Appendix D; however, due to the sensitivity of providing this detailed cost information, this material will be omitted in the public document. The costs are expressed as Project First Costs and include construction, contingencies, engineering, preconstruction and design, and construction management. Due to the construction period anticipated to occur in under 12 months, interest during construction (IDC) is not included in the project cost. The Project First Costs are the Project costs at the effective price level of October 2023 (FY24). Annual costs are calculated with the assumption of a 50-year analysis period (2025-2075). The more refined cost estimate also involved refining quantities, an Abbreviated Risk Analysis to determine contingencies, Micro-Computer Aided Cost Estimating System (MCACES), and Total Project Cost Summary (TPCS) with costs escalated to the mid-point of construction. Table 7 shows the estimated cost by account.

**Table 7. Tentatively Selected Plan Project First Cost**

| Account | Item | Project First Cost |
|---|---|---|
| **01** | Lands and Damages | $3,000 |
| **06** | Fish & Wildlife Facilities | $62,000 |
| **16** | Bank Stabilization | $1,876,000 |
| **18** | Cultural Resource Preservation | $61,000 |
| **Subtotal** | | **$2,002,000** |
| **30** | Preconstruction, Engineering & Design | $357,000 |
| **31** | Construction Management | $185,000 |
| **Subtotal** | | **$2,544,000** |
| | **Total Investment Cost** | **$2,544,000** |
| | Annualized Project Cost | $90,252 |
| | Annual OMRR&R | $2,000 |
| | **Total Annual Cost** | **$92,252** |

***October 23 price level**

## 4.6 Cost Apportionment

Cost sharing for TPP projects is established based on the causal factors necessitating the project or the project purpose with which each activity most closely aligns (Table 8). For this project, the cost share for flood risk management is anticipated to apply. Cost sharing for flood risk management requires the non-federal sponsor contribute a minimum of 35 percent, up to a maximum of 50 percent, of construction costs, including a 5 percent minimum cash contribution, in-kind contributions, and provision of real property interests and relocations required for the project. Further, section 203(d)(1) of the Water Resources Development Act of 2000, as amended (33 U.S.C. 2269(d)(1) requires that cost share agreements under the Tribal Partnership Program shall be subject to the ability of the non-Federal Sponsor to pay in accordance with procedures established by the Secretary, and the non-Federal Sponsor has met the applicable criteria for the ability to pay adjustment consisting of the application of a 25 percent factor to the otherwise applicable non-Federal share of its required cash contribution.

**Table 8. Non-Federal Cost Share[1]**

| | | |
|---|---|---|
| Construction Cost | | $2,544,000 |
| Non-Federal 35% | 35% | $890,400 |
| Non-Federal LERRD | | ($3,000) |
| Section 1156 Waiver | | ($665,000) |
| Subtotal | | $222,400 |
| Ability To Pay Adjustment | 25% | |
| Non-Federal Cash Contribution | | $55,600 |
| Non-Federal contribution | | $58,600 |

1 – Project First Cost, October 2023 price level

## 4.7 Real Estate Considerations

The construction staging area is reachable by a public road owned by Paxton Township. According to the Township's Chairperson, a permit will not be required for USACE to utilize the access road for construction purposes. The other project features will not be accessed by public roads since they are in the water. All land required for the construction, operation and maintenance of the project are held in trust for the LSIC by the United States Government (through the Bureau of Indian Affairs); including land required for staging and river access areas and disposal. The construction staging area is reachable by public road, the other project features will not be accessed by public roads since they are in the water. The LSIC is the non-federal sponsor and supports the Project.

The value of lands required for Alternative 3 is estimated to be $2,057. There are no relocations with Alternative 3. See Appendix F for additional information.

## 4.8 Plan Implementation

In general, the next steps include approval of the feasibility study by the Commander of the Mississippi Valley Division. After approval the project would initiate the plans and specifications stage. The Project cost is below the Federal program limit and thus specific authorization by Congress will not be required. Then the project would move into active construction. All future actions are pending funding. Prior to implementation, the Corps and non-Federal Sponsor would execute a Project Partnership Agreement (note this langue is subject to change).

## 4.9 Residual Risk and Uncertainty

Table 9 presents the potential residual climate risks for the TSP project features. Since runoff is likely to increase in the future, the project may be subject to higher flow velocities and more frequent overtopping, which creates risk for the project features. Future climate change risks are addressed by ensuring measures are robust to a climate change stressor (e.g., extreme high flows). For example, a scale factor (SF) of 1.5 was applied to the riprap size. This SF was selected based upon the text in EM 1100-2-1601 Section 3-7.c.(1). This text recommends increasing the scale factor above the minimum value of 1.1 when large debris may impact the project site. Observed large trees within the channel during multiple site visits led to the use of a SF of 1.5. While not expressly driven by climate change considerations, the application of a SF will increase climate resilience of the riprap protection measures. Consideration of increasing frequencies of flood events possibly driven by climate change could subject the site to more frequent large debris impacts. The proposed gradation's $D_{30}$ exceeds the calculated $D_{30}$ by ~50% and the TSP design thickness should provide added robustness against more frequent flow and debris impact events. Including instructions for monitoring and guidance suggesting when project features should be adjusted or redesigned in the project's operation and maintenance manual will also increase the resilience of the riprap. Additional details on the Climate Risks are located in Appendix I.

**Table 9. Residual Climate Risks**

| Residual Climate Risk Summary Table - Lower Sioux Project | | | | | |
|---|---|---|---|---|---|
| **Project Feature** | **Trigger (Variable which Causes Risk)** | **Environmental Hazard** | **Potential Harm to Project** | **Qualitative Likelihood (Low/ Moderate/ High)** | **Qualitative Justification for Likelihood Rating** |
| Top Elevation - Erosion Protection | Increase in snowmelt runoff or runoff from heavy rainfall events | Increase in high flow conditions at the site resulting in higher channel depth and flow velocity | Floods could overtop the riprap protection more frequently and exacerbate erosion | Low | The top elevation of the riprap is set to the elevation of the existing bank and the riprap uses a conservative safety factor of 1.5. Projections in hydrology are uncertain and increases in temperature and evapotranspiration could offset increases in future streamflow. |
| Riprap | Increase in snowmelt runoff or runoff from heavy rainfall events | Increase in frequency and duration of high flow conditions, increase in shear stress and velocity in the channel | Increased frequency and duration of high flow conditions would increase the potential for erosion at the site, causing damage. | Low | The riprap uses a conservative safety factor of 1.5 and can withstand flow velocities from the estimated 1% AEP event. Projections in hydrology are uncertain and increases in temperature and evapotranspiration could offset increases in future streamflow. |
| Bendway weirs (in addition to riprap protection of the streambank) | Increase in snowmelt runoff or runoff from heavy rainfall events. Decreased ice cover and rising temperatures increase ice movement/jamming during cold weather months. | Increase in frequency of high flow conditions and increases in shear stress on bendway weirs. Increases in ice impacts damaging the bendway weirs. | Bendway weirs are designed with current seasonal mean water and low water elevations, which could be higher in the future. Increased frequency and duration of high flow conditions could damage the bendway weirs and/or exceed their ability to redirect flows away from the streambank. Increased frequency of ice movement during cold weather months could also damage the bendway weirs. | Low | The bendway weirs would be designed for flows expected at the site; however, they are not commonly used in the Northern United States, and their performance in cold environments is uncertain. This project would combine bendway weirs with riprap protection on the streambank. Projections in hydrology are uncertain and increases in temperature and evapotranspiration could offset increases in future streamflow. The riprap factor of safety of 1.5 would account for additional, projected ice impacts. Changing ice conditions that may prematurely degrade bendway weirs should be monitored. |

# 5. Assessment of Existing Resources and Environmental Consequences of the Tentatively Selected Plan*

The affected environment is the area and resources that might be affected by the Tentatively Selected Plan (TSP). The affected environment includes the project footprint (specific area covered by proposed features as well as staging and access), and project area (area for effects that varies by resource in the vicinity of the project). This section also serves to describe the existing and future “without project” conditions. The sections below document the No Action Alternative and Alternatives 1 - 4.

