

Draft Environmental Assessment

Minnesota Valley and Davis Creeks Two-stage Ditch

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Prepared by Loess Bluffs National Wildlife Refuge

Mound City, Missouri

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Executive Summary

This environmental assessment evaluates one action alternative and one no action alternative. The proposed action would modify Minnesota Valley Creek and Davis Creek into a two-stage ditch or inset floodplain at the Loess Bluffs National Wildlife Refuge (Appendix B, Figures 1 and 2). Minnesota Valley Creek and Davis Creek are drainage ditches influenced by a 60,000-acre watershed. Today, tiled agricultural lands to the north of the refuge drain more efficiently and the trapezoidal style ditches that run through the refuge no longer retain annual peak flows within their banks, making them susceptible to overtopping at numerous locations. The “no action” alternative would result in no modifications to the current trapezoidal or V style shape of Minnesota Valley Creek and Davis Creek. The action alternative would include a redesigning of the current trapezoidal or V style ditches to a two-stage style ditch using historical flow data to prevent overtopping during high flow events, facilitate sediment transport at base flows, and improve stability of side slopes reducing erosion and required maintenance while considering ditch capacities upstream and downstream of the refuge.

The following resources were analyzed in the environmental assessment: natural resources, cultural and historic resources, socioeconomics, and refuge resources. Other resources were initially considered by the U.S. Fish and Wildlife Service but were ultimately dismissed from further analysis because neither the proposed action nor its alternatives would have the potential to result in measurable impacts to these resources.

Based on the analysis presented in the environmental assessment and coordination and/or consultation with all appropriate federal, state and local agencies as well as all pertinent federally recognized Native American tribes, the U.S. Fish and Wildlife Service has determined that the impacts associated with the proposed action and its alternative would not have a significant impact on the quality of the natural and human environment.

Certification Statement: This environmental assessment has been developed pursuant to the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.), the Department of the Interior NEPA (DOI) NEPA Regulations (43 CFR 46), the U.S. Department of the Interior Handbook of NEPA Implementing Procedures (516 DM 1), the Service policy (550 Service Manual, or FW), and other applicable Federal and State laws and regulations.

Chapter 1: Introduction

1.1 Background

National Wildlife Refuges are guided by the mission and goals of the National Wildlife Refuge System, the purposes of an individual refuge, federal laws and executive orders, U.S. Fish and Wildlife Service policy and international treaties. Relevant guidance includes but is not limited to the National Wildlife Refuge Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 United States Code [U.S.C.] 668dd et seq.), the Refuge Recreation act of 1962 and selected portions of the Code of Federal Regulations and the U.S. Fish and Wildlife Service manual.

See Appendix A for a list of relevant laws and regulations.

The mission of the National Wildlife Refuge System, as outlined by the National Wildlife Refuge System Administration Act (NWRSA) of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997 (16 U.S.C. 668dd), is:

“... to administer a national network of lands and waters for the conservation, management and, where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.”

The National Wildlife Refuge System Improvement Act of 1997 directs the Secretary of the Department of the Interior to ensure that refuges are fulfilling the intended mission of the refuge system and the purposes of individual refuges (16 U.S.C. 668dd(5)(a)(3)(A-M)).

Loess Bluffs National Wildlife Refuge was established in 1935 in Executive Order 7156 the refuge’s purpose was to “... effectuate further the purposes of the Migratory Bird Conservation Act.” The Executive Order further stated that lands are to be used “as a refuge and breeding ground for migratory birds and other wildlife.”

In addition, the stated purposes for Loess Bluffs National Wildlife Refuge include: “... suitable for- incidental fish and wildlife oriented recreational development, the protection of natural resources, the conservation of endangered species or threatened species ...”, 16 U.S.C. - 460k-1 (Refuge Recreation Act) and “....for conservation purposes”, (1985 Food Security Act in conjunction with the transfer of Farm Service Agency, formerly Farmers Home Administration, property)

1.2 Proposed Action

The U.S. Fish and Wildlife Service is proposing to modify Minnesota Valley Creek and Davis Creek into a two-stage ditch or inset floodplain on Loess Bluffs National Wildlife Refuge. Minnesota Valley Creek and Davis Creek provide water to wetlands on the refuge using drop gate style water control structures.

A proposed action is an initial proposal and may evolve during the development of alternatives, the impact analysis and public involvement. This environmental assessment may determine

that there are other, better, or less impactful ways to address the purpose and need that may become the preferred alternative. The proposed action and alternatives may change during the NEPA process as the agency refines its proposal and gathers feedback from the public, federally recognized tribes and tribal entities and other agencies or organizations. Therefore, the final action may be different from the originally identified preferred alternative and will be finalized at the conclusion of the public comment period after the incorporation of substantive comments. A decision to implement a proposed action will not be made until the environmental review process is complete.

1.3 Purpose and Need for Action

The purpose of the proposed action is to increase capacity of Minnesota Valley Creek and Davis Creek, decrease damage to refuge infrastructure (levees, roads, ditches, and water control structures), improve water quality, decrease erosion, and facilitate sediment transport. While increasing capacity of the ditch and eliminating overtopping and sedimentation in refuge wetland units is the overall goal with this project, the refuge needs to consider replacing the current bridge over Minnesota Valley Creek with a new bridge or low water crossing and installation of new water control structures on both creeks to replace the current drop gates. Redesign of the trapezoidal ditches to a two-stage style ditch, using historical flow data, will prevent overtopping during high-flow events, facilitate sediment transport during base flows, and improve side slope stability, thereby reducing erosion and maintenance requirements while considering the capacities of the ditches upstream and downstream of the refuge.

Chapter 2: Involvement, Coordination and Consultation

2.1 Public Involvement

This draft environmental assessment will be available for public review and comment for 30 days from October 5, 2026, to November 4, 2026. Members of the public will be notified of the availability of the draft documents with a news release, and the draft document will be made available in hardcopy at the Loess Bluffs National Wildlife Refuge visitor center 25542 Highway 159, Forest City, MO 64451, or it can be downloaded from the refuge website <https://www.fws.gov/refuge/loess-bluffs>. For access to the document in an alternative format contact the refuge. Comments may be submitted via email at LoessBluffs@fws.gov or by mail to the refuge Loess Bluffs National Wildlife Refuge, P.O. Box 158, Mound City, MO 64470. Any comments, concerns, suggestions, or other feedback will be incorporated into the final environmental assessment if a substantive response is required.

2.2 State Coordination

The refuge staff corresponded with Missouri Department of Natural Resources, Missouri Department of Conservation, Federal Emergency Management Agency and U.S. Army Corps of Engineers staff regarding the proposed action for the past several years and have discussed the potential of creating a two-staged ditch for Minnesota Valley and Davis creeks that flow through Loess Bluffs National Wildlife Refuge. Emails and information were gathered from

Minnesota Department of Natural Resources because they had experience with two-staged ditch design and implementation. A formal letter and this environmental assessment will be provided to State of Missouri partners inviting them to provide comments on the proposed action on Minnesota Valley and Davis creeks within Loess Bluffs National Wildlife Refuge. As the preferred action alternative is implemented the refuge staff will continue to work in close coordination with Missouri partners.

2.3 Tribal Consultation

A notice of this draft document was sent to tribal sovereign partners inviting them to provide comments on the Draft Environmental Assessment for the proposed two-staged ditch design and implementation of Minnesota Valley Creek and Davis Creek on Loess Bluffs National Wildlife Refuge. The following Tribes were invited to provide comments: Apache Tribe of Oklahoma, Iowa Tribe of Kansas and Nebraska, Iowa Tribe of Oklahoma, Miami Tribe of Oklahoma, Omaha Tribe of Oklahoma, Osage Nation, Otoe-Missouria Tribe of Indians, Sac & Fox Nation of Missouri in Kansas and Nebraska, Sac & Fox Nation, and the Sac & Fox Tribe of the Mississippi in Iowa. As the preferred action alternative is implemented the refuge staff will continue to work in close coordination with tribal partners.

Chapter 3: Alternatives

3.1 Decision Framework

The Assistant Regional Director National Wildlife Refuge System (ARD Refuges) in Region 3 of the U.S Fish and Wildlife Service will make two decisions based on this environmental assessment once the review process is complete. They will: (1) select an alternative for the refuge, and (2) determine if the selected alternative is a major federal action that would significantly affect the quality of the human and/or natural environment, and therefore, require the preparation of an environmental impact statement. The Loess Bluffs National Wildlife Refuge recommends Alternative B: Two-stage Ditch Design – Preferred Alternative to the ARD Refuges. The Minnesota Valley and Davis Creeks Two Stage Ditch Environmental Assessment was developed based on this recommendation.

3.2 Alternatives

Alternative A – Status Quo - No Action Alternative

Under the No Action alternative, the refuge would not implement any additional modification or design of a two-stage ditch in Minnesota Valley or Davis creeks. Ditch cleanout would still be done which has historically been done on roughly a 10-year cycle documented in refuge annual narratives. Sedimentation plugs water control structures and fills in Minnesota Valley Creek and Davis Creek ditches – causing the need to frequently excavate the sediment from the ditches to maintain capacity and prevent even more flooding. No additional flood storage capacity, resilient infrastructure or restoration of native flood tolerant vegetation would be established or created. The volume and speed with which water exits the refuge would remain unchanged except by changes in weather patterns.

Alternative B – Two-stage Ditch Design - Preferred Alternative

Under the Preferred Action Alternative, the refuge would use high-resolution elevation data (LiDAR, RTK GPS), recent and historic aerial imagery, the inset floodplain or two-stage ditch downstream of U.S. Highway 159 bridge on Minnesota Valley Creek and on-site assessments to determine, as accurately as possible, the effected locations footprint, size, slope, and composition of the two-staged ditch design of Minnesota Valley Creek and Davis Creek (Appendix B, Figures 1 and 2). The purpose of the proposed action is to increase capacity of Minnesota Valley Creek and Davis Creek, decrease damage to refuge infrastructure (levees, roads, ditches, and water control structures), improve water quality, decrease erosion, and facilitate sediment transport. Construction of a two-stage ditch will improve conveyance capacity, be more self-sustaining, and create and maintain improved aquatic habitat (NRCS 2007). While increasing capacity of the ditch and eliminating overtopping and sedimentation in refuge wetland units is the overall goal with this project, the refuge needs to consider future installation of a low water crossing or new bridge, depending on funding, in the place of the current bridge and account for new water control structures to replace the current drop gates. The new water control structures on Minnesota Valley Creek would be separate from the low water crossing or bridge. Redesign of the trapezoidal ditches to a two-stage style ditch, using historical flow data, will prevent overtopping during high-flow events, facilitate sediment transport during base flows, and improve side slope stability, thereby reducing erosion and maintenance requirements while considering the capacities of the ditches upstream and downstream of the refuge.

