



U.S. DEPARTMENT OF AGRICULTURE

Natural Resources Conservation Service

EAXX-005-53-031-1243439916

August 2026

Cottonwood 21-A Dam Rehabilitation Environmental Assessment



For More Information Contact:

Melissa Baier
1121 Lincoln Mall Room 360
melissa.baier@usda.gov
402-437-4065

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the State or local Agency that administers the program or contact USDA through the Telecommunications Relay Service at 711 (voice and TTY). Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Mail Stop 9410, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

USDA is an equal opportunity provider, employer, and lender.

1.0 PROPOSAL INFORMATION

1.1 General Information

Proposal Name: Supplemental Watershed Plan No. 5 for the Rehabilitation of Floodwater Retarding Structure No. 21-A Cottonwood Creek

NRCS NEPA Unique ID #: EAXX-005-53-031-1243439916

Proponent Name: Lower Platte North Natural Resources District

Signing Authority: Responsible Official

Responsible Official: Robert D. Lawson

Unit: Nebraska State Office, Natural Resources Conservation Service

General Location of Proposal: The dam is in Section 10 of Township 15 North and Range 6 East in Saunders County, Nebraska, about 1 mile north of the small village of Malmo, Nebraska, in the Cottonwood Creek Watershed.

1.2 Purpose and Need: Why do we need to act?

The purpose of the project is to reduce the risk of loss of life and property due to catastrophic dam failure and continue the level of flood protection that is currently provided by the dam while minimizing environmental, economic, social impacts, and comply with applicable dam safety and performance standards.

The project is needed to maintain flood protection downstream and to address dam safety and performance deficiencies of the existing high-hazard dam that are not in compliance with NRCS and the Nebraska Dam Safety Agency – Department of Water, Energy, and Environment (DWEE) standards.

1.3 Proposed Action: What are we proposing to do?

The proposed action (Alternative 4) is to rehabilitate Cottonwood 21-A to high hazard potential standards and construct a new auxiliary spillway.

The major improvements that are planned for the structure include the key areas relating to the removal of the existing earthen auxiliary spillway, increases in the embankment height, improvements to the county road profiles that follows the top of dam, addition of a new earthen auxiliary spillway, installation of a toe drain system, and addition of shoreline protection along the upstream face of the dam. These major items are further described below.

The following measures would be implemented to rehabilitate the Cottonwood 21-A dam to high hazard standards:

- Strip approximately 2 acres of topsoil within the existing auxiliary spillway footprint to obtain suitable foundation for construction of the earthen embankment.

- Construct a raised earthen embankment by placing and compacting approximately 18,750 CY of fill material along 1500 linear feet of roadway. The existing top of dam will be elevated by approximately 4 feet and have a level top elevation from the West abutment to the East abutment. The side slopes will be consistent with the existing embankment slope with a top of dam width of 30 feet.
- Strip topsoil within a 6-acre footprint of the proposed auxiliary spillway, excavate borrow material to be used for construction of the earthen embankment fill, and construct a new proposed auxiliary spillway structure that is approximately 800 feet long, 200 feet wide, and has a 200-foot level crest. An excess of about 47,000 cubic yards of excavation material will be placed on the downstream side of the existing auxiliary spillway.
- Place riprap aggregate for shoreline protection along 1400 linear feet of wave berm on the upstream face of the dam.
- Install 260 linear feet of slotted drainpipe encased in 220 linear feet of filter sand to construct a toe drain at the base of the embankment. This drainpipe is designed to daylight to the existing plunge pool.
- Construct an earthen berm and diversion channel around the existing cemetery adjacent to a tributary of Cottonwood Creek. This cemetery is located about 5/8th of a mile downstream of the proposed auxiliary spillway. The berm and diversion channel will be constructed to protect an existing cemetery in the event of a PMF that activates the new auxiliary spillway and flows through an existing ephemeral stream channel. The average height of the berm would be 3 feet and it would have a 8-foot wide top with 4:1 side slopes. The diversion channel would measure approximately 330 feet long, have a bottom width of 6 feet, and side slopes of 4:1.
- After implementation of the Proposed Action, the Cottonwood 21-A dam would meet all current DWEE and NRCS safety and performance standards.

1.4 Alternatives to the Proposed Action: Are there other ways to meet the purpose and need?

Alternative 5 (Action Alternative 1) proposes to rehabilitate the dam to high hazard potential standards by modifying the existing spillway. This alternative would maintain the High Hazard Potential classification and meet current dam safety criteria. The dam must effectively contain and route the PMF safely through the auxiliary spillway. The existing auxiliary spillway would be widened and the county road over the dam would be improved. The upstream wave berm would be lined with riprap for shoreline protection and a seepage blanket installed to protect from potential under dam seepage issues.

Alternative 6 (Action Alternative 2) proposed to rehabilitate the dam to significant hazard potential standards and remove three residences from the downstream breach inundation zone.

1.5 Alternatives Considered but Not Analyzed in Detail

Alternative	Description	Meets Purpose and Need	Reasonable	Practicable	Complete, Effective, Efficient, and Acceptable (PR&G)
LPNNRD Financed Alternative	This alternative would include an extension of the dam embankment on the east end of the downstream side to protect the embankment toe and contain flows in the auxiliary spillway outlet channel. The county road profile would not change.	No. Passing the PMP is part of the overall flood risk management of the structure. The potential for an uncontrolled breach is inconsistent with the Purpose of maintaining downstream flood damage reduction benefits	Yes, other than the project not meeting Purpose and Need.	Yes, other than the project not meeting Purpose and Need.	No, this is not acceptable because it does not meet the federal objective relative to avoiding unwise use of floodplains and flood-prone areas.
Dam Decommissioning	This alternative would include dam removal and the addition of modifications to the county road to perform as a grade control structure. This alternative includes site	Yes	No. Alternative would create the need to re-map the FEMA 100-year floodplain and would likely result in four (4) residences within the 100-year floodplain.	No. Decommissioning would reduce pond fringe wetlands, wetland habitat, water quality benefits, and increase negative impacts to downstream crop production,	No. Cost of dam decommissioning is not insignificant due to the amount of reclamation needed. Alternative would create the need to re-map the FEMA 100-year floodplain and would likely result in four (4)

Alternative	Description	Meets Purpose and Need	Reasonable	Practicable	Complete, Effective, Efficient, and Acceptable (PR&G)
	reclamation back to pre-project (no dam) conditions and installation of an adequately sized county road culvert to meet NRCS design standards. The NRCS would also maintain an easement for downstream culvert outlet riprap protection. This alternative would have no flood control benefits.		Dam decommissioning is not a reasonable alternative due to the potential social and environmental impacts.	public infrastructure, and private homes.	residences within the 100-year floodplain. Downstream bridges and culverts are not sized correctly and would need replacement (at County's/Community expense) to minimize roadway overtopping and additional flood damages. The cost of dam decommissioning and loss of benefits creates an inefficient and unacceptable alternative.
Structural Rehabilitation to Low Hazard	This alternative would rehabilitate the floodwater structure to Low Hazard status.	No, this alternative does not comply with Low Hazard dam design criteria based on the downstream flood impact to U.S. Highways	No, does not meet NRCS or state standards for low hazard dam.	Yes, other than the project not meeting Purpose and Need.	No, this is not acceptable because it does not meet the federal objective relative to avoiding unwise use of floodplains and flood-prone areas, nor does it comply

Alternative	Description	Meets Purpose and Need	Reasonable	Practicable	Complete, Effective, Efficient, and Acceptable (PR&G)
		92 and 77. To meet Low Hazard status, the breach inundation downstream may not overflow a main roadway by more than 1' of depth. Highway 92 and U.S. Highway 77, which are main roadways are downstream of the dam and would be inundated by more than 1' of water in the instance of a breach. Therefore, this alternative does not meet the Purpose and Need of maintaining existing flood			with dam safety standards.