To ensure species specific restrictions are met, the project would be completed in two phases, tree removal during the winter (November 1 – March 31) followed by project construction sometime between June 15 and October 31. Short-term effects include those impacts that

would occur during implementation of the project, as well as transient ecological effects that can be expected to occur during the first one to three years. Long-term effects might be expected to persist for up to ten years and beyond. For purposes of this analysis, degree (or severity of impact) definitions (*i.e.,* negligible, minor, moderate, and major) have been developed to assess the magnitude of effects for all of the affected resource categories resulting from implementing of any of considered action alternatives and are defined as the following:

- ***Negligible*****:** A resource was unaffected, or the effects were not appreciable; changes were not of any measurable or perceptible consequence.
- ***Minor*****:** Effects on a resource were detectable, although the effects were localized, small, and of little consequence to the sustainability of the resource and were determined to be less than significant.
- ***Moderate*****:** Effects on a resource were readily detectable, long-term, localized, and measurable and were determined to be significant.
- ***Major*****:** Effects on a resource were obvious, long-term, and had substantial consequences on a regional scale and were determined to be significant.

Although project specific OMRR&R activities have not been developed in detail, common causes of stream bank protection disrepair include the formation of scour holes, riprap instability caused by excessive stream velocities, ice, erosion or sloughing and surface erosion. In each of these situations, additional riprap would need to be placed in a manner consistent with design plans and specifications on an as needed basis. Rock materials used for repair would meet the original project requirements. The placement of additional riprap would result in similar or lesser environmental effects to those discussed below. Additionally, herbicide applications may be necessary to remove/control woody and herbaceous vegetation.

Table 12 provides a summary of the affected environment for the No Action Alternative and TSP.

## 5.1 Socioeconomic

### 5.1.1 Noise

Noise levels in and around the vicinity of the project area are commensurate with that of other small towns in western Minnesota.

**Impacts of the No-Action Alternative** – No change in noise levels would be expected with the No Action alternative.

**Impacts of All Action Alternatives** – Construction of the any action alternative, including the Tentatively Selected Plan, would generate a temporary increase in noise levels associated with heavy equipment.

Excavators needed to cut back the bank, truck hauling construction materials and equipment in and out of the site, and the placement of the riprap will all create noise during the construction timeframe (3 to 6 months). Work is expected to occur during daylight hours only. There are no residences within 0.5 miles of the project area.

Noise associated with construction of the project would lead to temporary displacement of some wildlife species. Nesting of birds may also be discouraged within the project area. However, birds and other wildlife species are expected to return to the area following construction. No long-term impacts would be expected to occur once construction is complete.

### 5.1.2 Aesthetics

The project area consists of a former agricultural field that was converted to native vegetation in 2015 and floodplain forest along a bend of the Minnesota River.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on aesthetics in the area.

**Impacts of All Action Alternatives –** Alternatives 1 - 4 would have a long-term but localized effect on the project area by replacing a natural streambank with riprap. In Alternative 1, only in Reach 3 would riprap replace natural streambank. The project area is on a relatively remote stretch of the Minnesota River and riprap would not be visible outside of the immediate area. The bank In Reaches 1 and 2 of Alternative 1 would continue to erode until a stable slope is achieved naturally. These reaches would become vegetated over time, either by planting or through natural recruitment. Alternative 1 would have a natural look compared to the other alternatives and would blend in with the local viewshed.

### 5.1.3 Recreational Opportunities

The project area is used by members of the LSIC for hunting and fishing.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on recreation.

**Impacts of All Action Alternatives –** Fishing and hunting activities within and immediately adjacent to the project area would be temporarily impacted during construction due to noise from construction equipment and limited or no access during construction; however, no long-term negative effects are anticipated. Stairs constructed in Reach 3 would be beneficial as they would provide access to the bedrock outcropping which is an important fishing area for the tribe. The addition of bendway weirs in Alternatives 1 and 3 would support higher population densities of large fish which would be an added benefit to the area.

### 5.1.4 Transportation

Minnesota Highway 19 and U.S. Highway 71 are the closest major highways to the project area. Minor roads in the area include County Road 2, Reservation Highway 3 and an unnamed gravel road.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on transportation.

**Impacts of All Action Alternatives–** Alternatives 1 – 4 would have a temporary and minor effect on transportation into and out of the project area during construction which is expected to last 3 to 6 months. No road closures are anticipated and traffic in the area would return to normal after construction is completed.

### 5.1.5 Environmental Justice

Environmental Justice is institutionally significant because of Executive Order 12898 of 1994 (E.O. 12898) and Department of Defense's Strategy on Environmental Justice of 1995, which directs federal agencies to identify and address any disproportionately high adverse human health or environmental effects of federal actions to minority and/or low-income populations, as well as E.O. 14008.

Since the analysis considers disproportionate impacts, two areas must be defined to facilitate comparison between the area actually affected and a larger regional area that serves as a basis

for comparison and includes the area actually affected. The larger regional area is defined as the smallest political unit that includes the affected area and is called the community of comparison. For purposes of this analysis, the affected area is the census block (271277501002) that includes the project area, and Redwood County is the community of comparison. A minority population, for the purposes of this environmental justice analysis, is identified when the minority population of the potentially affected area is greater than 50% or the minority population is meaningfully greater than the general population or other appropriate unit of geographic analysis. Additionally, the CEQ identifies “low-income” using Census data for “individuals living below the poverty level.” The USEPA EJScreen mapping and screening tool was used to obtain minority population and low-income population data. Within the census block, people of color account for 59 percent and low-income populations account for 30 percent of the population compared to 13 and 30 percent respectively for Redwood County, Minnesota (U.S. Environmental Protection Agency 2022). Based on the above, the affected area includes a minority population.

The project would not have any adverse impacts related to environmental justice. The only adverse impacts identified in other resource categories are minor, and the action would not have disproportionally high or adverse impact any minority or low-income populations. The project would have a beneficial effect to the LSIC by providing access (stairs in Reach 3) to an important fishing area. The LSIC is the non-federal sponsor for the project. The proposed project is in response to a problem identified by the LSIC, and the LSIC has been engaged in the plan development. There are no concerns with environmental justice for the No Action Alternative or any of the action alternatives. Meaningful involvement by the LSIC is discussed in Section 6.3.