Primary water supply ditches on the refuge – Minnesota Valley Creek and Davis Creek – overtop frequently and cause damage to refuge infrastructure, primarily the auto-tour road, and cause habitat damage through sedimentation and excessive flooding/inundation. Both streams are prone to flash flooding, which has potential to impact private lands upstream of the refuge. The age and condition of infrastructure on the refuge is closely related to this issue.

Sedimentation has long been an issue at Loess Bluffs. The degree and source of sediments on the refuge were the subject of a 2002 USGS report. The high sediment volumes associated with the Minnesota Valley Creek and Davis Creek ditch systems, as well as other sources, have caused the infilling of refuge pools and wetlands. At best, this has degraded wetland habitat, and, at worst, it has converted wetland habitat to reed canary grass (*Phalaris arundinacea*, RCG). Sedimentation plugs water control structure and fills in Minnesota Valley Creek and Davis Creek ditches – causing the need to frequently excavate the sediment from the ditches to maintain capacity and prevent even more flooding. The loess soil, for which the refuge is named, are extremely fine particles and remain in suspension for long periods of time. This affects water clarity and results in sediment being transported farther into wetland areas.

Much of the water resource infrastructure on the refuge is aging and outdated. The ditches, water control structures, levees and roads were constructed under a different precipitation and flood regime. The result is that infrastructure is frequently overwhelmed by flood waters,

causing damage, limiting habitat management, and demanding frequent maintenance. Among some of the largest water resource infrastructure issues, the auto-tour road is frequently overtopped. The refuge has recently invested one million dollars into repairing the road but is concerned that the same areas may need to be repaired in the near future due to almost annual overtopping. The overtopping issue is closely related to the ditch systems. The ditches are now too narrow to convey the high flood frequencies seen over the past 20 years. Even with ditch cleanouts, the ditches do not have the capacity to contain flood waters. Ditch banks are sloughing and contributing to the sediment problem. When excavated, ditch spoil must be placed on the exterior of the ditch, resulting in a higher levee and increased probability that flood waters (and associated sediment) would be forced over the auto-tour road and into refuge wetlands. The water control structures on Minnesota Valley and Davis creeks have limited functionality due to age, are too small and are ill-designed to efficiently pass flood waters. The water control structures in these channels frequently collect significant debris jams that require maintenance and have potential to impact private lands upstream of the refuge. The Minnesota Valley Creek water control structure also serves as a bridge on the auto-tour route and is notably smaller and lower in elevation in relation to the creek than the newer bridge over Davis Creek or the Highway 118 Minnesota Valley Creek bridge. The preferred alternative is to redesign and enlarge the existing ditch system to incorporate an inset floodplain or two-stage ditch with sufficient capacity to convey the 25-year or 50-year flood event. This design would reduce maintenance requirements and ditch sloughing, promote sediment capture in accessible areas for easier removal, and provide improved aquatic and riparian habitat.

Mitigation Measures

Mitigation measures would be used to minimize effects caused by the proposed action. Use of the best available science including but not limited to stream data from Minnesota Valley Creek and Davis Creek, high resolution elevation data, the inset floodplain or two-stage ditch downstream of U.S. Highway 159 bridge on Minnesota Valley Creek and on-site assessments to determine, as accurately as possible, the footprint, size, slope, and composition of the two-stage ditch design of Minnesota Valley Creek and Davis Creek. The footprint of the inset floodplain or two-stage ditch would take the path of least disturbance to woodland and wetland areas. A minimum number of trees would be removed for the potential area increase – keeping in mind federally listed species, species of conservation concern, migratory birds and bald eagle nesting sites. Bat acoustic surveys would be conducted prior to work, and tree removal would be done outside of the active bat season (October 16 – March 31). Invasive species including but not limited to reed canary grass or Japanese hops (*Humulus japonicus*) would be treated using integrated pest management methods. Water tolerate native bottomland prairie vegetation including but not limited to prairie cordgrass (*Spartina pectinate*), Canada bluejoint (*Calamagrostis canadensis*), riverbank wildrye (*Elymus riparius*), switchgrass (*Panicum virgatum*), brown fox sedge (*Carex vulpinoidea*), common tussock sedge

(*Carex stricta*), lake sedge (*Carex lacustris*), common milkweed (*Asclepias syriaca*) and other pollinator plants would be used to reseed the impacted area.

Alternatives Considered but Dismissed (if applicable)

There were a few alternatives that were discussed but determined to be infeasible. The first being replacing the current Minnesota Valley Creek bridge and water control structure as a single integrated unit similar to what it is today but with a possible change of the water control structure from a roller gate design to Obermeyer gate or other water control structure type. Keeping the bridge and water control structure connected together by either not replacing the current bridge and only replacing the water control structure would not accommodate the footprint or flow of the two-stage ditch design. It would continue to be a potential pinch point for log jams and flash flooding. Replacing the current bridge and water control structure with one large enough for the increased footprint of a two-stage style ditch would be cost prohibitive and still may prove to be a pinch point for log jams. Separating the water control structure from either a new low water crossing or larger separate bridge would open up the stream channel for more water and debris to pass. Having the structure and water crossing separate would also make replacement options and cost more flexible. Another alternative would be to implement a two-stage ditch design only in Minnesota Valley Creek or Davis Creek, rather than in both. Implementation of the two-stage ditch design would occur in phases, with work likely being completed on one section of a creek at a time. Implementing a two-stage ditch design on only Minnesota Valley Creek or only Davis Creek would not adequately address the overall flooding issues at Loess Bluffs National Wildlife Refuge. Flooding often occurs in only one creek at a time, depending on precipitation, Missouri River stage, or a combination of other factors. Implementing a two-stage ditch on Minnesota Valley Creek alone, for example, would not prevent Davis Creek from overtopping its banks, accumulating sediment, or causing flood-related damage to infrastructure in that portion of the refuge. The same limitation would apply if improvements were made only to Davis Creek.

Monitoring Applicable to All Alternatives

In 2010, Region 3 Division of Natural Resources and Conservation Planning (DNR-CP) Branch of Water Resources staff installed 2 water monitoring stations (one on Davis and Minnesota Valley creeks) (USFWS 2018b). Both of these stations are equipped with GOES data loggers and transducers that measure streamflow and water temperature. These data loggers record readings every 15 minutes, which allows for the determination of a daily average stream depth along with determination of flood risks. When coupled with bathymetric maps showing elevation and volume of wetland units, it would be possible to determine stream discharge.

The Loess Bluffs National Wildlife Refuge Water Resource Water Inventory Assessment (WRIA) identified eight monitoring sites that are considered applicable to the refuge's water resources, including six surface water monitoring sites and two groundwater monitoring stations. Several resources and agencies offer water quality and quantity datasets relevant to the refuge and were utilized in the creation of Loess Bluffs National Wildlife Refuge's water monitoring site inventory (USFWS 2016). For example: Data for historical sampling locations can be retrieved through the EPA STORET (storage and retrieval; <http://www.epa.gov/storet>) database. This data warehouse is a repository for water quality, biological, and physical data used by state environmental agencies, EPA and other federal agencies, universities, and private citizens.

Missouri Department of Natural Resources Volunteer Water Quality Monitoring Program network includes several sites near the refuge, which house water chemistry, macroinvertebrate, and limited discharge data

(https://experience.arcgis.com/experience/c77b12c049cc4e3f9befbdf63daada29/page/Water-Quality#zoom_to_selection=true)(USFWS 2016). In addition, in areas where trees are removed, bats would be monitored using acoustic sampling techniques before, during and after implementation of the project.

Chapter 4: Affected Environment and Environmental Consequences

The affected environment describes those portions of the natural and human environment that could be affected with the implementation of any of the management alternatives. This section is organized by affected resource categories. Each affected resource discusses both (1) the existing environmental or socioeconomic baseline in the action area and (2) the reasonably foreseeable effects of the alternatives on each resource. The terminology “reasonably foreseeable effects” is used throughout and refers to effects that are sufficiently likely to occur and that encompass both the direct and indirect effects of the action as well as effects of the action when combined with other potential past, present, and future effects.

The following terminology is used throughout this section and the environmental assessment to help describe the reasonably foreseeable effects of the proposed action and the reasonable range of alternatives:

- Beneficial effect – those impacts to the human environment that provide desirable situations or outcomes.
- Negative effect – those impacts to the human environment that provide an undesirable situation or outcome.
- Negligible effects – slight impacts that would not typically be detectable and in some instances, may also not be observable.
- Minor effects – impacts that are detectable, and in some instances, observable, but that would not approach a threshold of significance as defined in the NEPA section 102(2)(C) or FWS Policy (550 FW 3).
- Moderate effects – impacts that are detectable, and in some instances, observable and that approach but do not reach or exceed a threshold of significance as defined in the NEPA section 102(2)(C) or FWS Policy (550 FW 3).
- Short-term effect – a known or potential effect of limited duration, relative to the proposed alternative and the resource impacted. For the purposes of this analysis, these impacts may last anywhere from a few minutes to a few months depending on the context of the effect but not more than a year.
- Long-term effect – a known or potential effect of extended duration, relative to the proposed alternative and the resource impacted. For the purposes of this analysis, these improvements or disruptions to a given resource would last a year or longer.

Effects that are speculative (i.e., there is a remote possibility that the impact would occur, but no meaningful information exists on which to base a prediction) or indefinite will not be included.

The following resources, either (1) do not exist within the project area or (2) would either not be affected or only negligibly affected by the proposed action:

- **Air Quality (negligible effect):** The air quality in the area is consistently good and the proposed action would only have a negligible short-term impact on it from the exhaust produced by the heavy equipment used during the restoration activities. No long-term impacts would result from the proposed action.
- **Soundscape (negligible effect):** The soundscape in the area is good and the proposed action would only have a negligible short-term impact on it from the sound produced by the heavy equipment used during the restoration activities. No long-term impacts would result from the proposed action.
- **Aesthetics, Viewsheds and Visual Resources (negligible effect):** The aesthetics, viewsheds and visual resources in the area are good and the proposed action would only have a negligible short-term impact on it during the construction phase from bare ground created from heavy equipment during restoration activities. Once native vegetation is reestablished the area would look similar what it did before and viewshed might improve in many places. No long-term impacts would result from the proposed action.
- **Land Use (Farming, Subsistence, and Recreation) (does not exist):** There is no farming, subsistence or guided recreation activities on Loess Bluffs National Wildlife Refuge.

4.1 General Description of Affected Environmental Applicable to All Affected Resources

The refuge consists of 12 square miles (7,440 acres) in Holt County, Missouri (See map at Appendix B, Figures 1-3). The refuge consists of primarily emergent herbaceous wetlands, woody wetlands, grassland, and deciduous forest (Appendix B, Figure 3). The proposed action is located along the Minnesota Valley and Davis creeks which run north to south through the refuge (Appendix B, Figure 2). The approximate size of the area impacted by the proposed action is 262 acres (Minnesota Valley Creek – 146 acres and Davis Creek -116 acres). For more specific information regarding the characteristics of the environment in the project area environment, please see chapter 2 of the refuge's Habitat Management Plan (USFWS 2018a) or refuge Comprehensive Conservation Plan and Environmental Assessment (USFWS 2005).