Alternative	Description	Meets Purpose and Need	Reasonable	Practicable	Complete, Effective, Efficient, and Acceptable (PR&G)
		damage reduction benefits.			

1.6 Scope of Analysis

The following describes how the agency drew a reasonable and manageable line relating to its consideration of environmental effects from the proposed action (and action alternatives, if any) that extend outside the geographical territory of the proposal or might materialize later in time.

The scope of analysis is identified as the affected resource area (ARA) and includes all areas that could be physically affected by activities associated with construction of the proposed action, including but not limited to utility relocates, access routes, construction staging areas, alterations to existing dams, excavation footprints, grading, tree removal, alterations to existing roads, inundation of permanent and flood pool areas, temporary flooding easements, and sediment disposal as well as areas considered for potential visual and other effects to cultural resources. The scope of analysis also included potential hydrological impacts to Bethesda Cemetery, which is located downstream from the proposed new auxiliary spillway and could be flooded by storm events that activate the new auxiliary spillway. The ARA totals 526 acres of which 190 acres could experience direct effects from ground disturbing activities or inundation.

1.7 Agencies and Persons Consulted

Given the nature of the proposal, the responsible official consulted the following agencies, organizations, tribes, and persons during development and analysis of the proposal:

Agencies

Federal	State	Local
U.S. Fish and Wildlife Service	Nebraska Department of Health and Human Services	Saunders County Clerk
U.S. Geological Service	Nebraska Department of Transportation	Saunders County Planning and Zoning
U.S. Environmental Protection Agency	Nebraska Department of Natural Resources	Saunders County Highway Department
U.S. Army Corps of Engineers	Nebraska Department of Energy and Environment	
Federal Emergency Management Administration (FEMA) Region VII	Nebraska State Historic Preservation Office	
Farm Service Agency	Nebraska Department of Agriculture	
	Nebraska Game and Parks Commission	

Organizations/Businesses

Center for Rural Affairs

Native American Tribes

Ponca Tribe of Nebraska	Mandan, Hidatsa, and Arikara Nation	Otoe-Missouria Tribe of Indians, Oklahoma
Pawnee Nation of Oklahoma	Omaha Tribe of Nebraska	Ponca Tribe of Indians of Oklahoma

Individuals

Citizens and property owners within the Cottonwood Creek Watershed were invited to public meetings about the project and were invited to comment on the project.

Table 1: Applicable proposal record documentation to support agencies/persons consulted

Documentation Type	File Name (if applicable/needed)
Cottonwood Creek Watershed Plan Supplement No. 5	Appendix A

1.8 Substantive Issues Considered for Analysis

RESOURCE CONCERNS	RATIONALE
Soils Resources, Erosion, and Sedimentation	Erosion has occurred along the pond shoreline and contributes to water quality degradation and decreases habitat quality. Sediment has accumulated in the pond.
Prime and Unique Farmland	Prime farmland exists within the watershed planning area.
Geology	Geologic investigations and further detailed analysis for the purpose of structure design and integrity will be required as outlined in TR-60 for review of structural and seismic conditions of a dam with a High Hazard Classification.
Geotechnical Considerations	Geotechnical investigations will be needed to evaluate dam integrity and alternatives.
Floodplain Management	The watershed planning area includes mapped floodplain therefore any development in regulatory floodplain would require a Floodplain Development Permit.
Regional Water Resource Plans	There is an existing NRCS watershed plan for the Cottonwood Creek Watershed. Additionally, there is a Platte River Recovery Implementation Plan that outlines guidance to evaluate potential depletions to the Platte River downstream. The Lower Platte River Corridor Alliance has developed projects and reports focused on water quality, environmental suitability, and habitat impact studies.
Surface Water	Surface water quantity and conveyance is impacted by the Cottonwood 21-A structure.
Groundwater	Potential impact to local groundwater in immediate vicinity of Cottonwood 21-A structure.

RESOURCE CONCERNS	RATIONALE
Waters of the U.S.	Section 404 of the Clean Water Act would be addressed for proposed actions in the watershed involving wetlands and Waters of the U.S. through USACE Clean Water Act Section 404 regulatory process.
Water Quality	Sections 401 and 404 and Section 303d of the Clean Water Act would be addressed by proposed actions through Nebraska Department of Water, Energy, and Environment (DWEE) and USACE permitting compliance processes.
Air Quality	Potential to impact air quality during construction activities.
Vegetation Communities and Habitat	Potential to impact upland and floodplain vegetation communities and habitat.
Wetlands	Wetlands exist within watershed and actions will comply with Executive Order Section 11990 and the Food Security Act of 1985.
Riparian Areas	Riparian areas exist within watershed and may be impacted.
Federal and State-Listed Plant Species	Listed species have known ranges downstream in Platte River watershed.
Invasive Species	Invasive and noxious weed species exist within the watershed. These species could be spread by activities involving transport of vegetation from one location to another within watershed.
Fish & Wildlife Species	Fish and wildlife species exist within the watershed.
Migratory Birds and Eagles	Project activities will adhere to the Migratory Bird Treaty Act and the Bald Eagle & Golden Eagle Protection Act that require avoidance of direct impacts to migratory birds and eagles though timing restrictions
Federal- and State-Listed Animal Species	Listed species may have known ranges in the watershed or downstream.
Fish and Wildlife Coordination Act	The United States Fish and Wildlife Service (USFWS) will investigate and report on the proposed action and provide recommendations to minimize impacts on fish and wildlife resources (USFWS, 2023).
Cultural Resources/ Historic Properties	Rehabilitating the dam has the potential to impact historic properties. Potential impacts to historic properties and cultural resources will be investigated for each alternative.
Land Use	No significant land use changes are anticipated within the watershed. Private land could be impacted by impoundment modifications.
Natural Areas and Parklands	Natural areas and public properties exist within watershed.

RESOURCE CONCERNS	RATIONALE
Public Health and Safety	Impoundment provides flood safety benefits to downstream community.
Transportation/ Infrastructure	Dam impoundment is a county road.
Provisioning Services	Agricultural and pastureland exists in the watershed.
Regulating Services	Watershed provides flood control and water filtration through wetland habitats.
Supporting Services	Wetland habitats within watershed provide nutrient cycling and soil formation.
Cultural Services	Recreational public lands are located within the watershed.

1.9 Issues Considered but Dismissed from Detailed Analysis

RESOURCE CONCERNS	RATIONALE
Coastal Zone Management Area	No coastal zone management area occurs within watershed planning area. The State of Nebraska does not have a Coastal Zone Management Program. NOAA 2025a. "Coastal Zone Management Programs." Accessed . https://coast.noaa.gov/czm/mystate/
Coral Reefs	No coral reefs occur within the watershed planning area. The State of Nebraska does not have a Coastal Zone Management Program NOAA 2025a. "Coastal Zone Management Programs." Accessed. https://coast.noaa.gov/czm/mystate/
Wild and Scenic Rivers	There are no designated Wild and Scenic Rivers in the watershed. National Park Service. 2025. "Nationwide Rivers Inventory Official." Accessed. https://public-nps.opendata.arcgis.com/datasets/105a104d5a3043b0ba2a25e31ecf3ff1_0/explore?location=42.369499%2C-102.691477%2C9.87 .
Sole Source Aquifers	There are no sole source aquifers in the watershed. EPA 2025. "Sole Source Aquifers." Accessed https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b .
Ecologically Critical Areas	There are no ecologically critical areas in watershed. NGPC 2025. "Biologically Unique Landscapes of Nebraska." https://www.arcgis.com/apps/MapJournal/index.html?appid=a1c36663b34145b49886e7fbbf2ae581
Forest Resources	There are no significant forest resources within the watershed. This link includes a map of National Forest Lands: https://data.fs.usda.gov/geodata/rastergateway/data3/National/Chiefs_map.pdf

RESOURCE CONCERNS	RATIONALE
Essential Fish Habitat	There is no Essential Fish Habitat within the watershed. NOAA 2025b. “Essential Fish Habitat Mapper.” Accessed https://www.habitat.noaa.gov/apps/efhmapper/
Scenic Beauty	No specifically designated unique or valuable scenic landscapes within the area.
Significant Scientific Resources	No significant scientific resources have been currently identified within the planning area (see map in Appendix C).