## 5.2 Natural Resources

### 5.2.1 Air

The U.S. Environmental Protection Agency is required by the Clean Air Act to establish air quality standards that primarily protect human health. These National Ambient Air Quality Standards (NAAQS) regulate six major air contaminants across the U.S. When an area meets criteria for each of the six contaminants, it is called an “attainment area” for the contaminant; those areas that do not meet the criteria are called “nonattainment areas.” Redwood County is classified as an attainment area for each of the six contaminants and is therefore not a region of impaired ambient air quality (U.S. Environmental Protection Agency, 2022). This designation means that the project area has relatively few air pollution sources of concern.

**Impacts of the No-Action Alternative –** The No Action Alternative would have no impacts to air quality.

**Impacts of All Action Alternatives –** The operation of heavy equipment (backhoes, excavators, dump trucks) during construction would temporarily increase vehicle emissions and slightly degrade air quality in the immediate vicinity of the project area. However, impacts would be short-term and negligible as the construction timeframe is only 3 to 6 months.

### 5.2.2 Aquatic Habitat

The modern Minnesota River originates in Big Stone Lake on the Minnesota–South Dakota border and flows 335 miles south and east to join the Mississippi River in Minneapolis/St. Paul, Minnesota. The basin elevation in the Minnesota River’s headwaters at Big Stone Lake is approximately 964 feet (294 meters) above sea level and the river falls to elevation 690 feet (210 meters) above sea level near its confluence with the Mississippi River near St. Paul,

Minnesota. The average gradient of the river is 0.8 feet per mile which is very low and similar to the Illinois River, another large, glacial river. The river drains 16,770 square miles (10,732,800 acres), of which 14,840 miles are in Minnesota (approximately 20 percent of the state), 1,610 miles are in South Dakota, and the remainder are in North Dakota and Iowa. The ordinary high-water mark (OHWM) through the project area was determined to be the top of bank.

**Impacts of the No-Action Alternative** – The No-Action Alternative would have a minor effect on the Minnesota River. Within the project area, continued erosion of the streambank due to increased flows would contribute to turbid water; however, erosion outside the project area would also continue to cause turbidity in the river.

**Impacts of All Action Alternatives**– All alternatives would result in the stabilization of approximately 1500 linear feet of riverbank. Table 10 provides the acreage of permanent fill material discharged below the ordinary high-water mark (top of bank) of the Minnesota River for each of the alternatives which ranged from 1.06 to 1.8 acres. Regardless of alterative, there would be a temporary increase in turbidity and suspended solids which would locally suppress phytoplankton productivity during construction. However, this effect would be minor and short-term as plankton populations would quickly recover after construction. Impacts would also be limited by the inclusion of BMPs. BMPs would include sediment fencing and floating silt curtain to prevent movement of soil and sediment as well as managing construction materials and debris such that no debris, garbage or fuel enters the water. Visual monitoring for excessive turbidity, floating debris, trash, or oil sheen would be continuously performed to ensure water quality is being protected. Alternative 1 would have long-term temporary water quality impacts as the streambank would continue to erode and contribute to turbid water until the bank stabilizes.

Alternatives 1 and 3 include bendway weirs which would create both slack water aquatic habitat within the eddies downstream of weirs and low-flow habitat at scour holes that form at the tips of the structures. The habitat diversity created by the bendway weirs would be beneficial to fish species. Effects to fish and other aquatic organisms are discussed in later sections.

**Table 10. Aquatic resource impacts for each alternative**

| Alternative | Impact Duration | Wetland Impacts (acres) | River Impacts (acres) |
|---|---|---|---|
| No Action | Permanent | 0 | 0 |
| 1 | Permanent | 0 | 1 longitudinal stone toe, bank shaping, placement of riprap, bendway weirs, stairs |
| 2 | Permanent | 0 | 1.06 placement of riprap, stairs |
| 3 | Permanent | 0 | 1.22 placement of riprap, bendway weirs, stairs |
| 4 | Permanent | 0.7 bank reshaping | 1.8 bank shaping, placement of riprap, stairs |
| 1, 2, 3, 4 | Temporary | 1.0 staging area<br>1.1 access road | 0 |

### 5.2.3 Wetlands

The National Wetland Inventory (NWI) shows emergent and a small portion of forested wetland throughout the project area (Figure 5). Approximately 5 acres of the CRP area was initially planted with a native seed mixture, while the remainder of the CRP acreage was unplanted due to flooding. Due to flood prone nature of the area, the vegetation has been allowed to regenerate naturally. Dominant species include smartweeds, water hemp and cottonwood seedlings.

**Impacts of the No-Action Alternative –** The No-Action Alternative would allow for the continued erosion of the streambank which would result in the loss of wetlands at the top of the bank. The No-Action Alternative would allow the erosion to continue, and approximately 2 acres of existing wetland would be lost over the 50-year planning horizon.

**Impacts of All Action Alternatives –** As shown in Table 10, only Alternative 4 would result in permanent wetland impacts of approximately 0.7 acres (bank cutback). All alternatives would temporarily impact 2.1 acres (staging and access) of wetland. The portion of the access road that passes through forested wetland utilizes an existing road and would therefore not result in wetland impacts. The portion of the access road that passes through emergent wetland would impact 1.1 acres and would be removed following construction. Approximately one acre of emergent wetland would also be temporarily impacted for staging of construction equipment. The staging area would be removed, and the area restored following construction. Due to the entire project area being identified as wetland, temporary impacts are unavoidable. To minimize temporary wetland impacts, areas would be restored to pre-construction conditions (contours, elevation, and vegetation) upon completion of the project. Wetlands would be temporarily impacted for several months during one construction season so the overall temporal loss is minimal. Per the NEPA definition of mitigation (40 CFR § 1508.1(s)), rectifying the impact by repairing, rehabilitating, or restoring the affected environment is a form of mitigation.

The emergent wetland is currently enrolled in CRP and the LSIC has coordinated the project with the Natural Resource Conservation Service. Best management practices would be used to minimize effects to wetlands immediately outside the project area by clearly marking the construction limits to avoid unnecessary plant loss or ground disturbance. Permanent loss of wetland functions and services would be mitigated. Wetland mitigation is discussed in Section 6.4.

### 5.2.4 Floodplain

The project area falls within a Regulatory Floodway as identified by the Federal Emergency Management Agency's (FEMA) Flood Map Service Center. Due to the presence of the Regulatory Floodway the Tentatively Selected Plan is subject to a "no-rise criteria" and must cause no more than a 0.005-foot increase in water surface elevation during the 100-year flood event. The extents of this Regulatory Floodway are shown in Figure 4.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on the Regulatory Floodway.

**Impacts of All Action Alternatives –** Alternatives 1 – 4 all meet FEMA's no-rise criteria and would have minimal impact on the water surface elevation, with stage increases all less than 0.00 feet, within the Regulatory Floodway when compared to the Effective FEMA Regulatory RAS model.

### 5.2.5 Water Quality

The project area is located along the Minnesota River. The Minnesota River between the Granite Falls Dam and the Yellow Medicine River is listed as an impaired water in the draft 2020 list of impaired waters in Minnesota. Pollutants and stressors include mercury and polychlorinated biphenyl compounds (PCB) in fish tissue, nutrients and turbidity (MPCA 2022).