4.2 Natural Resources

Habitat and Vegetation: Affected Environment

The vegetation communities and non-native plants of concern are thoroughly discussed in the refuge's HMP (USFWS 2018a) (Appendix B, Figure 3). The areas immediately adjacent to the Minnesota Valley and Davis creeks are managed wetlands, bottomland prairie and floodplain forest vegetation communities. Based on 2007 Land Cover Land Use Data, habitat types include

824 acres of floodplain forest, 1,875 acres of bottomland prairie (mesic 42% and wet 58%), 377 acres of white oak- hickory forest, 300 acres of Loess Hills prairie, 3,641 acres of managed wetland, and 172 acres of wetland (USFWS 2018a). Developed land including administrative areas, channelized ditches and roads accounts for 251 acres on the refuge. These vegetation communities are typically maintained by the natural hydrologic periods of flooding and fire. However, in recent decades flood intensity and frequency have increased causing amplified spread of invasive species, siltation, and decreased water quality resulting in alteration of native vegetation communities. Invasive species adjacent to the area include reed canary grass (*Phalaris arundinacea*), garlic mustard (*Alliaria petiolata*), Japanese hops (*Humulus japonicus*), musk thistle (*Carduus nutans*), Johnson grass (*Sorghum halepense*), and sericea lespedeza (*Lespedeza cuneata*).

Habitat and Vegetation: Environmental Consequences

More frequent flood timing and duration has caused portions of the floodplain forest to die back resulting in a decrease in habitat diversity and increase areas where invasive species could establish. Regardless of the alternative chosen, invasive species would likely continue to threaten the ecological integrity of the project area's habitats. Some invasive plant infestations are currently beyond the capabilities of the refuge staff to completely eradicate, and therefore they would continue to have a negative influence on vegetation communities. To control species like reed canary grass, the refuge frequently implements habitat management actions such as herbicide treatment, prescribed fire and water level manipulation that promote native.

Alternative A

Under the status quo or no action alternative, the non-native vegetation community and distribution would remain on its current trajectory. Species like reed canary grass would remain established in wetlands, bottomland prairie, floodplain forest and banks of Minnesota Valley Creek and Davis Creek. Invasive species would continue to spread via creeks, ditches and flash flood events.

Alternative B

Under this alternative, native herbaceous plants like prairie cordgrass, sedges and forbs would be established. The footprint and profile of creeks would be increased, allowing more water to flow through the system during flood events. Species like reed canary grass have been shown to outcompete native vegetation particularly well in areas with flashy hydro-period and disturbed communities. Increasing the capacity of Minnesota Valley Creek and Davis Creek would increase the competitive ability of native species throughout the refuge. Over time, natural water flows should promote a healthier and more diverse plant community consisting of sedges, rushes, grasses and forbs that would in turn provide better habitat for wildlife. Establishing native vegetation on Minnesota Valley Creek and Davis Creek would decrease the amount of invasive species seed potentially dispersed from floods, water and other management actions.

Floodplains: Affected Environment

Most of the refuge is located along the eastern edge of the Missouri River floodplain in a historic wetland area (Appendix B, Figure 3). Loess Bluffs NWR is directly influenced by a 60,000 acre (Minnesota Valley Creek 45,000 acres and Davis Creek 15,000 acres) upstream watershed, lying at the base of the highly erodible Loess Hills (Heimann and Richards 2003) (Appendix B, Figure 1). Three smaller creeks - Porter, Swope, and Blair - drain watersheds from the north and east that enter Loess Bluffs NWR. Though small, these creeks add another 9 square miles of drainage and runoff to the refuge, making the total upstream drainage area influencing the refuge approximately 95 square miles. Executive Order 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977) specially requires federal agencies to evaluate the potential impacts of their actions on floodplains with particular emphasis on avoiding actions that would reduce the ability of the floodplain to function and perform naturally and increase flood hazards.

Floodplains: Environmental Consequences

Excessive precipitation in this area and in upstream regions of the Missouri River Watershed can result in flooding from both the Missouri River and the input tributaries to Loess Bluffs National Wildlife Refuge (USFWS 2016). Flooding impacts on the refuge can result in overtopping of roads, levees, water control structures, and bridges. During high water events, drainage within the refuge is inhibited causing water control structures on the refuge to act as hydraulic dams and additional sediment deposition to occur. Sedimentation issues in this area have filled in the drainage ditches and decreased wetland capacity.

Alternative A

Under the no action alternative, no additional flood storage capacity or resilient infrastructure would be established or created. The volume and speed with which water enters and exits the refuge would remain unchanged except by changes in weather patterns. Refuge roads, levees and water control structure would continue to be impacted by high water events.

Alternative B

Under the preferred alternative, the capacities of Minnesota Valley Creek and Davis Creek would increase, water would move through the system slower and allow for sediment to flow past the refuge or settle out in stream channel where it could be periodically removed rather than end up in refuge wetlands. The preferred alternative would also result in mitigating large storm events and reducing downstream flooding by allowing floodwaters continuity to other sections of Minnesota Valley Creek that have increased capacity or function as a two-stage ditch and allow flow to the Missouri River. Although this action would occur in a floodplain, the outcome of creating a two-stage ditch or inset floodplain in Minnesota Valley Creek and Davis Creek from the current trapezoidal or V shaped ditch system would improve the functionality of the floodplain, decrease flood hazards and strain on infrastructure that Executive Order 11988 – Floodplain Management, 42 Fed. Reg. 26951 (1977) was written to protect.

Wetlands: Affected Environment

The refuge is comprised of over 3,800 acres of wetlands of which over 90% are intensively managed for waterbirds and other wetland dependent species. The refuge contains 33 independently managed units made up of semi-permanent or seasonal (moist soil unit) wetlands. Water levels are manipulated in each of the marshes and moist soil units to provide water depths and vegetative conditions attractive to migrating waterfowl as well as to provide nesting habitat for waterfowl and a variety of waterbirds during the summer.

Wetlands: Environmental Consequences

Moist soil units are drawn down yearly to encourage annual plant production, reset ecological succession and/or to use prescribed management actions when necessary, including mechanical, fire or herbicide for vegetative control. Executive Order 11990 -Protection of Wetlands, 42 Fed. Reg. 26961 (1977) to avoid to the extent possible long or short-term adverse impacts associated with destruction or modifications of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.

Alternative A

Under the no action alternative, flood water and silt would continue to impact refuge wetlands. Flood water would damage refuge infrastructure like roads, levees, ditches and water control structures. Refuge wetlands and ditches would fill with silt. Flood waters often carry woody debris, road gravel, and trash (possibly toxic substances) into wetland habitat.

Alternative B

Under the preferred alternative, the majority of flood water, silt and debris would be conveyed through Minnesota Valley Creek and Davis Creek avoiding refuge wetlands. The refuge would have the ability to manage water through the ditch system, allowing only water with lower sediment loads to enter the refuge, thereby reducing sediment deposition in ditches and wetlands. The preferred alternative would help avoid adverse impacts to refuge wetlands which is the reason, Executive Order 11990 -Protection of Wetlands, 42 Fed. Reg. 26961 (1977) was written.

Fish and Wildlife Species: Affected Environment

The terrestrial and aquatic species present are discussed in the refuge's CCP (USFWS 2005) and HMP (USFWS 2018a). Because the proposed action would occur adjacent to wetland communities special focus is given here to species which use the wetlands and aquatic communities on the refuge. More than 310 species of birds have been observed on the refuge. Many of these are wetland-dependent such as: ducks, geese, swans, shorebirds, secretive marsh birds and wading birds. The refuge also hosts a diverse number of other vertebrates including 41 species of mammals and 37 species of reptiles and amphibians (USFWS 2018a). Wetlands also support a variety of mammals like muskrat, mink, otter, and beaver. Although many species of reptiles exist in or around the refuge's aquatic communities, prairie massasauga, western foxsnake and Blanding's turtle are of greatest conservation concern. Fish species known to occur on the refuge are common warm-water species like shortnose gar,

common carp, smallmouth buffalo, largemouth buffalo, river carpsucker, channel catfish, black bullhead, largemouth bass, white crappie, and green sunfish (USFWS 2005). However, a detailed inventory of fish species has not been conducted. Four species of freshwater mussels have been recorded on the refuge: yellow sandshell, giant floater, pondhorn and fingernail clam (USFWS 2005), which are present in wetlands.

Fish and Wildlife Species: Environmental Consequences

The main factors affecting the wildlife on and around the refuge are land use practices and recreational outdoor activities (wildlife observation, hunting and fishing). Land use practices in the area around the refuge are not expected to change substantially. Urban development is minimal with most private property surrounding the refuge being farming, recreational hunting or rural residential. Local agriculture is primarily row crops (corn, and soybeans) or haying, there are no major changes to land use practices expected. Therefore, environmental trends are not expected to influence terrestrial wildlife resources. In their current state, the environment for aquatic species is influenced by the effects of the existing drainage network creeks, ditches and tile drainage. The drainage network, depending on Missouri River stage, and local weather patterns have resulted in a “flashy” system that quickly moves water out of Minnesota Valley Creek and Davis Creek and impacts levees, roads, water control structures, ditches and wetlands (Appendix B, Figure 4). This results in very unpredictable habitat conditions in wetter years and makes water management/dewatering wetlands unpredictable.

Alternative A

Presently, the water conditions (e.g., volume, speed, transparency, temperature) are found in the Minnesota Valley Creek and Davis Creek watersheds change rapidly in response to precipitation or lack thereof. Few species of aquatic wildlife can tolerate extremely unpredictable water conditions. Beaver populations take advantage of the existing V shaped ditch to anchor their dams. This along with further constriction of the stream channel provides areas for debris or log jams which could impact roads or other infrastructure. Under the no action alternative, the amount of habitat available to many aquatic species would remain at the current level. Water quality and quantity would continue to be highly variable in response to precipitation and runoff events.

Alternative B

Under the preferred alternative, the trapezoidal or V shaped ditches of Minnesota Valley Creek and Davis Creek would be modified into a two-stage ditch or inset flood plain and the hydrologic patterns in creek along with wetlands would be more stable. The wetlands, Minnesota Valley Creek and Davis Creek would provide more favorable habitat for aquatic wildlife resources. The quality of the water exiting the refuge would be improved as water transportation rates decrease, reducing turbidity and making water conditions more predictable. The stream channel footprint would be similar to the downstream extent which would allow additional water storage capacity in the two-stage ditch and groundwater. By restoring a more natural and stable hydrology pattern, the preferred alternative is expected to result in a cascade of positive changes for wildlife. Water conditions (i.e., temperature,

dissolved oxygen, clarity, and permanence) are expected to be more conducive for a stable and healthy community of aquatic insects, mussels and fish along with waterbirds, mammals, reptiles and amphibians.