2.0 ENVIRONMENTAL REVIEW & CONSULTATION

The following documents compliance with the National Environmental Policy Act (NEPA) and other relevant environmental laws, executive orders, and regulations.

2.1 NEPA: Consideration of Reasonably Foreseeable Impacts

2.1.1 Potentially Affected Environment

Soil Resources, Erosion, and Sedimentation

Soils in the ARA include Judson silt loam; Yutan, eroded Judson complex; and Nodaway silt loam. Sedimentation is the portion of total erosion that is transported from its point of origin and delivered to a specific location such as the stream system or the watershed outlet. The Cottonwood 21-A original design storage identified 209.3 acre-feet (89%) of submerged sediment and 26.8 acre-feet (11%) of aerated sediment. In fall 2023, a bathymetric survey was performed at Cottonwood 21-A. This 2023 bathymetric surface was compared against the as-built lake bottom contours from 1983 to estimate sedimentation in the lake since construction. The volumetric comparison between original storage and the current storage shows 35.61 acre-feet of submerged sediment has accumulated since construction was completed. This equates to a sedimentation rate for the watershed of 0.89 acre-feet per year.

Prime and Unique Farmland

Over 33% of the ARA is prime farmland and 32.5% of the ARA consists of soils of statewide importance.

Geology

Within the Cottonwood 21-A project watershed, unconsolidated surficial deposits are dominated by Quaternary Alluvium within stream channels and landscape mantled Late Pleistocene Peoria Loess that is underlain with Pre- Illinoisan glacial till. The University of Nebraska – Lincoln Conservation Survey Division bedrock and isopach maps (1975) and USGS glacial mapping (2003) indicate loess thickness ranges from approximately 50 to 66 feet in the region, overlying ~50–150 feet of till. Depth to bedrock typically ranges from 100 to 200 feet below ground surface (Fullerton et al., 2003; Burchett et al., 1975). At this contact is the underlying consolidated bedrock of the Cretaceous-age Dakota Group, a nearshore fluvial unit composed primarily of brown-red sandstones and siltstones (Burchett et al., 1975). The Dakota represents the earliest preserved

Cretaceous bedrock in Nebraska and was deposited during the Late Albian to Early Cenomanian stages of the period. Deposition of the Dakota coincides with the initial stages of marine transgression in the Western Interior Seaway, a broad epeiric sea that inundated much of the central interior of the North American continent during the Mesozoic era (Blakey, 2023; Joeckel et al., 2017). Unlike other marine depositions within the Cretaceous, the Dakota Group reflects terrestrial depositional environments, including fluvial, estuarine, and near shore-marginal marine settings (Joeckel et al., 2017).

Floodplain Management

The 100-year floodplain of the Cottonwood Creek and Cottonwood 21-A subwatershed has been mapped by the Federal Emergency Management Agency (FEMA). The 500-year floodplain has been mapped from the Cottonwood 21-A dam downstream to the village of Malmo. The 100-year floodplain includes mapped Zone A.

Regional Water Resource Plans

The “Watershed Work Plan for Watershed Protection and Flood Prevention for Cottonwood Creek Watershed” was completed in January 1965. The plan was a watershed work plan agreement between the Saunders Soil and Water Conservation District, Cottonwood Creek Watershed Conservancy District, and USDA Soil Conservation Service. This watershed work plan pre-dated the establishment of NRDs in Nebraska. The plan identified 12 floodwater retarding structures (including Cottonwood 21-A), channel improvements, and land treatments to address flooding and erosion damage in the watershed. These structures were constructed between 1967 and 1990. Cottonwood 21-A was completed in 1983.

LPNNRD has partnered with Nebraska Department of Water, Energy, and Environment (DWEE; formerly known as Nebraska Department of Environment and Energy and the Nebraska Department of Natural Resources) completing EPA nine element Water Quality Watershed Plans and NRCS (Water Quality Initiative Plans) for Cottonwood Creek, which is a subwatershed of Wahoo Creek. LPNNRD has also completed and updated Hazard Mitigation Plans that include the watershed.

In 1996, the Lower Platte River Corridor Alliance (LPRCA) began as a consortium of three NRDs and six agencies dedicated to working with people to protect the long-term viability of the Lower Platte River Corridor. The reach designated as the Lower Platte River is downstream of Cottonwood 21-A and includes the habitat ranges of a number of threatened and endangered species. The LPRCA has developed a number of projects and reports focused on water quality, environmental suitability, and habitat impact studies.

In 2017, the Lower Platte River Basin Coalition (Coalition) developed a basin-wide water management plan. The plan provides guidance for Coalition members to develop water use policies and practices that contribute to protection of existing surface and groundwater uses while also allowing for future development. The Coalition is comprised of seven NRDs (including LPNNRD) and DWEE. The Coalition prepares annual basin-wide reports.

Surface Water

Cottonwood Creek watershed is one of six subwatersheds in the Wahoo Creek watershed which drains into the Platte River near Ashland, Nebraska.

Groundwater

As mapped by the University of Nebraska Conservation and Survey Division (CSD), the Cottonwood Creek watershed is primarily supported by Paleovalley Aquifers. The region is also underlain and surrounded by the Dakota Aquifer, also referred to as the Maha Aquifer. Generally, Paleovalley aquifers are comprised of unconsolidated sand and gravel deposits and are the product of glacial and glaciofluvial deposition within the Pleistocene. According to the CSD Groundwater and Geology Data Portal, the groundwater levels in the Cottonwood 21-A subwatershed have oscillated on average from -5 to +5 feet from baseline between the years of 1981-2021.

Wetlands and Waters of the U.S.

TFG scientists conducted a wetland delineation on September 6, 2023, in accordance with the USACE 1987 Delineation Manual and the Midwest Regional Supplement. TFG staff employed routine wetland delineation methods to record vegetation, soils, and hydrology parameters at plot locations. Plot locations were paired to determine the boundary line between wetland and upland along the shoreline of Cottonwood 21-A.

Field-delineated wetland boundaries were determined utilizing the wetland delineation paired plot data locations as well as topographical survey information in conjunction with critical elevations on the dam riser outlet structure. LEICA GPS survey equipment with sub-centimeter accuracy was used to survey the wetland delineation plot locations as well as the outlet structure elevations. A wetland delineation map and site photographs (ground level and drone images) are included below.

Wetland delineation data were collected at 5 locations around the perimeter of the Cottonwood 21-A waterbody. The wetland delineation field investigation identified 7.67 acres of PEMC (palustrine emergent vegetation, seasonally flooded) wetlands in the ARA.

Cottonwood 21-A Wetland Delineation Data

Sample ID	Wetland Group	Wetland Classification	Area
Plots 1A, 2A,3A,4A	Pond Fringe	PEMC	7.3 acres
Pond	Open Water	L1HBHh (open water)	20.9 acres
Plot 6A	Pond Fringe	PEMC	0.07 acres
Plot 6B	Plunge Pool	PEMC	0.12 acres
Plot 7A	Old Channel, seepage area	PEMC	0.18 acres
Plots 1B,4B	Upland	N/A	N/A

Water Quality

Nebraska has developed Title 117-Nebraska Surface Water Quality Standards (NeWQS) which are state standards in effect for Clean Water Act (CWA) purposes for which EPA has deferred action. For aquatic life, the standards include pH, temperature, dissolved oxygen, ammonia, and conductivity.

The 2022 NDEE (DWEE) Nebraska Water Quality Integrated Report is a combination of the Section 303(d) list of impaired waters and the Section 305(b) water quality report. This report provides the public information on the status of Nebraska waters and allows for future water quality management planning (future monitoring, TMDL development, and watershed improvement implementation).