**Impacts of the No-Action Alternative –** The No Action Alternative would result in continued erosion of the streambank due to increased flows which would contribute to turbid water; however, erosion outside the project area would also continue to cause turbidity in the river. During flood events, water quality may be negatively affected by increases of suspended sediments, nutrients and pollutants from rural runoff. Water quality would eventually recover once flood waters recede.

**Impacts of All Action Alternatives** – Alternative 1 would have long-term temporary water quality impacts as the streambank would continue to erode and contribute to turbid water until the bank stabilizes. Alternatives 1 - 4 would see some temporary water quality impacts due to the construction of the project (staging and construction access, placement of riprap). Some possible temporary impacts include increased turbidity from runoff over newly disturbed land cover and increased nutrient concentrations due to the loss of nutrient uptake by riparian and in-channel flora. Due to the placement of riprap, long-term minor impacts to water quality are anticipated due to increased water temperature from loss of riparian shading, increased turbidity from runoff over newly disturbed land cover and increased nutrient concentrations due to the loss of nutrient uptake by riparian flora (Fischenich 2003). Impacts to water quality will be minimized with the use of BMPs. These would include sediment fencing and floating silt to prevent movement of soil and sediment as well as managing construction materials and debris such that no debris, garbage or fuel enters the water. Visual monitoring for excessive turbidity, floating debris, trash, or oil sheen would be continuously performed to ensure water quality is being protected. If grubbing occurs prior to project construction, soils would be stabilized to prevent erosion. Stabilization measures that could be employed include the placement of mulch or erosion control blankets. Under flood conditions, impacts similar to the No-Action Alternative are expected.

### 5.2.6 Geology and Soils

Minnesota bedrock geology is among the oldest recorded on the planet. Much of the western Minnesota River Basin overlies undivided marine sediment of shale and sandstone dated to the Cretaceous Age (70–150 million years ago [mya]). Traveling downstream and southeastward the river valley abruptly turns to the northeast when it encounters resistant limestone of Ordovician Age (440–500 mya).

The Lower Minnesota Valley is older, with undivided sandstones dated to the Cambium Age (500–545 mya). The oldest bedrock features are Late Archean granite (3–2.5 billion years ago [bya]) and Middle Archean gneiss (3.6–3 bya) forming bluffs along the main stem. This pattern of bedrock helps explain the outcomes of repeated glaciations. Ancient sedimentary rocks were pushed, crushed, ground, and mixed by glaciers many times, and then they were redeposited as glacial till plains. Glacial outwash flows forming the river valley were diverted by resistant bedrock. The most recent glaciation was the Wisconsin Age 75,000–9,000 years ago, which created the template for the modern landscape.

The soils in this region are dominantly silty glacial sediments, clay and silt, and sand and gravel. The major soil resource concerns are water erosion, wetness, and maintenance of the content

of organic matter and productivity of the soils. Soils within the project area are identified as Du Page loam which is considered prime farmland if protected from flooding or not frequently flooded during the growing season.

**Impacts of the No-Action Alternative** – The No-Action Alternative would have no effect on soils and geology within the project area; however, soils would continue to erode during flood events.

**Impacts of All Action Alternatives** – With the exception of Alternative 1, stabilizing the riverbank would replace native soils/sediments with riprap. Given the current condition of the riverbank, and the small project area, Alternatives 2 – 4 would have a minor effect on geology and soils in the project area beyond existing conditions whereas Alternative 1 would not replace native soils with riprap. The proposed project would not convert farmland to nonagricultural uses and would therefore be in compliance with the Farmland Policy Protection Act.

#### *5.2.6.1 Hazardous, Toxic and Radioactive Waste (HTRW)*

A Phase I HTRW analysis was conducted in June 2021, in accordance with ER-1165-2-132, Water Resource Policies and Authorities HTRW Guidance for Civil Works Projects (see Appendix H, *Hazardous, Toxic, and Radioactive Waste*, for the full report). Based on the desktop search and on-site inspection, this assessment revealed that there were no recognized environmental conditions. Therefore, USACE does not recommend a Phase II assessment.

There are no known HTRW sites at the study area. There are no HTRW concerns with either the No-Action Alternative or Alternatives 1 - 4.

### 5.2.7 Biological Resources

#### *5.2.7.1 Fish and Wildlife*

Wildlife within the project area may include birds, squirrels, rabbits, birds, deer and other species commonly found in floodplain areas. Over 63 species of fish have been found in the Minnesota River, including channel catfish, flathead catfish, northern pike, walleye, and smallmouth bass.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have a minor effect on wildlife due to continued erosion in the project area which would result in a loss of habitat. A minor effect to the fish population is anticipated as erosion would result in suspended sediment settling downstream, potentially on course substrate which could impact fish spawning. When the Minnesota River overtops its bank in this area, wildlife would be temporarily displaced but would return once flood waters receded.

**Impacts of All Action Alternatives** –Alternatives 1 – 4 would result in fish and wildlife species avoiding the area during construction. Birds may be discouraged from nesting within and adjacent to the project area due to construction noise. Following construction, fish, birds and other wildlife would return to the area. To further minimize effects to fish species, no instream work would occur during spawning season (March 1 – June 15). There would be a minor, temporary effect to immobile biota, such as invertebrates as they would be lost from areas where riprap was placed but would recolonize the area following construction. Fischenich (2003) found that riprap could have a long-term beneficial effect on benthic macroinvertebrates as well as some fish species. The bendway weirs would increase habitat diversity which would be beneficial to fish species such as channel and flathead catfish. The addition of rock would add interstitial spaces, good for benthic macroinvertebrates. However, riprap can act as a barrier between aquatic and terrestrial habitats thereby reducing biotic movements.

#### *5.2.7.2 Vegetation*

No formal vegetation survey of the area was conducted. In general, the dominant species include smartweed species, water hemp and cottonwood seedlings.

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on vegetation.

**Impacts of All Action Alternatives –** Alternatives 1 – 4 would all result in tree clearing along the streambank. Alternative 1 would result in 0.42 acre, Alternatives 2 and 3 would result in 0.2 acre and Alternative 4 would result in 1.0 acre of tree removal. Approximately 2.1 acres of emergent wetland would also be disturbed for temporary construction access and staging. Disturbed wetland areas would be revegetated with Minnesota state seed mix 34-261 for riparian areas. A cover crop of oats would be used if construction is completed later in the year. The addition of live stakes to the riprapped bank will be explored during plans and specifications. Vegetation would be incorporated at the top of the bank through the first couple feet of the riprap as possible. Details regarding this planting plan will be evaluated further during plans and specs with input from the tribe. Maintenance activities would include control and removal of herbaceous and woody vegetation that may establish in the riprap, with the exception of willow.

#### *5.2.7.3 Federally Threatened and Endangered Species*

The U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) website was consulted on January 4, 2023 to identify potential presence of federally listed threatened and endangered species within the action area. The northern long-eared bat (*Myotis septentrionalis*, NLEB, endangered), tricolored bat (*Perimyotis subflavus,* proposed endangered), monarch butterfly (*Danaus plexippus,* candidate) and prairie bush-clover (*Lespedeza leptostachya,* threatened) were listed for the action area.