Candidate, Threatened and Endangered Species, Critical Habitat and Special Status Species:
Affected Environment

Many of the species with special state, federal and refuge specific designations are discussed in the refuge's CCP and HMP (USFWS 2005, USFWS 2018a). The refuge's HMP identifies 18 priority species of concern, of which, 13 are associated with wetland or bottomland prairie communities. The Service's IPaC tool (<https://ipac.ecosphere.fws.gov/>) was used to identify the federally listed species present on the proposed project area. As of 4 February 2026, IPaC showed three federally Endangered species, one proposed Endangered and two proposed Threatened species listed in or around the proposed action area. There are no critical habitats listed in the project area or located on the refuge.

Indiana bat (*Myotis sodalis*) – Federally Endangered. Indiana bats may occur on the refuge during the summer. No Indiana bats have been positively confirmed on Loess Bluffs National Wildlife Refuge via mist net or acoustic surveys. Closest known records are in Nodaway or Andrew Counties. The species population is in decline due to high over-winter mortality rates caused by white-nose syndrome. Habitat near the project area consists of forested areas with decadent trees, snags and open areas for foraging. Trees large enough to provide roosting or pup-rearing habitat typically occur in upland vegetation communities or floodplain forest on the refuge. Both habitats are located outside of the project area. However, floodplain forest habitat is directly adjacent to the project area.

Northern long-eared bat (*Myotis septentrionalis*) – Federally Endangered. Northern long-eared bats occur on the refuge during the summer. No critical habitat for northern long-eared bat is designated on the refuge. The species population is in decline due to high over-winter mortality rates caused by white-nose syndrome. Northern long-eared bat habitat in the project area consists of forested areas with decadent trees, snags and open areas for foraging. Trees large enough to provide roosting or pup-rearing habitat typically only occur in upland vegetation communities or floodplain forest on the refuge. Both habitats are located outside of the project area. However, floodplain forest habitat is directly adjacent. Acoustic surveys conducted in 2013 – 2016 detected northern long-eared bats at 19 sites disbursed across the refuge.

Tri-colored bat (*Perimyotis subflavus*) – Proposed Endangered. Tri-colored bats occur on Loess Bluffs National Wildlife Refuge during the summer. No critical habitat has been designated for this species. Tri-colored bats are proposed endangered due to the range-wide impacts of white-nose syndrome, a deadly fungal disease affecting cave-dwelling bats across North America. Acoustic surveys conducted in 2013 – 2016 detected tri-colored bats at over 30 sites across the refuge.

Pallid sturgeon (*Scaphirhynchus albus*) – Federally Endangered. No critical habitat has been designated for this species. No pallid sturgeon has been positively confirmed on Loess Bluffs National Wildlife Refuge; however, no in-depth fishery inventory has been conducted. Adult pallid sturgeons inhabit large, deep turbid river channels, usually in strong current over firm sand or gravel. Minnesota Valley Creek and Davis Creek at normal flow on the refuge are usually shallow, slow moving and substrate is usually a silt or clay bottom.

Western regal fritillary (*Argynnis idalia occidentalis*) – Proposed Threatened. No critical habitat has been designated for this species. Regal fritillary butterflies live in tall-grass prairies and other open habitats. They depend on three main habitat components: violet host plants for caterpillars, nectar plants for adults and native warm-season bunch grasses that provide protective sites for all life stages. Western regal fritillaries are likely present on the refuge throughout the year.

Monarch butterfly (*Danaus plexippus*) – Federal Candidate. Monarch butterflies are found on the project area during the summer. Monarch habitat consists of grassland or open vegetation communities where milkweed (*asclepias* spp.) is present for reproduction. Monarchs have been known to roost in trees on the edge of floodplain forest, especially in September during migration to Loess Bluffs National Wildlife Refuge.

Blanding's turtle (*Emydoidea blandingii*) - State Protected and listed as State Endangered. Blanding's turtles, although rare are found in many of the aquatic communities on the refuge. The species' federal status is currently under review. Blanding's turtles are only known to occur at 3 locations in Missouri. Blanding's turtles are slow to reach reproductive age and have a relatively low reproductive rate making them an associated species of concern on the refuge.

Prairie massasauga rattlesnakes (*Sistrurus tergeminus tergeminus*) – State Protected and listed as State Endangered. Prairie massasaugas are listed as a species of concern on Loess Bluffs National Wildlife Refuge HMP and are found in wet-mesic and wet bottomland prairie habitat on the refuge. Massasaugas are only found in a few places in Missouri and Loess Bluffs National Wildlife Refuge contains the highest known population.

Bald eagle (*Haliaeetus leucocephalus*) – Least Concern (Population increasing). Although the bald eagle has been removed from the endangered species list, this species and the golden eagle are protected by the Bald and Golden Eagle Act and the Migratory Bird Treaty Act. Hundreds of bald eagles utilize Loess Bluffs National Wildlife Refuge during late fall and early winter. The refuge contains 3 – 4 active eagle nests.

Candidate, Threatened and Endangered Species, Critical Habitat and Special Status Species:
Environmental Consequences

U.S. Fish and Wildlife Service, State, and other partners have developed management and recovery plans for the conservation of wildlife in the area (USFWS 2005, USFWS 2014, USFWS 2018a, USFWS 2018b, ICF 2021). These plans provide land managers with guidance regarding conservation strategies that can be used in managing species and habitats. These plans establish regional population and habitat conservation objectives and provide estimates of the size and types of habitats required to increase and sustain wildlife populations at target levels. Species identified in these plans, and their associated objectives and strategies, were considered during evaluation specific to the refuge and in the development of the HMP objectives and strategies. Regardless of chosen alternative, refuge staff will continue to manage habitats on refuge for the benefit of threatened, endangered, and special status species.

Alternative A

The status quo (no action alternative) is expected to have little or negligible effect on threatened and endangered species on the refuge. The status quo would not include any of the proposed physical changes to the current water regime for Minnesota Valley Creek or Davis Creek within the refuge. Indirectly, however, threatened and endangered species, species of conservation concern and their habitats may degrade under certain flood and rain scenarios that result in higher and faster water flows through the refuge.

Alternative B

This alternative is expected to have a negligible effect on listed or proposed listed Federal threatened and endangered species and species of concern. However, creating a two-stage ditch in Minnesota Valley Creek and Davis Creek may require the removal of some trees which have grown adjacent to Minnesota Valley Creek or Davis Creek. To avoid potential impacts to Northern long-eared, Indiana and tri-colored bats, tree removal would be conducted during the winter. A minimum number of trees would need to be removed. Work near bald eagle nests would be completed outside of nesting season to minimize disturbance. At present, the deep and steeply sided ditches do not offer suitable habitat for resources of concern. Establishing more native vegetation (grasses, sedges and pollinator plants) on the banks and slopes of Minnesota Valley Creek and Davis Creek would provide additional habitat for monarchs and regal fritillary butterflies. Decreasing flood events and damage to infrastructure like levees would provide more a more stable environment for Blanding's turtles to nest and potential overwintering sites for massasaugas.

In 2026, under the provisions of Section 7 of the Endangered Species Act, an Intra-Service Consultation was completed for two-stage ditch and water control replacement on Minnesota Valley Creek and Davis Creek using the outlined techniques. The Section 7 Consultation found these actions would not likely adversely affect threatened and endangered species.

If selected, the preferred alternative would be implemented in phases over a period of years. To accommodate changes in the listing status, population trends, and ecological understanding, Section 7 consultations would be conducted for each distinct phase of the preferred action. This would allow the Service to tailor the actions to better meet conservation concerns for threatened and endangered species as well as species of other special status.

Geology and Soils: Affected Environment

All of Holt County, including Loess Bluffs National Wildlife Refuge, lies within Missouri's Western Glaciated Plains and Upper Missouri Big River divisions—also known as the Dissected Till Plains—formed by Kansan-stage Pleistocene glaciation and characterized by dissected plains sloping toward the Missouri and Mississippi Rivers (Kramer 1993; Nigh and Schroeder 2002; Thom and Wilson 1980). Soils developed from glacial till, loess, and alluvium over Pennsylvanian bedrock, and the area includes the Northwest Missouri River Alluvial Plain, Deep Loess Hills, and Loess Hills subsections (Nigh and Schroeder 2002). Most of Loess Bluffs National Wildlife Refuge is within the Northwest Missouri River Alluvial Plain, where deep floodplain deposits overlie bedrock more than 30 feet below the surface, while smaller areas of thick loess form steep hills and ridges (Nigh and Schroeder 2002). These very deep soils range from well drained upland loess to poorly drained floodplain clays—such as the Marshal-Exira-Shelby, Luton-Wabash-Blencoe, and Motark-Dupo-Dockery associations—and support both intensive crop production and valuable wildlife habitat (Heimann and Richards 2003; Holbrook 1997).

Geology and Soils: Environmental Consequences

Loess hills streams carry very high suspended sediment loads derived from the subsection's easily eroded loess soils (USFWS 2018a). Heimann and Richards (2003) reports trends in total sediment deposition and sedimentation rates in the wetlands of Loess Bluffs National Wildlife Refuge. From 1937 to 1964, mean total sediment deposition in the wetlands of Loess Bluffs National Wildlife Refuge was 1.26 feet, or 0.047 ft/yr, while the mean total sediment deposition for years 1964 to 2002 as reported from 2002 surveyed pools was 0.753 feet, or 0.020 ft/yr. When looking at 1937 to 2002, the total sediment deposited in the 2002 surveyed pool area was 9,900 acre-feet or 152 acre-ft/yr., also reported as about 10,300,000 tons of sediment 32.4 tons/acre/year (Heimann and Richards 2003). Alternative A

Under the "no action" alternative, the rate of soil erosion into and within refuge ditches is expected to increase in response to large precipitation events. Within the refuge, much of this erosion would be evident as sediment build up within the refuge's managed wetlands and bottomland prairie would continue to increase. Under the no action alternative, wetlands, prairies, floodplain forest, Minnesota Valley Creek and Davis Creek would continue to degrade.

Alternative B

Under the preferred alternative, refuge wetlands would experience more consistent water levels during normal weather events and less sediment from floods. The changes to the hydrology and the two-stage style ditches of Minnesota Valley Creek and Davis Creek would allow more water and sediment to pass through the refuge during heavy rain and/or flood

events. Infrastructure (roads, levees, ditches and water control structures) would be impacted less frequently from sediment, erosion and flood water.