The Integrated Report includes five waterbody categories to present information in a descriptive and comprehensive manner. Cottonwood Creek is listed as waterbody ID LP1-10210 (Lower Platte) and as a Category 3 water supply which is categorized as having insufficient data to determine if any beneficial uses are being met.

Air Quality

No increase in pollutant emissions is anticipated in the project area of Cottonwood 21-A. Saunders County is currently meeting all national ambient air quality standards (US EPA 2020). Although construction activities could result in some carbon dioxide emissions from construction equipment, these emissions would be relatively minor compared to the emissions of the county overall.

Vegetation Communities and Habitat

The Cottonwood 21-A drainage basin includes a variety of upland, riparian and aquatic vegetation communities. Upland vegetation includes pastureland, row crop farmland, riparian and forested land. The floodplains contain pastureland, aquatic and wetland vegetation, and riparian corridors.

Wetlands

Executive Order 11990 requires that Federal agencies take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the beneficial functions of wetlands when “providing federally undertaken, financed or assisted construction and improvements.” Additionally, the NRCS Food Security Act of 1985 included wetland conservation provisions that “were enacted to assist in protecting the values, acreage, and functions of the Nation’s wetlands.” Freshwater wetland habitat exists in the watershed floodplains and along the open water fringes of the Cottonwood 21-A water body. Common wetland vegetation observed around the pond include broad-leaf cattails, bulrushes, smartweed and arrowhead.

Wetland Delineation Data in the ARA

WETLAND TYPE	ACRES
Open Water (Lacustrine)	20.9
Fringe Wetland (Palustrine)	7.3

Riparian Areas

The unnamed tributary that flows into Cottonwood 21-A is perennial stream immediately upstream of the open waterbody. The tributaries that contribute to Cottonwood 21-A

range from perennial to intermittent depending on precipitation and time of year. Riparian areas throughout the watershed range from forested to vegetated with grasses and wetland vegetation. There are an estimated 120 acres of riparian corridors with woody and grassland vegetation (ranging from 30 feet to 350 feet wide) within the watershed. The riparian acreage was estimated based on NHD flowline segments and aerial imagery.

Federal and State-Listed Species (Plants)

The Endangered Species Act of 1973 provides a framework to conserve and protect threatened and endangered (T&E) species, and their habitats while the Fish and Wildlife Coordination Act of 1934, as amended through PL 116-188 and enacted in 2020, which directs the USFWS to investigate and report on proposed Federal actions and provide recommendations to minimize impacts on fish and wildlife resources.

The Nebraska Nongame and Endangered Species Conservation Act of 1975 is a state law that “automatically prohibits its take, exportation and possession, and imposes severe penalties” for a species listed as endangered in Nebraska. By officially designating a species as endangered or threatened, plans can be put in place to restore the species or to prevent extirpation or extinction.

On May 28, 2025, both the US Fish and Wildlife Service’s (USFWS) Information for Planning and Consultation (IPaC) Tool and the Nebraska Game and Park Commission’s (NGPC) Conservation and Environmental Review Tool (CERT) were run to determine the initial list of plant species with habitat ranges that intersect the boundaries of the sub-watershed. The Western prairie fringed orchid has a habitat range either within or downstream of the watershed boundary. There were no other listed plant species in the planning area.

There are currently no plant species undergoing proposed-listing review.

Below are the suitable habitat descriptions for each of the plant species listed in the opening section paragraph based off of information gathered from IPaC and CERT reports:

Western Prairie Fringed Orchid (*Platanthera praeclara*) – Federally and State Threatened

This orchid is a native perennial forb distinguished by large, white flowers on a single stem that grows up to three-feet high. Each flower stalk has up to 40 flowers that have fringed margins and are approximately one-inch-long. It was historically found throughout the tallgrass prairie regions of central United States and grows in wet to drier prairies. Habitat includes wet to moist calcareous or loess soils in unplowed tallgrass prairies and meadows as well as bogs, fens, and sedge meadows. It can also be found in the sandy sub-irrigated meadows in the Sandhills.

The greatest threat to the Western prairie fringed orchid is habitat loss and fragmentation, predominantly through the conversion of habitat for crop production, grazing, intensive haying, and drainage. Additional threats include overuse of herbicides, livestock overgrazing, and other detrimental practices to native prairies. The study area is within

the current range of the Western prairie fringed orchid; however, there are no records of the species because the area does not contain the necessary soil, hydrology, and vegetative conditions for the species to grow.

Invasive Species

There are a number of invasive plant species in Nebraska that can be found in the watershed including phragmites, Eastern redcedar, reed canary grass, and musk thistle. Other invasive species such as purple loosestrife and leafy spurge may also exist in watershed. Invasive species threaten the regions' biological diversity. Smooth brome, Kentucky bluegrass, reed canary grass, wheatgrass, purple loosestrife, Eurasian phragmites, sericea lespedeza, garlic mustard, Eastern redcedar, and other species have competitively excluded native plants and degraded habitat. Other plant species causing stress include narrow-leaf cattail and saltcedar (NE Legacy Project).

Fish and Wildlife Species

The project area lies in a region with an abundance of wildlife. Eastern Nebraska boasts more than 300 species of documented birds, 55 mammal species, 53 amphibious and reptilian species, and over 75 species of fish.

Most mammalian species have a widespread distribution and can be found across the state. The small mammal fauna of the region includes plains pocket gopher, prairie vole, plains pocket mouse, thirteen-lined ground squirrel, and Franklin's ground squirrel. Species such as the masked shrew and jumping mouse can be found associated with wet meadows and other wetlands. White-tailed deer are common big game animals and mule deer are infrequently found in upland grasslands. The most abundant large predator of the region is the coyote, but other predators such as the red fox and American badger can be found here as well. The bobcat, least weasel, long-tailed weasel, and American mink can be found in wooded areas, wetlands and along river valleys. The native large predators that were present prior to European settlement such as the mountain lion, black bear, grizzly bear, and gray wolf are extremely rare or extirpated from the region.

Insects are the most diverse and least studied animal group in the Tallgrass Prairie Ecoregion in Nebraska (Nebraska Natural Legacy Plan). They may also be the most important group ecologically and economically. They play vital roles as herbivores, predators, pollinators, decomposers, soil aerators, and as food for other wildlife.

Federally listed endangered and threatened species are protected under the Endangered Species Act of 1973 as amended (16 USC 1531 et seq.). The Threatened & Endangered (T&E) animal species in the watershed are discussed in Section 4.15 with State and Federal status. Adverse effects to a federally listed species or its habitat would require consultation with the U.S. Fish and Wildlife Service (USFWS) under Section 7 of the Endangered Species Act. Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of proposed, threatened, or endangered species or result in the destruction or adverse modification of their critical habitat. State listed endangered and threatened species are protected under the Nebraska Nongame

and Endangered Species Conservation Act, administered by Nebraska Game and Parks Commission (NGPC). All federally listed species are also state listed.

Regional streams, rivers, and lakes support many fish species. Among these are the channel catfish, flathead chub and river carpsucker. Game fish, primarily northern pike, largemouth bass, walleye, and bluegill have been introduced into many lakes and ponds. Exotic species such as grass, common, silver and bighead carp have found their way into most of the major rivers and lakes in the region. Within the project area, Cottonwood Creek and its tributaries have limited resources to support fish habitat (NE Legacy Project).

Migratory Birds and Eagles

The Migratory Bird Treaty Act (16 U.S.C. 703-712, MBTA) provides year-round protection for native migratory bird species that are listed under Title 50 Part 10.13. Resident and migratory birds documented in the Tallgrass Prairie Ecoregion in Nebraska (Nebraska Natural Legacy Plan) include nesting waterbirds, wood duck, green heron, northern pintail, blue-winged teal, and mallard. The region supports populations of greater prairie-chicken and a full complement of grassland birds including Henslow's sparrow, dickcissel, grasshopper sparrow, bobolink, vesper sparrow and Swainson's hawk. Along wooded stream corridors, woodland species such as Bell's vireo, black-and-white warbler, rose-breasted grosbeak, and orchard oriole are common breeding species. These species are listed under Title 50 Part 10.13.