NLEB is a medium-sized bat that hibernates in caves and mines in the winter and in the summer roosts singly or in colonies under the bark or in cracks and crevices of trees. NLEB is relatively widespread, and USFWS lists NLEB as a threatened species because a fungal pathogen causing white-nose syndrome is sharply reducing populations.

The tricolored bat is one of the smallest bats native to North America. During the winter, tricolored bats are found in caves and mines. During the spring, summer and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves. Female tricolored bats exhibit high site fidelity, returning year after year to the same summer roosting locations. Female tricolored bats form maternity colonies and switch roost trees regularly whereas, males roost singly.

Monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. The bright coloring of a monarch serves as a warning to predators that eating them can be toxic. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant, and larvae emerge after two to five days. Larvae develop over a period of 9 to 18 days, feeding on milkweed and sequestering toxic chemicals as a defense against predators. The larva then pupates into a chrysalis before emerging 6 to 14 days later as an adult butterfly. There are multiple generations of monarchs produced during the breeding season, with most adult butterflies living approximately two to five weeks. Prairie bush-clover is found in native prairies with well-drained soils. Prairie with moderately damp to dry soils favored by prairie bush-clover was prime cropland in the early 19$^{th}$ century which resulted in the loss of tallgrass prairie habitat. Today, only scattered remnants of prairie remain in

Minnesota and prairie bush-clover populations occur in sites that escaped the plow. The project areas does not contain prairie habitat and the prairie bush clover is not found on site or would be anticipated to occur on site.

**Impacts of the No-Action Alternative –** The No Action alternative would have no effect on the NLEB, tricolored bat, prairie bush clover or monarch butterfly.

**Impacts of All Action Alternatives –** USACE determined that the Alternatives 1 - 4 may affect but are not likely to adversely affect NLEB and tricolored bat. Informal consultation was initiated on January 12, 2023 and USFWS concurred on January 26, 2023. Consultation documentation can be found in Appendix A – Correspondence and Coordination. To avoid potential impacts to listed bat species, no tree clearing will occur between March 31 – November 1. The project would not impact any known hibernacula or roost trees within 0.25 miles of the project area. The project area does not contain prairie habitat; therefore, the project would have no effect on the prairie bush-clover. The project area also does not include milkweed species which are essential for monarch survival; therefore, the project would have no effect on the monarch. The project would have a minor but permanent effect on the NLEB and tricolored bat. Woody vegetation maintenance would have no effect on listed bat species as this vegetation would be removed prior to it reaching a diameter at breast height of three inches. Bat species are unlikely to use small saplings as habitat, particularly when mature trees are present nearby.

#### *5.2.7.4 Minnesota State listed Species*

Species that are listed by the State of Minnesota as endangered, threatened or of special concern have been historically documented in the vicinity of the project area (Table 11). A review of the Minnesota Department of Natural Resources (MNDNR) Natural Heritage Information System Rare Features Database was conducted. Natural Heritage Database information was obtained from the MNDNR Division of Ecological and Water Resources through an inter-agency cooperative licensing agreement and includes the most recent February 2021 update.

**Table 11. Minnesota state listed species**

| | Common Name | Scientific Name | Status |
|---|---|---|---|
| **Fish** | American eel | *Anguilla rostrata* | Species of Concern |
| | Mudpuppy | *Necturus maculosus* | Species of Concern |
| | Blue sucker | *Cycleptus elongatus* | Species of Concern |
| **Mussel** | Wartyback | *Quadrula nodulata* | Threatened |
| **Plants** | A Species of Lichen | *Buellia nigra* | Species of Concern |
| | prairie bush clover | *Lespedeza leptostachya* | Threatened |
| | Wolf's Spikerush | *Eleocharis wolfii* | Endangered |
| **Insects** | Regal Fritillary | *Speyeria idalia* | Species of Concern |
| | Iowa skipper | *Atrytone arogos iowa* | Species of Concern |

**Impacts of the No-Action Alternative –** The No-Action Alternative would have no effect on state listed mussel, plant or insect species. A minor effect to listed fish species is anticipated as erosion would result in suspended sediment settling downstream, potentially on course substrate which could impact fish spawning.

**Impacts of All Action Alternatives –** Alternatives 1 – 4 would have no effect on state listed mussel, plant and insect species. The project would have a minor, temporary effect on state listed fish species as they would avoid the area during construction. To reduce impacts to the fish population, no instream work would be completed during fish spawning season (March 1 – June 15).

In 2012, the Minnesota Department of Natural Resources completed a mussel survey along a 7-mile reach of the Minnesota River on and near the Lower Sioux Indian Community in order to obtain a baseline understanding of current mussel resources in the area. The state threatened wartyback was found approximately 0.5 miles downstream of the project area. No wartyback were found within the project area. Given no record of wartyback within the project area and the eroding and inhospitable habitat conditions for mussels within the site it is unlikely state listed species would be present or impacted by the project. Stabilization of the bank could result in improved aquatic habitat conditions and mussels could colonize the site post-construction.

The lichen species of concern's preferred substrate is non-calcareous rock in sunny exposed areas, sometimes near the edge of hardwood forests. None were observed within the project area. Wolf's spikerush are associated with level outcrops of bedrock within a prairies or savannas which do not occur within the project area. Prairie bush clover is associated with native prairies with well-drained soils which does not occur in the project area.

The regal fritillary is strongly associated with both native upland and wet prairie habitat. However, larval development may be restricted to upland prairie which are not found in the project area. Adults are rarely encountered away from native prairie remnants. Although wet prairie habitat is within the project area, there is no upland prairie present to allow for reproduction. It is unlikely regal fritillary would be found within the project area. The Iowa skipper is restricted to native prairie, particularly those that are mesic or dry-mesic and is unlikely to be found in the project area.

## 5.3 Cultural Resources

The Area of Potential Effect (APE) for National Historic Preservation Act (NHPA) purposes includes the immediate shoreline within the project area, where earth moving activities may potentially occur, such as access roads and lay-down yards for equipment storage and sediment disposal, and where the project features may be visible. Figure 14 depicts the project's APE, which this study is also using for assessment of cultural resource effects for NEPA purposes.


**Figure 14. Lower Sioux TPP APE**

Archaeological investigations for the streambank protection project were completed on 21-22 June 2021, by Dr. Bradley Perkl, Corps Archaeologist under a Cultural Resources Permit issued by the Tribal Historic Preservation Office (Appendix A). Archaeological investigations included a pedestrian surface survey, an inspection of the cut bank, and placement of shovel tests. Figure 15 provides a sketch map of the investigations in the study area.