Water Resources: Affected Environment

Loess Bluffs National Wildlife Refuge is influenced by a 60,000-acre upstream watershed at the base of highly erodible loess hills, with drainage flowing west to the Missouri River and east to the Nodaway River, along with tributaries such as the Big Tarkio River, Little Tarkio Creek, and Minnesota Valley Creek (Heimann and Richards 2003; Holbrook 1997). Minnesota Valley Creek alone drains about 63 square miles above Highway 59 before entering the refuge floodplain between levees, while Davis Creek and three smaller creeks contribute to a total upstream drainage area of approximately 95 square miles (Heimann and Richards 2003). Although the Missouri River has limited direct influence, the 1993 flood demonstrated that most refuge damage resulted from upstream runoff, exacerbated by the river's flood stage preventing discharge (Heimann and Richards 2003). River regulation by dams and levees has reduced natural flow variability, while extensive drainage, bank stabilization, and leveeing have altered hydrology and increased sedimentation and turbidity due to agricultural land use (Nigh and Schroeder 2002).

Water Resources: Environmental Consequences

John Weber, USFWS, completed a Contaminant Assessment Process in 2008 for Loess Bluffs National Wildlife Refuge identifying major contaminant sources and pathways, including heavy silt loading from the Loess Hills watershed via Minnesota Valley Creek and Davis Creek, ongoing wetland in-filling, and widespread agricultural non-point pollution such as fertilizers and pesticides (USFWS 2008). The refuge is also exposed to point-source pollution from Mound City wastewater discharges near Davis Creek, upstream agricultural chemical storage, and high risks of accidental spills from transportation corridors including Interstate 29 and the Burlington Northern Sante Fe Railway (USFWS 2008). Flooding represents the primary water supply threat, influenced by regional precipitation patterns in Iowa and Nebraska and river responses such as the Nodaway River, with additional ecological risks to species like the prairie massasauga during prolonged floods (USFWS 2016). Compounding these threats are adjacent landowner water pumping, invasive species transport, groundwater limitations tied to Missouri River discharge, and the likelihood of future weather extremes—both flooding and drought—challenging long-term habitat management.

Alternative A

Under the no action alternative, the water clarity, silt load, pollution, and water levels would continue to be highly variable in response to precipitation and runoff events. Under high flow events, water clarity would be expected to decrease as the greater speed and volume found in the ditched system would create more erosion, increasing the sedimentation load carried by Minnesota Valley Creek and Davis Creek. Flood events would likely continue to cause damage to refuge infrastructure including roads, levees and water control structures.

Alternative B

The preferred alternative would modify how the water moves through the project area. Implementation of the proposed action would reduce the frequency and severity of damaging flooding on refuge lands and adjacent private properties. During large storm events, the two-stage ditch design in Minnesota Valley Creek and Davis Creek would allow floodwaters to spread across the inset floodplain, temporarily storing water, reducing flow velocities, and decreasing downstream flooding. Although this action would occur in a floodplain, the outcome of an inset flood plain within Minnesota Valley Creek and Davis Creek created by a two-stage ditch design would improve the functioning water transport and decrease flood hazards and strain on infrastructure.

Special Land Status Designations: Affected Environment

The refuge does not include designated wilderness areas. However, three Research Natural Areas (RNAs) are located on the refuge including the Loess Hills (100 acres), Bluejoint-Slough Grass-Prairie (250 acres) and Cordgrass Prairie (210 acres) Research Natural Areas (Kramer 1993, USFWS 2018a). The National Wildlife Refuge System contains 210 RNAs that are part of a nationwide network of ecological areas set aside for both research and education. The areas "contain important ecological and scientific values and are managed for minimum human disturbance."

Special Land Status Designations: Environmental Consequences

RNAs are permanently protected, often containing representative examples of specific ecosystems, such as rare plants, animals, and their habitats. Habitat in Loess Hills, Bluejoint-Slough Grass-Prairie and Cordgrass Prairie RNAs are maintained with prescribed fire and invasive species control. All 3 RNAs on Loess Bluffs National Wildlife Refuge are outside of the project area. However, the Bluejoint-Slough Grass-Prairie and Cordgrass Prairie RNAs are adjacent to the project area and are affected by flooding, trash and sedimentation.

Alternative A

Under the status quo or no action alternative, the refuge's RNAs would continue to degrade. Flood water, trash, sediment and invasive plant seeds would flow into Bluejoint-Slough Grass-Prairie and Cordgrass Prairie RNAs. Native vegetation that makes up the RNAs would be replaced by reed canary grass.

Alternative B

The preferred alternative would change how the water moves through the project area. The implementation of the action would be in such a way to greatly reduce detrimental flooding on refuge and adjacent private lands. The preferred alternative would result in mitigating large storm events and reduction of flood waters entering the RNAs, which would in turn keep additional sediment, trash and invasive plant seeds out of these areas.

4.3 Cultural and Historic Resources

Archeological Resources: Affected Environment

Holt County, where Loess Bluffs National Wildlife Refuge resides contains evidence of early human occupation, including Paleo, Archaic, Woodland, and Mississippian cultural materials reported in the county and occasionally within the refuge (USFWS 2005). Prehistoric occupation reflects major cultural developments such as pottery, bow-and-arrow technology, mound burials, and gardening, with some sites likely deeply buried along river corridors (USFWS 2005). Historically, several tribes—including the Sac and Fox, Kansa, Oto, Missouri, Kickapoo, Delaware, and Potawatomi—occupied or claimed the area. Prior archeological investigations have identified 12 sites on the refuge, though no properties are currently listed on the National Register within the refuge (USFWS 2005). An intensive cultural resource study was completed (Sturdevant 1980) prior to Refuge proposed projects including creek channel widening, drainage ditch excavation, and dike construction. The 1980 survey study includes the current area of potential effect, and no significant cultural resources were identified. The total project footprint encompasses approximately 262 acres, with the project portions along Minnesota Valley Creek encompassing 146 acres, and those along Davis Creek encompassing 116 acres. The linear project footprint is approximately 10.7 miles, 4.83 miles of which is located along Minnesota Valley Creek, and 5.83 miles of which is located along Davis Creek.

Archeological Resources: Environmental Consequences

Minnesota Valley Creek and Davis Creek have been highly disturbed since the refuge establishment in 1935. According to refuge annual narratives Minnesota Valley Creek and Davis Creek have been cleaned out or reshaped approximately every 10 years.

Alternative A

Under the status quo alternative there would be no effect on cultural resources as no new activities are proposed.

Alternative B

There are no items of historic significance known to exist in the project area at this time. In addition, the actions taken under this alternative would be restricted to areas of previously disturbed soil, making the possibility of affecting cultural resources more remote. The Midwest Regional Historic Preservation Officer has determined that the action alternative would have no potential to affect historic or cultural resources.

4.4 Socioeconomics

Local and Regional Economies: Affected Environment

The National Environmental Policy Act (NEPA) of 1969 requires agencies to disclose to decision makers and to the public what society gains or loses with projects that have the potential of altering the environment. Based upon 2024 USFWS Socioeconomic Profile data (<https://apps.headwaterseconomics.org/eps-usfws/>), Holt County can be characterized by the following statistics: the population is 4,240, median age 47.4 years old, 72.5% of the population is over 25 years old, 19.6% of the population have a bachelor's degree or higher, 7.2% do not have a high school degree, 94.3% of the population is white, and minority population makes up

6.7%. The median household income for Holt County is \$61,187 with 5.2% of families and 2.6% of single mother households are in poverty. The mean travel time for work is 21.6 minutes and 39.5% of people work outside of the county. Farming makes up 21.7% of the employment while service-related jobs account for 43.4% and government account for 16.2% of employment. The unemployment rate is 3.7%. Private land (94.2%) makes up the largest portion of Holt County followed by federal (2.4%) and local (0.1%) government lands. Most of the county is in row crops and waterfowl hunting clubs or guide services are located around the refuge and throughout the county. In 2017, the total economic output of the Loess Bluffs NWR was estimated to be 1.9 million dollars annually and created the equivalent of 23 jobs (Caudill and Carver 2019).

Local and Regional Economies: Environmental Consequences

Presently there are no known trends or planned actions that would influence the socioeconomics of the area. The environmental consequences of the status quo and two-stage ditch design alternatives depend largely on habitat degradation, improvements and long-term outcomes.

Alternative A

Under the status quo alternative, there would be no immediate changes to the refuge landscape, or current trends in eco-tourism or economic contributions from the refuge. However, over time the increase in large precipitation events and flash floods would strain the refuge's aging water management infrastructure and wetlands. Collectively these conditions could reduce the public's ability to access popular portions of the refuge and in-turn result in reduced economic impacts.

Alternative B

The preferred alternative would result in a substantial and noticeable change to the Minnesota Valley Creek and Davis Creek on the refuge. Changes to Minnesota Valley Creek and Davis Creek would improve water delivery through the refuge, especially during increased precipitation events, reducing the amount of erosion, and sediment deposit of refuge infrastructure (roads, levees, and water control structures) and refuge wetlands or other habitats. The two-staged ditch design would help maintain opportunities for public visitation and in turn the local tourism economy.

Public Health and Safety: Affected Environment

Health and safety for NEPA refers to noise, vibration, injury, illness, worksite safety, hazardous materials and healthy lifestyles. Being a regularly visited wildlife observation area, the refuge typically has little to no health and safety problems. This would typically be limited to vehicle traffic, smoke from prescribed fire operations, noise from wildlife and possible habitat management work and possible wildlife health outbreaks. The air quality, soundscape, aesthetics and viewsheds in the area are considered good.

Public Health and Safety: Environmental Consequences

At present there are no known trends or planned actions that would influence the public health or safety of the area.

Alternative A

The status quo or no action alternative, there would be no immediate changes to the refuge public health and safety on the refuge. Periodic maintenance and cleaning of Minnesota Valley Creek and Davis Creek would continue, resulting in temporary noise, vibration, and worksite safety hazards, producing effects similar to those associated with the two-stage ditch alternative.

Alternative B

The preferred alternative would result in disturbed ground, devegetation, use of heavy and survey equipment in the project area. The air quality, soundscape, aesthetics and viewsheds in the area are considered good. The proposed action would only have a negligible short-term impact on them from bare ground, sound and exhaust produced by heavy equipment used during the restoration activities. Once native vegetation is reestablished, the project area would resemble pre-construction conditions, and the viewshed may be improved in many locations. Most construction activities would occur outside periods of peak visitation or in areas with limited public access. No long-term impacts would result from the proposed action.

4.5 Refuge Resources

Visitor Use and Experience: Affected Environment

The 1997 Refuge System Improvement Act prioritizes six wildlife-dependent recreational uses on national wildlife refuges: hunting, fishing, wildlife photography, wildlife observation, environmental education, and interpretation, when compatible with refuge purposes. The refuge is open daily ½ hour before sunrise to ½ hour after sunset with no entrance fee. Highest visitation is during fall and spring migration. Visitors can enjoy birdwatching, hiking, fishing, a mobility limited managed deer hunt, interpretive exhibits, and a 10-mile auto tour. Accessible trails and an observation tower overlooking Eagle Pool enhance wildlife viewing opportunities, and annual events like Eagle Days which occur during the first full weekend in December promote education and wildlife observation. The refuge is located 1.5 hours from Omaha, Nebraska to the north and Kansas City, Missouri to the south.