Bald and golden eagles have specific protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, BGEPA), Migratory Bird Treaty Act and Nebraska Revised Statute §37-540. The BGEPA protects bald and golden eagles from disturbances that may interfere with their normal behavior or cause abandonment of nests. Bald eagles are most likely to occur in the project area while golden eagles are an uncommon occurrence. Construction activities in grassland, wetland, stream, woodland, and riverbank habitats that would result in impacts on the birds, their nests or eggs protected under these laws should be avoided (USFWS).

Bird species of conservation concern as detailed in the IPaC report accessed May 28, 2025, include:

- American Golden-plover (*Pluvialis dominica*)
 - Found in burned, plowed, and harvested agricultural fields, pastureland, sod farms, estuaries, mudflats, prairie and tundra
- Black-billed Cuckoo (*Coccyzus erythrophthalmus*)
 - Found in woodlands and thickets, including aspen, poplar, birch, sugar maple, hickory, hawthorn, and willow trees.
- Bobolink (*Dolichonyx oryzivorus*)
 - Prefer open areas with a mix of grasses and broad-leaved plants for breeding.
- Chimney Swift (*Chaetura pelagica*)

- Found in caves and hollow trees
- Eastern Whip-poor-will (*Antrastomus vociferus*)
 - Found in forests with open understories and deciduous and mixed deciduous-pine forests
- Grasshopper Sparrow (*Ammodramus svannarum*)
 - Found in grasslands, prairies, hayfields, and open pastures with little to no scrub cover and often with some bare ground
- Hudsonian Godwit (*Limosa haemastica*)
 - Found in freshwater tundra marshes and bogs
- Lesser Yellowlegs (*Tringa flavipes*)
 - Found in vegetated wetlands
- Pectoral Sandpiper (*Calidris melanotos*)
 - Found in wet coastal tundra dominated by grasses and sedges
- Prairie Loggerhead Shrike (*Lanius ludovicianus excubitorides*)
 - Found in open country with short vegetation and well-spaced shrubs or low trees, particularly those with spines or thorns
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)
 - Found in forest edges, orchards, open pine woods, groves of tall trees in open country
- Ruddy Turnstone (*Arenaria interpres morinella*)
 - Found nesting on high arctic tundra and along coastal habitats during migration
- Rusty Blackbird (*Euphagus carolinus*)
 - Found in wet areas including flooded woods, swamps, marshes and edges of ponds
- Semipalmated Sandpiper (*Calidris pusilla*)
 - Found on beaches and mudflats
- Short-billed Dowitcher (*Limnodromus griseus*)
 - Found in northern marshes, bogs, wet meadows, and coastal areas where boreal forests transition to tundra
- Upland Sandpiper (*Bartramia longicauda*)
 - Found in grasslands and native prairies in the Great Plains

Federal and State-Listed Species (Animals)

The Endangered Species Act of 1973 provides a framework to conserve and protect threatened and endangered (T&E) species, and their habitats while the Fish and Wildlife Coordination Act of 1934, as amended through PL 116-188 and enacted in 2020, which directs the US Fish and Wildlife Service (USFWS) to investigate and report on proposed Federal actions and provide recommendations to minimize impacts on fish and wildlife resources.

The Nebraska Nongame and Endangered Species Conservation Act of 1975 is a state law that “automatically prohibits its take, exportation and possession, and imposes severe penalties” for a species listed as endangered in Nebraska. By officially designating a

species as endangered or threatened, plans can be put in place to restore the species or to prevent extirpation or extinction.

On May 28, 2025, both the USFWS Information for Planning and Consultation (IPaC) Tool and the Nebraska Game and Park Commission's (NGPC) Conservation and Environmental Review Tool (CERT) were run to determine the initial list of animal species with habitat ranges that intersect the boundaries of the watershed. The CERT results did not include any protected areas in immediate vicinity of the project area. The Bald Eagle was listed in CERT as a regional documented species within 1 mile of the project review area. In total, 23 animal species were listed as a potential occurrences in immediate vicinity of project review area including: Henslow's sparrow, Short-eared Owl, Iowa Skipper, Nebraska Fritillary, Buff-breasted Sandpiper, Married Underwing, Whitney Underwing, Black-billed Cuckoo, Monarch, Ghost Tiger Beetle, Blanding's Turtle, Mottled Duskywing, Bucholz Black Dash, Plains Topminnow, Bald Eagle, Otoe Skipper, Loggerhead Shrike, Eastern Red Bat, Hoary Bat, Northern Long-Eared Bat, Tricolored Bat, Plains Pocketmouse, and Regal Fritillary.

Additionally, ten species are undergoing review, and are subject to re-classification before the project moves into the implementation phase. Those species include:

- American Bumble Bee (*Bombus pensylvanicus*)- Currently a non-listed species
- Blanding's Turtle (*Emydoidea blandingii*) - Currently a non-listed species
- Golden-winged Warbler (*Vermivora chrysoptera*) - Currently a non-listed species
- Plains Spotted Skunk (*Spilogale putorius interrupta*) - Currently a non-listed species
- Hoary Bat (*Lasiurus cinereus cinereus*) - Currently a non-listed species
- Little Brown Bat (*Myotis lucifugus*) - Currently a non-listed species
- Regal Fritillary (*Speyeria idalia*) - Currently a non-listed species
- Tri-colored Bat (*Perimyotis subflavus*)- Currently a proposed endangered species
- Variable Cuckoo Bumble Bee (*Bombus variabilis*) - Currently a non-listed species
- Western Bumble Bee (*Bombus occidentalis*) - Currently a non-listed species

Below are the suitable habitat descriptions for each of the species listed in the opening section paragraph based off information gathered from IPaC and CERT reports:

Northern Long-Eared Bat (*Myotis septentrionalis*) – Federally and State Endangered

In Nebraska, hibernation occurs mid-November through March for this species. During the summer, they roost either singly or in colonies underneath bark, in cavities or in crevices in both live and dead trees, and within structures like barns, sheds, and culverts. No hibernacula occur within 0.50 miles of the proposed project area. However, there is suitable roosting habitat in the proposed action area as defined on page 15-16 of the USFWS's Rangewide Indiana Bat & Northern long-eared bat Survey Guidelines.

Tri-colored Bat (*Perimyotis subflavus*) – Proposed Endangered

On September 14, 2022, the USFWS proposed to list the tri-colored Bat as an endangered species (87 FR 56381). The once common species is wide ranging across

the eastern and central United States and portions of southern Canada, Mexico and Central America. During the winter, in Nebraska, tri-colored bats hibernate in caves and mines. During the spring, summer and fall when the species is active (May through October), tri-colored bats are found in forested habitats where they primarily roost among live and dead leaf clusters of live or recently dead deciduous hardwood trees (USFWS 2021). No hibernacula occur within 0.50 miles of the proposed project area. However, there is suitable roosting habitat in the proposed action area as defined on page 15-16 of the USFWS's Rangewide Indiana Bat & Northern long-eared bat Survey Guidelines.

Piping Plover (*Charadrius melodus*) – Federally and State Threatened

Piping plovers arrive in Nebraska in mid- to late-April on the lower reaches of major rivers for breeding. Their breeding season is three to four-months long and the remaining eight to nine months of the year are spent on their wintering grounds along the Gulf of America and southern Atlantic Coast. During the breeding period, females place their eggs in depressions within the sand and typically lay around four eggs. Both parents are responsible for incubating the eggs during the 27-to-31-day incubation period. There is no suitable habitat in the vicinity of the Action Area and the only impacts would be downstream on the Lower Platte River.