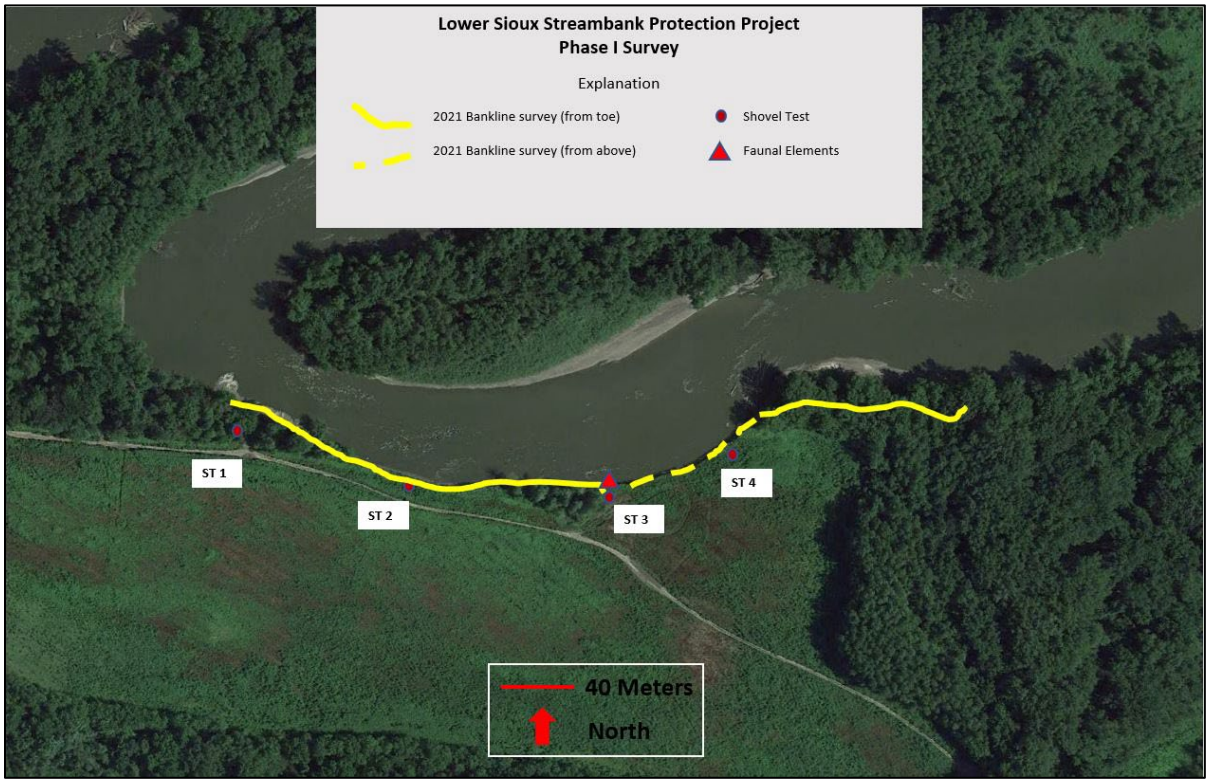


**Figure 15. Lower Sioux Phase I Survey Sketch Map**

*Cut Bank Inspection:* The cut bank was inspected from the bedrock outcrop on the upper portion to a sandbar on the lower portion of the project area. Water levels were low during the time of survey and approximately 75 percent (ca. 320 m/650 ft) of the bank was examined from the toe of the bank. The remaining areas (ca. 111 m/364 ft) were scrutinized from above. Surface visibility varied from approximately 25-100 percent.

In addition to debris, (e.g., plastic fragments, bottles), several caudal elements (atlas, axis, vertebrae) from a large mammal (bison vs. elk, cow, horse) were observed along the cut bank, approximately four feet below the ground surface and approximately 225 m (739 ft) downstream of the bedrock exposure. No cultural materials or other faunal remains were observed. The faunal remains appear to be a natural deposit, perhaps washed in.

*Archaeological Shovel Testing:* A total of four shovel tests (ST) were completed along the bank (Figure 14). ST 3 was placed just above where the faunal elements were located. They averaged approximately 40 cm in diameter. Removed matrix was screened through ¼-inch hardware cloth. All the STs exhibited similar soil profiles, with an A1 (post-settlement alluvium) horizon of very dark gray 10YR3/1 silt loam from 0-40 centimeters below surface (cmbs) over an A2 horizon of very dark grayish brown 10YR3/2 silt loam to approximately 60 cmbs. A one-inch soil probe was inserted at the base of each ST, revealing an A3 horizon of dark brown 10YR3/3 silt loam to approximately 90 cmbs. No buried soil horizons were observed along the cutbank nor are any mapped in this area. These profiles exhibit natural soil horizons and are within the range of Du Page soil characteristics mapped in the area (USDA 2021). Also, the profiles loosely conform to the geological borings obtained for the project, with a black silty clay topsoil extending to .08 ft (24 cmbs), over a brown clay silt too two ft (60 cmbs), over a dark brown silty

clay to nine ft (274 cmbs). No buried soils were revealed in the geological borings. No cultural materials were encountered in the STs.

**Impacts of the No Action Alternative –** The No Action Alternative is expected to result in continued erosion and loss of approximately 2 acres of land adjacent to the river over the 50-year planning horizon. While no eligible properties are anticipated to be affected, culturally significant land would continue to be lost.

**Impacts of the All Action Alternatives –** Alternatives 1 – 4 would have no effect on historic properties. The project area has experienced erosion and has been cultivated in the past. No cultural resources were identified during the June 2021 survey. In addition, portions of the project area are low and seasonally inundated. However, the project area does contain a variety of plant and animal resources important to the community. The Tribe has requested to be on site during construction to address the potential for unanticipated discovery. The no effect on historic properties determination was coordinated with the THPO and the Corps will continue to consult with the THPO pursuant to section 106 of the NHPA.

## 5.4 Mitigation

No compensatory mitigation is required for Alternative 3. Although 0.91 acre of riprap and bedding would be placed below the OHWM of the Minnesota River, this would not result in a permanent loss of waters; therefore, no mitigation would be provided. Temporary wetland impacts would be restored following construction and therefore no mitigation bank credits would be purchased to offset these impacts.

## 5.5 Cumulative Effects

The Council on Environmental Quality (CEQ) regulations (40 CFR §§ 1500–1508) implementing the procedural provisions of NEPA, as amended (42 USC § 4321 et seq.) define cumulative impact as:

"… the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR § 1508.7).

Cumulative effects analysis recognizes that the most serious environmental impacts may result from the combination of individually minor effects of multiple actions over time, rather than the direct or indirect effects of a particular action (Council on Environmental Quality, 1997).

Analyzing cumulative effects requires identifying the environmentally relevant area and the past, present and future actions in that area that would contribute incrementally to the overall effect. The environmentally relevant area is determined by both location and time. Future actions are those that are reasonably likely to occur. A future project is only considered in this analysis if there is sufficient information on the project to understand what its incremental contribution to cumulative effects might be.

### 5.5.1 Past Projects

Details on past projects are provided in Section 1.6 of this report.

### 5.5.2 Present and Future Projects

Details on past projects are provided in Section 1.6 of this report.

### 5.5.3 Cumulative Effects Assessment

Cumulative impacts on the environment are the result of the incremental impacts of past actions, the selected plan and reasonably foreseeable future actions. Changes to the environment were made when 37 acres of agricultural land was enrolled in CRP and allowed to naturally revegetate and the Tribe has planted black walnut trees and shrubs. The Tribe conducts treatment and removal of invasive plants and noxious weeds present throughout the area on an annual basis. The selected plan is intended to reduce bank erosion related to high flows and velocity of the Minnesota River which would protect Tribal Trust lands and allow for the continuation and preservation of the Community's cultural practices and lands. The CRP enrollment has had a beneficial long-term effect on the natural resources in the area by allowing improved wetland habitat. Past and current projects would not have a negative impact on biodiversity in the area or permanently fragment the habitat beyond existing conditions. Overall, the selected plan would cause no significant adverse cumulative impacts on the aquatic or terrestrial ecosystem. Effects of the construction would be minimal and mostly positive in maintaining and preserving Tribal Trust lands.