Visitor Use and Experience: Environmental Consequences

The refuge serves a large regional population and has growing potential as an educational and wildlife observation destination. Visitation from year to year varies likely depending on a myriad of factors including migration timing and bird numbers present. Caudill and Carver (2019) stated that in 2017 Loess Bluffs National Wildlife Refuge had 137,326 recreational visits. The refuge has documented over 250,000 visitors a year.

Alternative A

Under the status quo or no action alternative, the visitor use and experience would remain unchanged. However, the unexpected flooding caused by the high flow events are expected to

continue to inundate and damage roads and thereby limit access by the public. There would be lost opportunities for visitors to experience the refuge through wildlife observation, photography and education.

Alternative B

Under the two-stage ditch alternative Minnesota Valley Creek and Davis Creek would have increased flow capacity and likely decrease the occurrence of flooding during heavy precipitation events and influence from the Missouri River. Loess Bluffs National Wildlife Refuge infrastructure including the tour loop, observation platform and trails would be impacted less or not at all. The two-stage ditch and water control structure replacement on Minnesota Valley Creek may include the removal of the current bridge over Minnesota Valley Creek that is a part of refuge tour loop that connects one way loop to the Mallard Marsh exit on Missouri Highway 118. Those portions of the tour loop would be separated but still open to the public. The refuge would seek federal roads money to replace the current bridge with one that is compatible with the new two-stage ditch design.

Management, Operations and Administration (including land use and planning): Affected Environment

The refuge land cover and infrastructure are described in depth in the refuge's CCP (USFWS 2005) and HMP (USFWS 2018a). Typical management actions on the refuge include prescribed burning, mowing, disking, rolling, water level manipulation, pesticide application, and timber harvesting. These management actions are typically implemented within distinct management units that are often bordered by roads, trails, levees or natural barriers. Presently, there is no farming or grazing land used on the refuge. Wetland management is conducted by planned manipulations of water levels and followed up by occasional disturbance in the form of mechanical, herbicide, or prescribed fire that create habitat conditions to benefit various resources of concern on the refuge.

Management, Operations and Administration (including land use and planning): Environmental Consequences

If larger and more frequent precipitation events occur in combination with elevated Missouri River levels, the refuge would require additional resources to manage and maintain water infrastructure and respond to flood-related issues and public concerns.

Alternative A

Under the "no action" or status quo alternative, staff and budget resources would be expected to remain stable. The refuge's water-related infrastructure challenges would continue. The flashy nature of the watershed, high ditch banks, and V shaped ditches would result in unpredictable changes in surface water. Over time, the status quo alternative would require more frequent ditch clean out and an increasing number of repairs or replacements to water control structures and transportation infrastructure.

Alternative B

Under the preferred alternative, the trapezoidal or V shaped ditches of Minnesota Valley Creek and Davis Creek would be modified into a two-stage ditch or inset flood plain and the hydrologic patterns in the creeks along with wetlands would be more stable. The stream channel footprint would resemble the downstream channel on adjacent private lands, providing additional water-storage capacity in Minnesota Valley Creek and Davis Creek and allowing water to flow more efficiently to the Missouri River. Under the preferred alternative water levels around the tour road would be more predictable and flood related road damage would occur less frequently. Road maintenance costs would be expected to decrease. Water control structures and other infrastructure would be less susceptible to wear, damage and sedimentation.

4.6 Reasonably Foreseeable Impacts with Close Causal Relationship

Natural Resources

Across the refuge, increasing flood intensity has amplified invasive species spread, sedimentation, infrastructure damage, and instability in wetland and aquatic habitats. Under the no action alternative, flashy hydrology would continue degrading native vegetation, filling wetlands with silt, stressing water control infrastructure, and limiting habitat quality for wildlife and aquatic organisms. Over time, invasive plants such as reed canary grass would expand, habitat diversity would decline, and water conditions would remain highly variable and less supportive of sensitive aquatic species. The preferred alternative would restore more natural hydrologic function by increasing channel capacity, slowing flows, and reducing sediment deposition in managed wetlands. In time, this would enhance wetland resilience, improve water quality, reduce flood hazards and infrastructure strain, and support more stable, diverse plant and wildlife communities in alignment with federal floodplain and wetland protection policies.

Cultural and Historic Resources

There are no known historical sites located within the project area. Minnesota Valley Creek and Davis Creek have been highly disturbed since the refuge establishment in 1935. According to refuge annual narratives Minnesota Valley Creek and Davis Creek have been cleaned out or reshaped approximately every 10 years. According to Midwest RHPO NHPA Clearance Form the project area has been previously disturbed and of low potential for archeological site disturbance.

Socioeconomics

Under NEPA, the project must consider environmental, economic, and social impacts on Holt County and surrounding communities near Loess Bluffs National Wildlife Refuge. Increasing flood events could gradually reduce public access and visitation, potentially diminishing the refuge's annual economic contribution and related tourism-supported jobs in a county where agriculture and service industries are central. The preferred alternative would stabilize water management infrastructure, maintain visitation levels, and help sustain local economic benefits tied to recreation and hunting. Short-term construction impacts—such as noise, equipment use, and temporary aesthetic changes—would be minor and temporary, with no long-term

public health or safety concerns. The preferred alternative supports long-term economic stability, infrastructure resilience, and continued recreational benefits with negligible lasting social or health effects.

Refuge Resources

Current refuge management relies on active habitat manipulation and water control infrastructure to maintain wetlands and priority species, but increasing precipitation and influence from the Missouri River would intensify maintenance demands and public concerns. Unstable hydrology and aging V-shaped ditch systems would continue to strain wetlands and transportation infrastructure, leading to higher long-term repair and replacement costs. More frequent flooding would increase ditch cleanouts and accelerate deterioration of water control structures. The preferred two-stage ditch design would stabilize hydrologic patterns, increase water storage and conveyance capacity, and reduce sedimentation and infrastructure wear. It is anticipated that the preferred alternative would improve ecological resilience, reduce maintenance costs, and provide more predictable water management over time.

The refuge's accessibility, diverse wildlife, and proximity to major cities such as Omaha and Kansas City contribute to high and sometimes growing visitation levels. Recurring flooding would likely damage infrastructure, reduce access, and diminish opportunities for wildlife observation, photography, and education. The two-stage ditch alternative would reduce flood impacts, better protect roads and visitor facilities, and help sustain recreational access. Although temporary separation of portions of the tour loop could occur if the Minnesota Valley Creek bridge is removed, long-term infrastructure improvements would support continued public use and educational benefits.

4.7 Summary of Analysis

Alternative A – Status Quo – No Action Alternative

Under Alternative A (Status Quo), no two-stage ditch modifications would occur along Minnesota Valley and Davis creeks on Loess Bluffs National Wildlife Refuge, and management would continue relying on periodic ditch cleanouts to maintain capacity. While this avoids short-term construction disturbance and has no direct effects on cultural resources or immediate public health and safety, it provides no additional flood storage, infrastructure resilience, or restoration of native flood-tolerant vegetation. Over time, continued flashy hydrology would increase erosion, sedimentation, invasive species spread (e.g., reed canary grass), degradation of wetlands and RNAs, infrastructure damage, and reduced habitat stability for aquatic and wetland-dependent species. Flood-related access limitations could also diminish visitor use and local economic benefits. Overall, Alternative A would not meet the purpose and need of improving hydrologic stability, reducing flood impacts, and enhancing long-term ecological resilience, and would likely result in gradual environmental and infrastructure decline compared to the proposed action.

Alternative B – Two-stage Ditch Design – Preferred Alternative

The Preferred Action Alternative would redesign Minnesota Valley Creek and Davis Creek on Loess Bluffs National Wildlife Refuge into two-stage ditches to increase flow capacity, reduce erosion and sedimentation, stabilize hydrology, and protect wetlands and infrastructure from frequent flood damage. Compared to the No Action alternative, it would substantially improve water quality, reduce maintenance costs, enhance native vegetation establishment, limit invasive species spread, and provide more stable habitat for fish and wildlife while maintaining public access and local economic benefits. Short-term adverse impacts—such as ground disturbance, tree removal, noise, and temporary aesthetic changes—would be minimized through phased implementation, seasonal timing restrictions to protect species of concern like bats and bald eagles, Section 7 consultation, and work in previously disturbed areas. The project would also replace aging water control structures and potentially a bridge, improving long-term flood resilience for both refuge and adjacent private lands. Overall, the preferred alternative best fulfills the purpose and need by restoring hydrologic function, reducing flood hazards, and improving ecological integrity with only negligible, short-term impacts.

Chapter 5: List of Preparers and Sources

5.1 List of Preparers

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Appendix A: Applicable Statutes and Executive Orders

Statutes & Executive Orders with Nexus to Action:

- American Indian Religious Freedom Act of 1978: The refuge consulted with federally recognized Native American Tribes with potential interest in the action and determined there would be no infringement on traditional religious rights and cultural practices. The preferred alternative would not occur on a religious site and would not limit or change the ability of tribes to access the refuge.
- Bald and Golden Eagle Protection Act of 1940, as amended: Two – three bald eagle nests are located near the project area. Care, a distance buffer or timing of work will be used to elevate disturbance to bald eagles during the nesting period. No take of bald eagles, including their parts, nests or eggs would occur.
- Clean Air Act of 1970: Any construction under the action alternative would have a temporary and negligible impact on air quality.
- Clean Water Act of 1972, as amended: Work on the proposed action will be concentrated on the creeks and not adjacent wetlands. However, the Army Corps of Engineers will be consulted, and proper permits will be acquired before work begins. No modifications will be made under the preferred alternative that would impact wetlands or negatively affect their function and value.
- Endangered Species Act of 1973, as amended: A consultation pursuant to Section 7 of the Endangered Species Act was formerly conducted as part of the Environmental Assessment and the Hunting Plan. See the Candidate, Threatened and Endangered Species and Critical Habitat Section for more information.
- Federal Noxious Weed Act of 1990: Native vegetation will be planted and established in the footprint of the proposed action. Non-native vegetation found in the project area will be treated using integrated pest management practices.
- Fish and Wildlife Act of 1956: Routine management actions on the refuge during construction of the action alternative would continue as outlined in the refuge's habitat management plan (U.S. Fish and Wildlife Service, 2022).
- Fish and Wildlife Coordination Act of 1958: The preferred alternative was discussed with the Missouri Department of Natural Resources and consistent with refuge Comprehensive Conservation Plan and Habitat Management Plan.
- Migratory Bird Hunting and Conservation Stamp Act of 1934: The action alternative would have temporary negligible impacts on migratory birds, but no project funding would come from the Migratory Bird Conservation Fund.
- Migratory Bird Treaty Act of 1918, as amended: The action alternative could temporarily disturb and displace migratory birds during construction, however sufficient habitats would be available in adjacent areas. Any impact would be comparable to those from refuge visitation.