Interior Least Tern (*Sternula antillarum athalassos*) – State Endangered

During the breeding season, least terns typically nest and raise young on dry riverine sandbars in wide, braided rivers, and along the shores of reservoirs and lakes. They can also be found nesting on sand and gravel piles at mining operations near rivers. There is no suitable habitat in the vicinity of the Action Area and the only impacts would be downstream on the Lower Platte River.

Pallid Sturgeon (*Scaphirhynchus albus*) – Federally and State Endangered

Pallid sturgeons are bottom dwelling, slow growing fish that feed primarily on small fish and immature aquatic insects. There is no suitable habitat in the vicinity of the Action Area and the only impacts would be downstream on the Lower Platte River.

Monarch Butterfly (*Danaus plexippus*) – Proposed Federally Threatened

Monarchs lay their eggs on milkweed host plants during the breeding season and the larvae feed on milkweed plants. Adult monarch butterflies pollinate many flowering plants. Monarchs migrate to warmer areas for the winter. Grassland areas exist within and near the Action Area which may contain flowering plants, including milkweed, which may support the monarch during various portions of their life cycle.

Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*) – Proposed Federally Endangered

This species of bumblebee is known to occupy open grassy areas which contain flowering plant suitable for nectar and pollen collection with priority for plants such as asters and goldenrod. These nests are located at ground level and may commonly occur in abandoned rodent burrows. Grassland areas exist within and near the Action Area which may contain flowering plants and nesting colonies of other bumble bees which may support the presence of the Suckley's cuckoo bumble bee.

Fish and Wildlife Conservation Act

The Fish and Wildlife Coordination Act (FWCA) requires consultation with the U.S. Fish and Wildlife Service (USFWS) and the Nebraska Game and Parks Commission (NGPC) for the purpose of preventing loss of and damage to fish and wildlife resources in the planning, implementation, and operation of federal and federally funding, permitted, or licensed water resource development projects. The USFWS is a cooperating agency on this Supplemental Plan and will be consulted about any effects of water related projects on fish and wildlife resources prior to implementation of the projects. NGPC will also be consulted with regarding potential impacts to any state-listed species.

Cultural Resources/Historic Properties

The Area of Potential Effect (APE) for historic properties is the same as the ARA. History Nebraska's State Archaeology Office (SAO) completed an intensive cultural resource field inventory of the APE in June 2024 and October 2024. The cultural resources investigation report (see Appendix E) summarizes previous investigations and previously documented archaeological sites and architectural properties; the methods of the investigation; and describes the resources recorded by the survey in more detail.

Eight areas were subject to an intensive pedestrian survey at 20-meter transects. Ground surface visibility was generally fair to good and averaged 25%. The survey area totaled 95.5 acres. Roughly 100 acres of the APE were not surveyed. Of the areas that were not investigated, about 40 acres comprised the dam and pool. Most of the remaining unsurveyed areas in the APE were grassy and treed areas near and within the creek drainageway or extant farmsteads. Most of the agricultural fields surrounding the dam have been altered with terrace and field tile systems. No archeological materials were found during the survey. All areas of the APE that offered adequate visibility were surveyed.

Four farmsteads and one cemetery were documented during the survey. A fifth farmstead in the APE is visible on aerial photographs from 2022, but the buildings have been demolished. No archeological materials were observed at this location. All resources documented by the investigation were evaluated for NRHP eligibility following the guidance found in National Register Bulletin No. 15: *How to Apply the National Register Criteria for Evaluation*. The farmsteads and cemetery were all considered not eligible for the NRHP. NRCS determined that no historic properties would be affected by undertaking in accordance with 36 CFR 800.4(d)(1).

The Nebraska State Historic Preservation Office concurred with the NRCS determination of No Historic Properties in a letter dated May 27, 2025. The Pawnee Nation responded that the project should have no adverse effect on the cultural landscape of the Pawnee Nation in an email received June 23, 2025.

Land Use

The land use around Cottonwood 21-A is agricultural row crop and pasture. These land use patterns have remained consistent since the dam was constructed in 1983. The land is privately owned with easements held by LPNNRD for flood control management. The existing LPNNRD easement is upstream of the dam in the band of elevation contours

extending from the auxiliary spillway overflow elevation to the top of the dam (road) elevation.

Natural Areas and Parklands

NRCS defines natural areas as land and water units where natural conditions are maintained and are typically a result of minimum human intervention. These areas may be designated, owned and/or managed by the Federal government, state or local government, or private landowners. The project area is privately owned with NRCS easements for management and dam safety compliance as described in Section 4.20. The private landowner maintains the site with minimal intervention and allows select members of the public access with permission for recreational use.

Public Health and Safety

The Cottonwood 21-A dam structure was constructed to provide flood reduction safety to people, infrastructure, and other property downstream. Cottonwood 21-A is located in a rural portion of Saunders County and is comprised of farmland, pastureland, county roads and the small village of Malmø.

Transportation/Infrastructure

The Cottonwood 21-A impoundment is also a county road and provides transportation access across the Cottonwood Creek tributary. County Road P crosses the dam and provides a connection between the paved county road 78E and state Highway 79. The road is a “Farm to Market” road and commerce would be impacted if the road were impassable.

Ecosystem Services

The four ecosystem service categories of provisioning, regulating, supporting, and cultural are described below with further explanation on the specific services within the categories relevant to Cottonwood 21-A.

Provisioning services are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass. Within this watershed, these types of tangible goods would include agricultural land for crop production and pastureland for livestock production in addition to indirect impacts to cropland and pastureland for erosion and water quality. The Cottonwood 21-A structure provides flood control benefits that protect agricultural land for crop production both upstream and downstream of the dam. Furthermore, a county road crosses the dam impoundment which provides transportation as a “Farm to Market” road to distribute the tangible goods of agricultural crops grown in the watershed and livestock production.

Regulating services maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe – examples include flood and disease control, water filtration, climate stabilization, or crop pollination. For the Cottonwood 21-A watershed, the dam provides flood control and water filtration/quality improvements through sediment capture in the pond.

Supporting services refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary productions. The Cottonwood 21-A pond provides fish and wildlife habitat and sustains fringe wetland

habitat along the pond shoreline and upper portion of the pond in the contributing stream channel.

Cultural services make the world a place in which people want to live – recreational use, spiritual, aesthetic viewsheds or tribal values. In the Cottonwood 21-A watershed, there are recreational opportunities on private lands for birding, fishing, hiking, hunting, and wildlife appreciation. Watershed resources such as wetlands, streams, birds, fish, wildlife, and natural areas are all elements to cultural services. The Cottonwood 21-A dam creates a pond of open water that provides habitat for fish and wildlife habitat to support cultural services. The pond provides fishing and recreational benefits with the open water. The pond also provides aesthetic benefits by creating an open water feature on the local landscape dominated by rolling hills of agricultural production land.

The pond provides supporting services of wildlife and fish and migratory bird habitat that provides social benefits for species existence. Water quality, climate regulation, erosion regulation, and carbon sequestration support regulating services to improve public safety and property damage reduction as part of flood damage reduction. Cultural services for recreation, protection of culturally important species and creation of aesthetic viewsheds support a sense of place for humans.

Geology and Geotechnical Considerations

The affected environment surrounding the Cottonwood 21-A dam in Saunders County, Nebraska, is characterized by stable geological and watershed conditions that support the dam's rehabilitation efforts. The site lies within a region underlain primarily by lean clays, as identified through both historical and 2024 subsurface investigations. These clays are classified under the Unified Soil Classification System (USCS) and are considered stable, making them suitable for dam foundations. The upper ~100 feet of soil at the site are categorized as Site Class D (stiff soil) (NRCS 210-302-NI, 1st Ed., July 2021), which is typical for areas with dense clay or similar materials. This classification was used in seismic modeling to estimate potential ground motion impacts.