**Table 12. Environmental Assessment Matrix.**

| No Action Alternative | | | | | | | Symbol: X = Long-Term Effects ST = Short Term Effects | Tentatively Selected Plan | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BENEFICIAL | | | | ADVERSE | | | | BENEFICIAL | | | | ADVERSE | | |
| SIGNIFICANT | SUBSTANTIAL | MINOR | NO EFFECT | MINOR | SUBSTANTIAL | SIGNIFICANT | PARAMETER X = Long Term Effects ST = Short Term Effects | SIGNIFICANT | SUBSTANTIAL | MINOR | NO EFFECT | MINOR | SUBSTANTIAL | SIGNIFICANT |
| | | | | | | | **A. Social Effects** | | | | | | | |
| | | | X | | | | Noise Levels | | | | | ST | | |
| | | | X | | | | Aesthetic Values | | | | | X | | |
| | | | X | | | | Recreational Opportunities | | | | | ST | | |
| | | | X | | | | Transportation | | | | | ST | | |
| | | | X | | | | Public Health and Safety | | | | X | | | |
| | | | X | | | | Community Cohesion (Sense of Unity) | | | X | | | | |
| | | | X | | | | Community Growth and Development | | | | X | | | |
| | | | X | | | | Business and Home Relocations | | | | X | | | |
| | | | | X | | | Existing/Potential Land Use | | | X | | | | |
| | | | X | | | | Controversy | | | | X | | | |
| | | | | | | | **B. Economic Effects** | | | | | | | |
| | | | X | | | | Property Values | | | | X | | | |
| | | | X | | | | Tax Revenue | | | | X | | | |
| | | | X | | | | Public Facilities and Services | | | | X | | | |
| | | | X | | | | Regional Growth | | | | X | | | |
| | | | X | | | | Employment | | | | X | | | |
| | | | X | | | | Business Activity | | | | X | | | |
| | | | X | | | | Farmland/Food Supply | | | | X | | | |
| | | | X | | | | Commercial Navigation | | | | X | | | |
| | | | | X | | | Flooding Effects | | | | | X | | |
| | | | X | | | | Energy Needs and Resources | | | | X | | | |
| | | | | | | | **C. Natural Resource Effects** | | | | | | | |
| | | | X | | | | Air Quality | | | | | ST | | |
| | | | X | | | | Terrestrial Habitat | | | | X | | | |
| | | | X | | | | Wetlands | | | | | ST | | |
| | | | X | | | | Aquatic Habitat | | | | | X | | |
| | | | X | | | | Habitat Diversity and Interspersion | | | | X | | | |
| | | | X | | | | Biological Productivity | | | | X | | | |
| | | | X | | | | Surface Water Quality | | | | | ST | | |
| | | | X | | | | Water Supply | | | | X | | | |
| | | | X | | | | Groundwater | | | | X | | | |
| | | | | X | | | Soils | | | ST | | | | |
| | | | X | | | | Threatened and Endangered Species | | | | | X | | |
| | | | | | | | **D. Cultural Resource Effects** | | | | | | | |
| | | | X | | | | Historic Architectural Values | | | | X | | | |
| | | | X | | | | Precontact & Historic Archeological Values | | | | X | | | |

# 6. Summary of Environmental Compliance and Public Involvement

This document is a feasibility planning study with integrated environmental assessment. A highlight of compliance with the major environmental laws and regulations follows as well as agency, tribal, and public coordination.

## 6.1 Environmental Laws and Regulations

This document is a feasibility planning study with integrated environmental assessment. A highlight of compliance with the major environmental laws and regulations follows as well as agency, tribal, and public coordination (Table 14).

**Bald and Golden Eagle Protection Act:** The Bald and Golden Eagle Protection Act prohibits anyone from taking, possessing or transporting an eagle, or the parts, nests or eggs of such birds without prior authorization. Disturbing an eagle to a degree that causes, or is likely to cause injury to an eagle, decrease productivity or cause nest abandonment are considered forms of take. Activities that directly or indirectly lead to take are prohibited without a permit. Currently, there are no eagle nests in the vicinity of the project area.

**Clean Water Act:** The Clean Water Act (CWA; 33 USC §1251 *et seq.*) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.

Section 404 of the CWA regulates the discharge of dredged or fill material into waters of the United States and is administered by USACE. A Section 404(b)(1) Evaluation has been prepared for the project and is available in Appendix G – Clean Water Act Compliance.

Section 401 water quality certification is required for actions that may result in a discharge of a pollutant into waters of the United States to ensure that the discharge complies with applicable water quality standards. The certifying authority for the project would be the U.S. Environmental Protection Agency (USEPA). The Corps submitted a pre-filing meeting request to USEPA on March 17, 2021. USEPA did not respond to schedule a meeting. The Corps will apply for a 401 WQC during plans and specifications. A copy of the pre-filing meeting request can be found in Appendix A – Correspondence and Coordination. The Corps will coordinate with the 401 certifying authorities during the public comment period and seek a letter of confirmation (Corps St. Paul District has requested this from EPA and this will be updated prior to final report approval).

**Endangered Species Act:** The Endangered Species Act (16 USC § 1531 et seq.) provides for the conservation of threatened and endangered plants and animals and the habitats in which they are found. There are four federally listed species that are believed or known to occur within the study area, (see Section 6.2.7.3). USCAE made a may affect, not likely to adversely affect determination for the northern long-eared bat (NLEB) and the tricolored bat. USACE initiated informal consultation on January 12, 2023, and USFWS concurred on January 26, 2023. USACE made a no effect determination for the prairie bush-clover and monarch. A copy of the consultation letter can be found in Appendix A – Correspondence and Coordination.

**Fish and Wildlife Coordination Act:** The Fish and Wildlife Coordination Act (FWCA; 16 USC 661–667e) authorizes the Secretaries of Agriculture and Commerce to provide assistance to and cooperate with federal and state agencies to protect, rear, stock and increase the supply of game and fur-bearing animals, as well as to study the effects of domestic sewage, trade wastes and other polluting substances on wildlife. Compliance with the FWCA, project plans has been coordinated with the USFWS and MNDNR. A copy of the FWCA coordination email can be

found in Appendix A – Correspondence and Coordination. No agency responded with comments.

**National Environmental Policy Act (NEPA):** The National Environmental Policy Act (NEPA; 42 USC § 4321 et seq.) establishes the broad national framework for protecting our environment. NEPA's basic policy is to assure proper consideration to the environment prior to undertaking any major federal action. This document has integrated the content required of a NEPA environmental compliance document. A range of alternatives have been presented and the significance of the project's impacts have been evaluated. The document will be distributed to agencies, the public and other interested parties to gather any comments or concerns. If no significant unmitigable effects to the environment are found during the comment period or moving forward with the project design, a Finding of No Significant Impact (FONSI) will be signed by the St. Paul District commander.