- National Environmental Policy Act of 1969: This environmental assessment is a public document prepared by the U.S. Fish and Wildlife Service to comply with the National Environmental Policy Act. Analyses included in this document will determine if the proposed federal actions would have the potential to cause significant impacts to the quality of the human environment.
- National Wildlife Refuge System Improvement Act of 1997: The “action” alternative would allow for all six of the priority wildlife dependent recreational uses on the refuge and is consistent with the refuge’s Comprehensive Conservation Plan and Habitat Management Plan. Completing this Environmental Assessment, Intra-Service Section 7 and subsequent Finding of No Significant Impact for the proposed action will satisfy requirements for this Act, and the refuge will ensure the proposed action will follow compatible use and public input as part of the planning process.
- Noise Control Act of 1972: Project construction under the “action” alternative would have a temporary and negligible impact on noise levels.
- Refuge Recreation Act of 1962, as amended: The preferred alternative would indirectly benefit wildlife-dependent recreation by allowing for all priority wildlife-dependent recreational uses on the refuge and nearby flooded lands.
- Executive Order 11593, Protection and Enhancement of the Cultural Environment: The preferred alternative would have no impact on cultural and historic resources.
- Executive Order 11988, Floodplain Management: The project would occur in a floodplain. The proposed action for two stage ditch and associated federal funding would not contribute to flood damage or negative impacts to the floodplain. Mitigation measures, as outlined in the Environmental Assessment and reference documents, would be used to protect refuge infrastructure and private land, minimize impacts and protect the resource. No modifications will be made under the preferred alternative that will increase floodplain elevation or negatively affect its function and value.
- Executive Order 11990, Protection of Wetlands: Work on the proposed action will be concentrated on the creeks and not adjacent wetlands. However, the Army Corps of Engineers will be consulted, and proper permits will be acquired before work begins. No modifications will be made under the preferred alternative that would impact wetlands or negatively affect their function and value.
- Executive Order 12962, Recreational Fisheries: Recreational fishing may be temporarily and negligibly impacted by construction under the “action” alternative; however, no fisheries exist in the proposed project area.
- Executive Order 12996, Management and General Public Use of the National Wildlife Refuge System: The preferred alternative would continue to fulfill the biological integrity and environmental health requirements of the refuge system and there would be continued collaboration between the refuge, local municipal and state governments and federally recognized tribes. The public will be provided with the opportunity to give input on the preferred alternative.

- Executive Order 13007, Indian Sacred Sites: The preferred alternative would not occur in an area with known sacred sites. See the Tribal Consultation Section for more information on how tribes would be informed and consulted regarding the proposed action.
- Executive Order 13112, Invasive Species: Under the preferred alternative, risks of invasive species introduction with construction of the action alternative will be managed using best management practices. The refuge will continue to monitor, map the extent and treat invasive species each year.
- Executive Order 13175, Consultation and Coordination with Indian Tribal Governments: No statutory, regulatory or policy changes would occur under the preferred alternative. See the Tribal Consultation Section for more information on how tribes would be informed and consulted regarding the proposed action.
- Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds: The preferred alternative would not have a measurable negative effect on migratory bird populations.

Statutes & Executive Orders Not Requiring Additional Consideration:

There are no anticipated impacts to resources associated with the laws and/or executive orders outlined below.

- Administrative Procedures Act of 1946: The preferred alternative would not involve developing or issuing regulations (e.g., rulemaking).
- Alaska National Interest Lands Conservation Act of 1980, as amended: The preferred alternative would not occur in Alaska.
- Americans with Disabilities Act of 1990: No modifications to trails or parking areas are planned under the preferred alternative.
- Anadromous Fish Conservation Act of 1965: Any fish found on the refuge are not considered anadromous fish.
- Antiquities Act of 1906: The preferred alternative would not occur in an area of known historic or scientific interest. No examination of ruins, excavation of archaeological sites or gathering of objects would occur.
- Archaeological and Historic Preservation Act of 1974: The preferred alternative would not occur in an area of known historic or scientific interest and is not expected to result in the loss of destruction of significant scientific, historical or archeological data.
- Archaeological Resources Protection Act of 1979, as amended: The proposed action and alternatives would not involve the excavation of archaeological sites.
- Architectural Barriers Act: No modifications to trails or parking areas are planned under the preferred alternative.
- Coastal Barriers Resources Act of 1982: The preferred alternative would not occur on the coast.

- Coastal Zone Management Act of 1972, as amended: The preferred alternative would not occur on the coast.
- Consultations for Essential Fish Habitat: This consultation requirement is only applicable to marine fish and shellfish. The preferred alternative would not occur in a marine environment.
- Emergency Wetlands Resources Act of 1986: No wetlands would be purchased under the preferred alternative.
- Executive Order 11644, Use of Off-Road Vehicles on Public Land: No off-road motor vehicle trails would be modified, designated or established under the preferred alternative.
- Executive Order 12866, Regulatory Planning and Review: No changes to new or existing regulations would occur under the preferred alternative.
- Executive Order 13563, Improving Regulation and Regulatory Review: No changes to new or existing regulations would occur under the preferred alternative.
- Farmland Protection Policy Act of 1981, as amended: The preferred alternative would not convert farmland to nonagricultural uses.
- Federal Cave Protection Act of 1988: No caves exist within the proposed action area.
- Plant Protection Act of 2000: The preferred alternative would not include the interstate commerce of federally designated noxious weeds.
- Fishery (Magnuson) Conservation and Management Act of 1976: The preferred alternative would not occur in a marine environment.
- Lacey Act of 1900: The preferred alternative would not involve the importation, exportation, transportation, sale, receipt, acquisition or purchase of any fish, wildlife or plants.
- Marine Mammal Protection Act of 1972, as amended: The preferred alternative would not occur in a marine environment.
- National Historic Preservation Act of 1966, as amended: The preferred alternative would have no impact on cultural and historic resources.
- Native American Graves Protection and Repatriation Act of 1990: The preferred alternative would not occur in an area with known Native American cultural items or involve the repatriation or transfer of such items.
- Paleontological Resources Protection Act of 2009: No paleontological resources exist within the proposed action area.
- Rivers and Harbors Act of 1899: There are no navigable waterways in the proposed project area.
- Resource Conservation and Recovery Act of 1976: The preferred alternative would not involve hazardous waste.
- Safe Drinking Water Act of 1974: No potable water exists in or near the proposed action area.

- Water Resources Planning Act of 1965: The preferred alternative would not require review by the Water Resources Council because no river basin plans, or federal water projects would occur.
- Wild and Scenic Rivers Act of 1968, as amended: No designated wild and scenic rivers occur within the proposed action area.
- Wilderness Act of 1964, as amended: No designated wilderness areas occur within the proposed action area.