Hydrologically, the Cottonwood 21-A site is part of a watershed that has been evaluated for dam breach scenarios, although current hydraulic modeling is limited to top-of-dam elevations rather than normal pool levels which is used to determine the type of consequence of failure scenario used in seismic hazard modeling. As such, for the Cottonwood 21-A watershed area, all possible failure scenarios were modeled to holistically evaluate various site-specific seismic loading conditions. Overall, the modeled loading conditions combined with the sites geological stability determined from subsurface investigations, contribute to a primarily low seismic hazard profile, with only high consequence of failure scenarios dictating potential further seismic design considerations. The region has experienced minimal seismic activity historically, with only two minor earthquakes (magnitudes 3.3 and 3.4) recorded within 100 kilometers of the site over the past century. Additionally, no active or capable faults have been identified beneath the project area, and the nearest structural features, such as the Nemaha Tectonic Zone and Midcontinent Rift, are deeply buried and not currently classified as active within the Holocene epoch by USGS or NRCS standards. These conditions collectively indicate a low risk of seismic-induced failure, supporting the conclusion that

no special seismic design measures are currently necessary for the dam's rehabilitation. Future hydraulic modeling during design will confirm the final consequence of failure scenario that is appropriate to use for project rehabilitation purposes.

2.1.2 Environmental Impacts

What are the reasonably foreseeable short- and long-term and adverse or beneficial effects of the proposed action and alternatives (if any) on the environment, to public health and safety, on economics, and to the quality of life of the American people?

The No Action/FWOFI is the baseline upon which other alternatives are compared against. Below is a summary list of the three (3) alternatives carried forward for detailed analysis:

- Alternative 1 – No Action/FWOFI
- Alternative 4 (Proposed Action) – Rehabilitation – New Auxiliary Spillway and Cemetery Protection Berm
- Alternative 5 (Action Alternative 1) – Rehabilitation – Widen Existing Spillway
- Alternative 6 (Action Alternative 2) – Rehabilitation – Significant Hazard

The following sections describe the environmental consequences in comparison to the baseline and how the alternatives address the potential economic, environmental and social effects. The No Action/FWOFI baseline comparison for each resource category includes four aspects for quality, intensity, range, and duration as defined below:

- Quality: negligible (not much difference), positive (increase ecosystem services), or negative (decreased ecosystem services)
- Intensity: negligible (slight or not detectable), minor (measurable but small), moderate (measurable and apparent), and substantial (significant)
- Range: localized (limited to narrow area, upstream area (UA) comparison only), local (extending over a larger area including near downstream, applicable to both the UA and downstream area (DA) comparisons), and regional (also extending downstream, DA comparison only)
- Duration: temporary (transitory, days or months), short-term (greater than transitory but less than five years), and long-term (five years or longer)

Soils Resources, Erosion and Sedimentation

Alternative 1 – No Action/FWOFI

UA: An uncontrolled breach would have a negative and moderate intensity effect on soil erosion and sedimentation upstream of the dam. The impact would be localized and be temporary. The No Action could cause a potential breach of the dam structure and would remove the sediment capture functions of the existing flood control structure and lead to downstream erosion and sedimentation.

DA: An uncontrolled breach would have a negative and intense effect on soil erosion and sedimentation downstream. Sediment would move downstream, and erosion could occur due to high flows. The range of impact would be both local and regional in the Cottonwood Creek Watershed over the short-term. Without the dam for the long-term,

sediment downstream would increase moderately in a localized area and have a negative effect.

Alternatives 4 & 5 – Spillway Rehabilitation

UA: These alternatives would have a negligible and minor impact on erosion and sedimentation upstream of the dam. Dam embankment improvement measures would maintain sediment capture functions and minimize upstream headcutting and erosion. Rock riprap would be placed along the water's edge of the dam to prevent further erosion of the dam from wind and wave action.

DA: These alternatives would have a positive and substantial effect on minimizing downstream erosion and sedimentation. The impact would be local and regional and occur on a long-term basis. Dam embankment improvement measures would maintain sediment capture functions and minimize downstream erosion. For Alternative 4, a berm and diversion channel would be constructed to protect a cemetery from the PMF event in the drainage downstream of the new east auxiliary spillway. The berm impact to soil resources would be long-term in the localized area of the cemetery but negligible impact to ecosystem service quality or intensity.

Alternative 6 – Non-Structural Rehabilitation - Rehabilitation to Significant Hazard Potential

UA: This alternative would have a negligible and minor impact on erosion and sedimentation upstream of the dam. Upstream wave berm improvement measures would maintain sediment capture functions and minimize upstream head cutting and erosion. Rock riprap would be placed along the water's edge of the dam to prevent further erosion of the dam from wind and wave action.

DA: This alternative would have a positive and substantial effect on minimizing downstream erosion and sedimentation. The impact would be local and regional and occur on a long-term basis. Dam embankment improvement measures would maintain sediment capture functions and minimize downstream erosion.

Prime and Unique Farmlands

The Nebraska State Farmland Protection Policy Act (FPPA) Coordinator was consulted on 7 May 2024 and asked to review the Affected Resource Area (ARA) map coverages in comparison to Prime Farmland. The proposed ARAs contain areas of Prime Farmland, and the state coordinator completed the Farmland Conversion Impact Rating form (AD-1006) for the ARAs. The combined rating of the site is 135. The FPPA law states that sites with a rating less than 160 will need no further consideration for protection and no additional evaluation is necessary. The FPPA review materials are included in Appendix E.

Alternative 1 – No Action/FWOFI:

UA: This alternative would have a positive and moderate impact to prime and unique farmlands upstream. After an uncontrolled breach, the existing localized water body footprint could be farmed over the long-term. On the short-term, there would be nutrient loading in the old waterbody footprint soils that would likely not be conducive to crop production.

DA: This alternative would have a moderate impact to downstream farmland following an uncontrolled breach. Downstream farmland that was previously protected from stormwater runoff by the attenuation behind the dam, will now be impacted and inundated by increased flows that are no longer controlled.

Alternative 4 – Rehabilitation – New Auxiliary Spillway:

UA: There would be negligible impacts to quality and intensity of prime farmlands in the localized area upstream over the long-term.

DA: This alternative would impact 3.6 acres of prime farmland downstream of the dam embankment expansion and 0.5 acres near the cemetery for berm and diversion channel construction. This would have a negligible and minor impact over a localized area for the long-term.

Alternative 5 – Rehabilitation – Widen Existing Spillway:

UA: There would be negligible impacts to quality and intensity of prime farmlands in the localized area upstream over the long-term.

DA: This alternative would impact 2.3 acres of prime farmland downstream of the dam embankment expansion. This would have a negligible and minor impact over a localized area for the long-term.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential:

UA: There would be negligible impacts to quality and intensity of prime farmlands in the localized area upstream over the long-term.

DA: This alternative would not impact any prime farmland downstream of the dam embankment.

Geology

Alternative 1 – No Action/FWOFI:

UA/DA: There would be no beneficial or adverse impacts to subsurface geology. An uncontrolled breach would have negligible effect to the region's geological setting and sediments would remain unchanged. The impact intensity would be negligible and on a local scale in the watershed with a long-term duration.

Alternatives 4 & 5 – Spillway Rehabilitation

UA/DA: Geological materials are not expected to have a beneficial or adverse impact on the design of either alternative. Geologic and geotechnical conditions that may affect the design of this alternative would be thoroughly explored during the design phase. Per the preliminary seismic analysis conducted for this project and the USGS Quaternary Faults map, there are no active faults located near the project sites. These alternatives would have a negligible effect on the quality and intensity regarding the region's geological setting, with negligible impacts to geologic materials and sediments. These negligible impacts would apply to the local and regional scale over the long-term duration.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA/DA: Geological materials are not expected to have a beneficial or adverse impact on the design of either alternative. Geologic and geotechnical conditions that may affect the design of this alternative would be thoroughly explored during the design phase. Per the preliminary seismic analysis conducted for this project and the USGS Quaternary Faults map, there are no active faults located near the project sites. These alternatives would have a negligible effect on the quality and intensity regarding the region's geological setting, with negligible impacts to geologic materials and sediments. These negligible impacts would apply to the local and regional scale over the long-term duration.