**National Historic Preservation Act (NHPA):** As amended by Public Law 96-515 (94 Statute 2987), this act established national policy for historic preservation, authorized the Secretary of the Interior to expand and maintain a National Register of Historic Places, and created the Advisory Council on Historic Preservation. Section 106 specifies that federal agencies, before approval of any expenditure or before issuance of any license, must consider the effect of the action on any property included in or eligible for the National Register of Historic Places and must afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on this action. The proposed alternative is located within the reservation boundaries of the LSIC. As such, the LSIC THPO has a delegation from the National Park Service and assumed the majority of Section 106 review responsibilities for federal undertakings. As a result, no consultation with the Minnesota State Historic Preservation Office is required. The Corps is consulting with the THPO as required by the NHPA. The Corps has determined that the project would have no effect on historic properties. Consultation with the THPO was initiated on August 27, 2021. The THPO concurred with the determination on March 4, 2022. Since then the TSP has changed, although the determination of no effect persists. Additional consultation with the THPO occurred after the TSP change, to include verbal discussion and in a letter dated 8 February 2023. Copies of the consultation letters can be found in Appendix A – Correspondence and Coordination.

**Table 13. Compliance review with all applicable environmental regulations and guidelines**

| Environmental Requirement | Compliance[1] |
|---|---|
| | |
| ***Federal Statutes*** | |
| Bald and Golden Eagle Protection Act of 1940, as amended | FULL |
| Clean Air Act, as amended | FULL |
| Clean Water Act, as amended | PARTIAL |
| Coastal Zone Management Act, as amended | NA |
| Endangered Species Act of 1973, as amended | FULL |
| Federal Water Project Recreation Act, as amended | FULL |
| Fish and Wildlife Coordination Act, as amended | FULL |
| Land and Water Conservation Fund Act of 1965, as amended | FULL |
| Migratory Bird Treaty Act of 1918, as amended | FULL |
| National Environmental Policy Act of 1969, as amended | PARTIAL |
| National Historic Preservation Act of 1966, as amended | PARTIAL |
| National Wildlife Refuge Administration Act of 1966 | NA |
| Noise Pollution and Abatement Act of 1972 | FULL |
| Watershed Protection and Flood Prevention Act | FULL |
| Wild and Scenic Rivers Act of 1968, as amended | NA |
| Farmland Protection Policy Act of 1981 | FULL |
| | |
| ***Executive Orders, Memoranda*** | |
| Floodplain Management (E.O. 11988) | FULL |
| Safeguarding the Nation from the Impacts of Invasive Species (E.O. 13112) | FULL |
| Protection and Enhancement of Environmental Quality (E.O. 11514) | FULL |
| Protection and Enhancement of the Cultural Environment (E.O. 11593) | FULL |
| Protection of Wetlands (E.O. 11990) | FULL |
| Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 30 August 1976) | FULL |

[1] The compliance categories used in this table were assigned according to the following definitions:
a. Full - All requirements of the statute, E.O., or other policy and related regulations have been met for the current stage of planning.
b. Partial - Some requirements of the statute, E.O., or other policy and related regulations remain to be met for the current stage of planning.
c. Noncompliance (NC) - Violation of a requirement of the statute, E.O., or other policy and related regulations.
d. Not Applicable (N/A) - Statute, E.O., or other policy and related regulations not applicable for the current stage of planning.
[2] 401 water quality certification required.
[3] Full compliance to be achieved with the District Engineer's signing of the Finding of No Significant Impact.

## 6.2 Coordination, Public Views, and Comments

The proposed action has been coordinated with the BIA, USFWS, USEPA, MNDNR, and MPCA. No substantive concerns were raised during interagency coordination efforts (see Appendix A – Correspondence and Coordination).

A public notice of availability of the draft feasibility report with integrated environmental assessment will be published on the USACE website (www.mvp.usace.army.mil/Home/PublicNotices.aspx). A press release will be issued, and signage will be posted at the proposed project site describing the project and announcing the availability of the draft report. This section will be updated accordingly prior to the final report.

The 30-day public review period ended on DATE.

## 6.3 Tribal Consultation

As part of the NHPA and the USACE's tribal trust responsibility, USACE takes into consideration the relationship between Native American tribes and the federal government. All federally recognized tribes are sovereign governments and are responsible for their own governance and management. Sovereignty is the foundation of tribal governments, and their sovereign status gives them special recognition and treatment under federal law.

USACE has consulted with the LSIC THPO throughout the feasibility phase of the project. A project kickoff meeting was held on October 15th, 2020 with a representative for the LSIC and the USACE team.

A representative from the tribe was invited to attend the biweekly team meeting for the study. A representative from LSIC was closely involved at significant meetings throughout the feasibility phase of the study. A cultural resources permit was issued for the cultural survey (Appendix A). In a letter dated March 4, 2022, the LSIC THPO concurred with the "No Historic Properties Affected" determination. A consultation letter describing the revised TSP, APE, and determination of "No Effect on Historic Properties" was sent to the LSIC THPO on February 9, 2023 (see Appendix A for documentation). This section will be updated accordingly once response is received from the THPO and prior to the final report.

# 7. Recommendation

The Tentatively Selected Plan is Alternative 3, which consists of riprap built out into the river from the bank in Reaches 1, 2, and 3. This alternative would include seven bendway weirs in Reach 1 and Reach 2. This alternative will protect the bank from velocities up to the 24,000 cfs flow event.

The estimated Project first cost at the fiscal year 2024 price level is $2,544,000 and the project total cost is $2,644,000 (Project first cost escalated to the midpoint of construction). The federal share of the total project cost is estimated to be $2,485,400. The non-federal cost, after application of the Section 1156 waiver and the ability to pay adjustments, is estimated to be $58,600. Upon completion, the LSIC would be responsible for operation, maintenance, repair, replacement, and rehabilitation at an estimated annual cost of $2,000. Total average annual Project costs amount to $92,252. The total project cost is below the Federal program limit of $18,500,000 and the project will not require specific authorization by Congress.

The non-federal sponsor will, through signing of the PPA, agree to perform the required items of cooperation including the following:

- Contribute a minimum of 35 percent, up to 50 percent, of the construction costs, subject to a reduction of up to $665,000 and subject to further reduction after application of the ability to pay adjustment, as follows:
    - Provide all real property interests and relocations required for construction, operation, and maintenance of the project, and
    - Provide a minimum of 5 percent cash contribution and provide any in-kind contributions and remaining cash contribution needed to contribute 35 percent of construction costs, after consideration of the value of real property interests and relocations, subject to a reduction of $665,000 and a further reduction for ability to pay.
- Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might hinder operation and maintenance of the project or interfere with the project's proper function
- Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government
- Hold and save the Federal government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Federal government or its contractors.

I have weighed the accomplishments to be obtained from the Lower Sioux Indian Community Riverbank Stabilization Project against the cost and have considered the alternatives, impacts, and scope of the proposed Project. Therefore, I recommend that the Lower Sioux Indian Community Riverbank Stabilization Project for preservation of cultural and natural resources on the Minnesota River be approved for construction.

The recommendations contained herein reflect the information available at this time and current department policies governing formulation of individual projects under the Tribal Partnership Program. They do not reflect program and budgeting priorities inherent in the formulation of a

national Civil Works projects nor the perspective of higher review levels within the Executive Branch.

Eric Swenson
Colonel, Corps of Engineers
District Commander

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