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Appendix B: Figures

Figure 1: Minnesota Valley and Davis Creeks Watershed

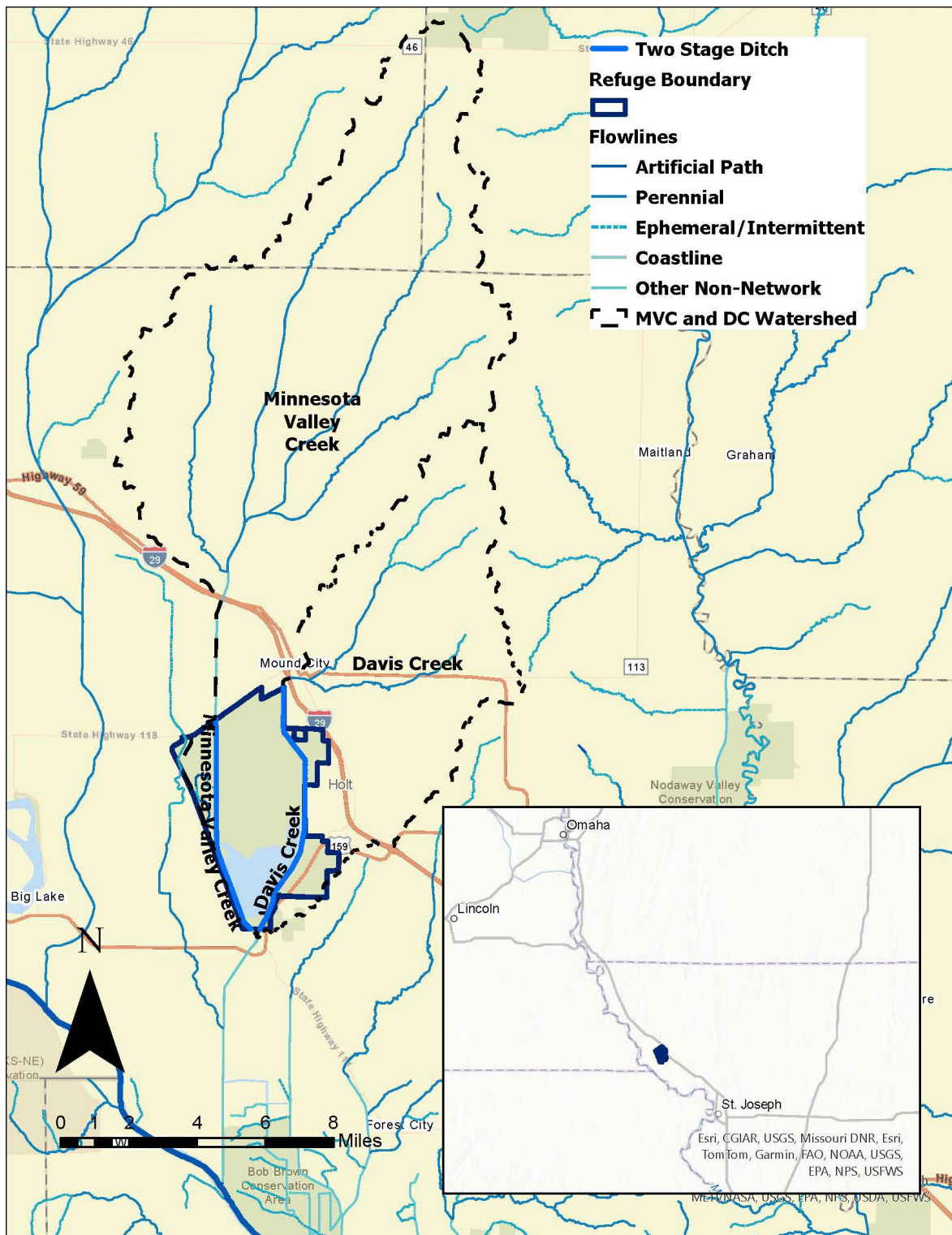


Figure 2: Minnesota Valley and Davis Creeks and Wetland Units

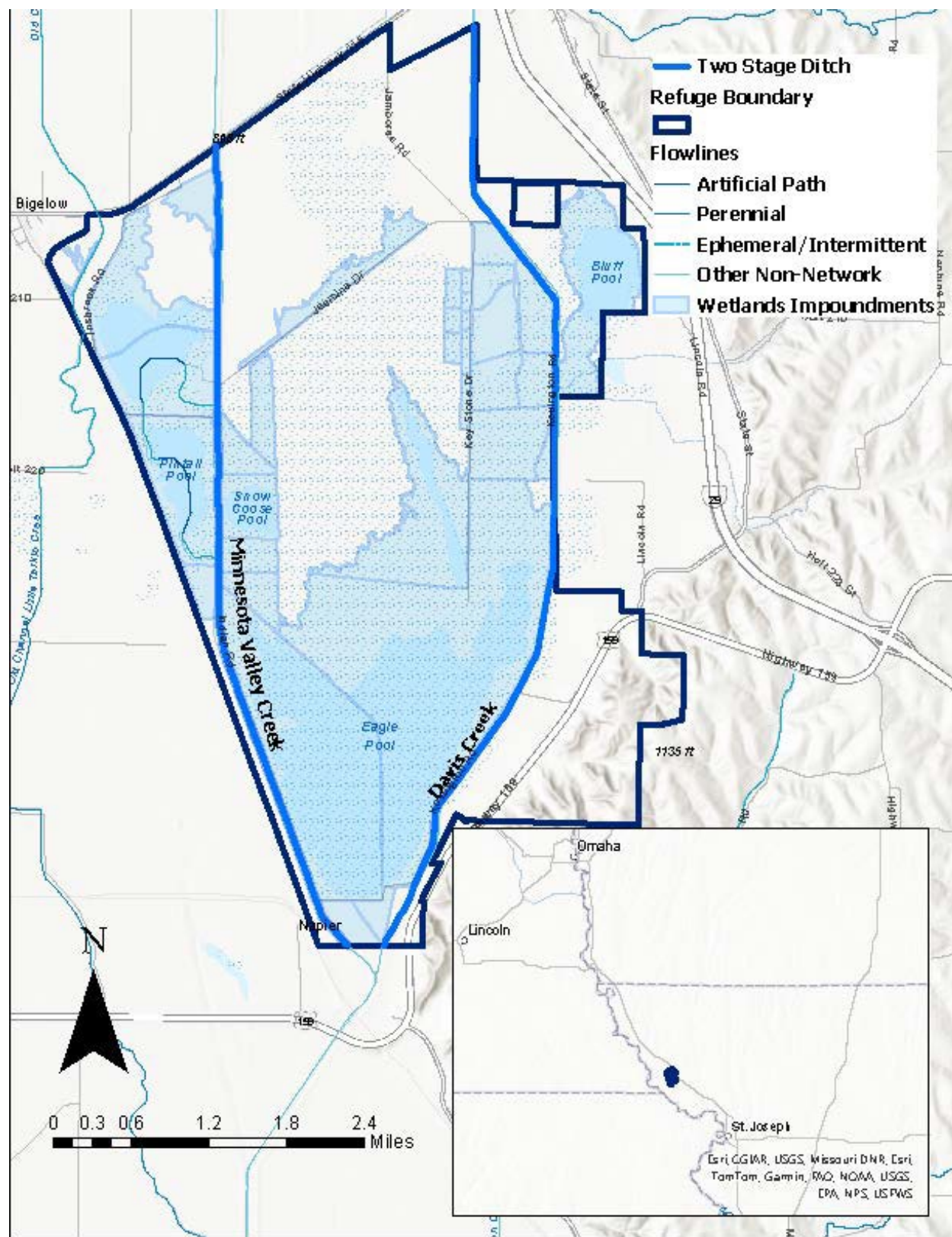


Figure 3: Vegetation Communities of Loess Bluffs National Wildlife Refuge

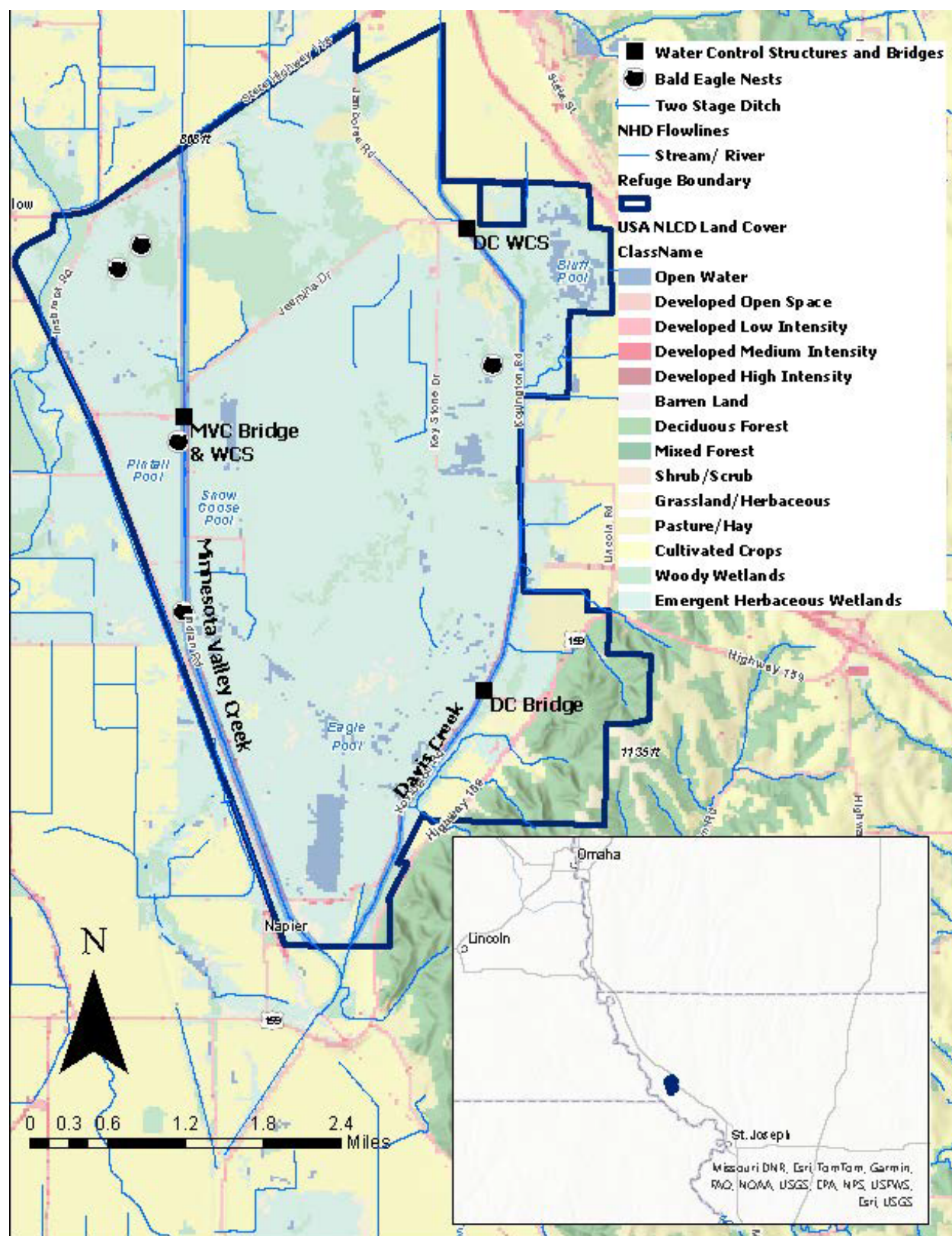
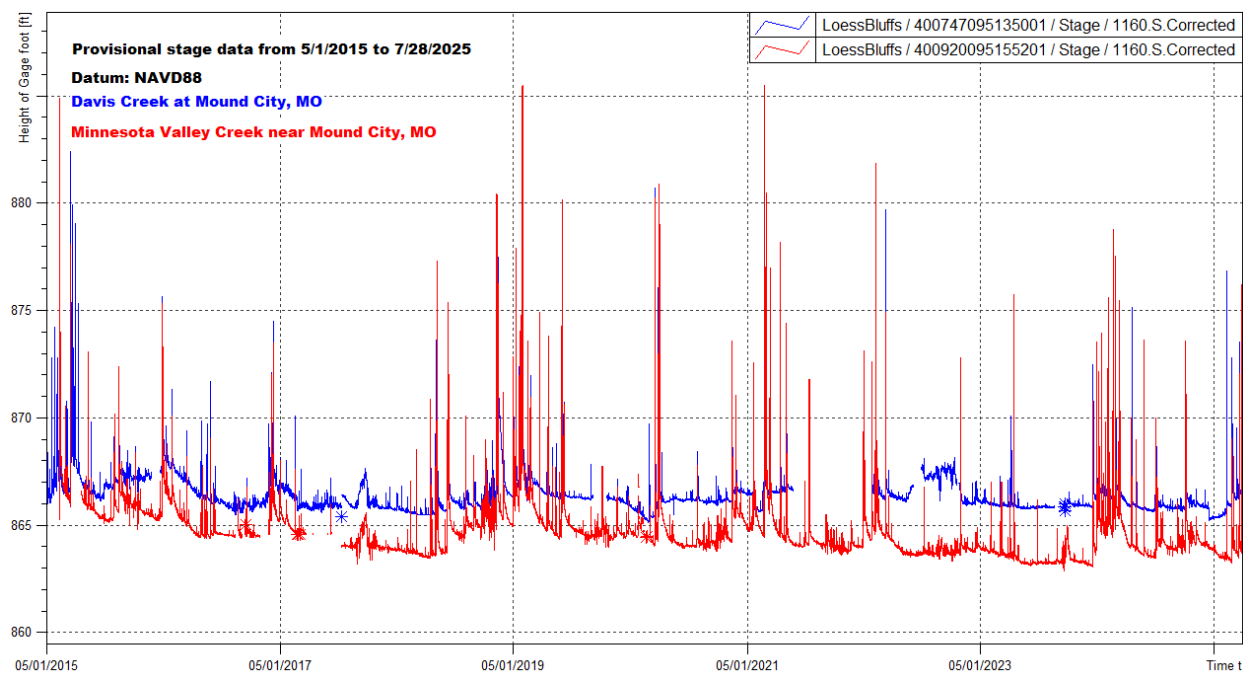


Figure 4. Provisional water level stage data from Minnesota Valley and Davis Creeks, 2015 – 2025.



Appendix C: Summary of Comments

Hold for final environmental assessment

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Appendix D: Finding of No Significant Impact

Hold for final environmental assessment

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