Floodplain Management

Alternative 1 – No Action/FWOFI:

UA: In an uncontrolled breach, there would be a decrease in quality of the 100-year floodplain of moderate intensity upstream. This would cause a localized impact over the short-term.

DA: In an uncontrolled breach, there would be a negative quality decrease of substantial intensity to the downstream 100-year floodplain on regional extents over the short-term. After the breach event, the impact would remain moderate over the long-term to the 100-year floodplain extents without the dam structure in place.

Alternative 4 – Rehabilitation – New Auxiliary Spillway:

UA: This alternative will not impact the 100-year or 500-year floodplain extents upstream. The existing dam and this alternative is designed to detain the 100-year Principal Spillway Hydrograph (PSH) without overtopping the auxiliary spillway crest. Activities planned as part of this alternative will include placement of fill within the FEMA regulatory floodplain upstream of the dam, therefore, approval of a floodplain development permit will be required by the local Floodplain Administrator at the Saunders County Planning and Zoning office.

DA: This alternative will not impact the 100-year or 500-year floodplain extents downstream. The pre-project 100-year and 500-year floodplain extents are nearly identical to the post-project 100-year and 500-year floodplain extents. This is displayed on Figure 6.4.1. The existing principal spillway safely passes the PSH and the plan does not include modifications to the outlet structure. Activities planned as part of this alternative will include placement of fill within the FEMA regulatory floodplain downstream of the dam, therefore, approval of a floodplain development permit will be required by the local Floodplain Administrator at the Saunders County Planning and Zoning office. For Alternative 4, a berm and diversion channel would be constructed to protect the cemetery from the PMF.

Alternatives 5- Rehabilitation – Widen Existing Spillway:

UA: This alternative will not impact the 100-year or 500-year floodplain extents upstream. The existing dam and this alternative is designed to detain the 100-year Principal Spillway Hydrograph (PSH) without overtopping the auxiliary spillway crest. Activities planned as part of this alternative will include placement of fill within the FEMA regulatory floodplain upstream of the dam, therefore, approval of a floodplain development permit will be required by the local Floodplain Administrator at the Saunders County Planning and Zoning office.

DA: This alternative will not impact the 100-year or 500-year floodplain extents downstream. The pre-project 100-year and 500-year floodplain extents are nearly identical to the post-project 100-year and 500-year floodplain extents. This is displayed on Figure 6.4.2. The existing principal spillway safely passes the PSH and the plan does not include modifications to the outlet structure. Activities planned as part of this alternative will include placement of fill within the FEMA regulatory floodplain downstream of the dam, therefore, approval of a floodplain development permit will be required by the local Floodplain Administrator at the Saunders County Planning and Zoning office.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA: The proposed Significant Hazard rehabilitation alternative would not substantially change upstream flooding conditions associated with the reservoir pool during the 100-year or 500-year storm events. Existing upstream flood elevations and inundation extents are anticipated to remain generally consistent with current conditions because the proposed improvements do not significantly modify the reservoir storage volume or normal operating characteristics of the dam.

Proposed structural improvements would primarily occur along the east abutment of the embankment and within the downstream edge and level section of the auxiliary spillway. These improvements are intended to enhance spillway performance and reduce the potential for uncontrolled erosion or inadvertent overtopping and breach of the main embankment during auxiliary spillway operation.

Improvements to the roadway section and the auxiliary spillway level section would provide more uniform and reliable spillway flow conditions and be designed to comply with applicable NRCS Significant Hazard dam design criteria.

DA: This alternative would reduce the dam hazard classification from a High Hazard to a Significant Hazard classification through a combination of structural improvements and downstream risk reduction measures. The proposed rehabilitation measures are less extensive than those required for a full High Hazard rehabilitation and would reduce long-term maintenance, inspection, and liability considerations associated with the structure. This is displayed on Figure 6.4.3.

As part of this alternative, three downstream residential properties located within the breach inundation area would be acquired and removed from the breach zone. In addition, a perpetual “no-build” easement would be required within the downstream breach area to restrict future construction of occupied buildings and other improvements that could increase downstream hazard exposure.

The easement would serve as a long-term non-structural component necessary to maintain the Significant Hazard classification for the life of the dam.

Regional Water Resource Plans

Alternative 1 – No Action/FWOFI:

UA: There would be a decrease in effectiveness of the flood control plan for Cottonwood 21-A over the long-term.

DA: In an uncontrolled breach, there would be a negative decrease to the broader flood control projects in the Cottonwood Creek Watershed. This would have a moderate impact over the long-term to other flood control projects in the watershed due to the connection between projects in the broader watershed flood control plan.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA: There would be an increase in quality on a moderate intensity by improving the flood control project in the Cottonwood Creek Watershed. This would provide regional benefits over the long-term to flood control upstream.

DA: There would be an increase in quality on a moderate intensity by improving the flood control project in the Cottonwood Creek Watershed. This would provide regional benefits over the long-term to flood control downstream of the dam.

Alternative 6 – Non-Structure Rehabilitation:

UA and DA: This alternative would reduce the dam hazard classification from a High Hazard to a Significant Hazard classification through a combination of structural rehabilitation measures and downstream risk reduction strategies. This alternative would support the Watershed Work Plan for the Cottonwood Creek watershed by removing 3 homes from the breach zone and rehabilitating the structure to Significant Hazard status.

Surface Water

Alternative 1 – No Action/FWOFI:

UA and DA: In an uncontrolled breach, the stored water of the pond would flow downstream over the short-term duration until the pond is drained to the breach overflow point. During the uncontrolled breach, the extent of the breach inundation is shown on Figure 4.29.4. After the uncontrolled breach event, surface water would flow at the perennial rate for the watershed. The open surface water pond would be drained and would cause a negative decrease in quality on a substantial intensity over the course of one event. The range would be local for the impoundment area and temporary in duration until the impoundment could be rebuilt to retain water. If the impoundment is not rebuilt, the impact to surface water decline would be long-term and localized.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA and DA: These two alternatives would result in negligible impacts to UA and DA in local area over the long-term as a result of rehabilitation. For Alternative 4, a berm and diversion channel would be constructed to protect a cemetery from the PMF event in the drainage downstream of the new east auxiliary spillway. The diversion channel construction impact to surface water would be moderate during construction and have a long-term impact on surface water flow through the new diversion channel.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: These alternatives would result in negligible impacts to UA and DA in local area over the long-term as a result of rehabilitation.

Groundwater

Alternative 1 – No Action/FWOFI:

UA and DA: In an uncontrolled breach, the groundwater level would decline in conjunction with the lowering of the surface water level of the pond. This groundwater decline would be moderate and localized to the property immediately adjacent to the pond and long-term if the structure is not replaced after a breach.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA and DA: These alternatives would store water behind the rehabilitated dam at the same historic water surface elevation and therefore no impact to groundwater levels in the planning area.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential:

UA and DA: These alternatives would store water behind the rehabilitated dam at the same historic water surface elevation and therefore no impact to groundwater levels in the planning area.

Waters of the U.S.

It is anticipated that a Nationwide Permit (NWP) 3 will be sufficient to permit the measures at each site.

Alternative 1 – No Action/FWOFI:

UA: An uncontrolled breach would cause a negative impact to Waters of the U.S. by draining the pond and dewatering wetlands. This would be a substantial negative impact on a local area over the long-term. The breach would drain 20.9 acres of open water and negatively impact 7.3 acres of PEMC wetland fringe along the pond shoreline.

DA: The breach scenario would have a negative temporary impact of flooding to the downstream local waters of the U.S.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA: These alternatives would each cause 0.32 acres of wetland fringe impact from riprap placement to provide shoreline toe protection. This would cause negligible impacts in a localized area along the toe of the dam over the long-term.

DA: These alternatives would include installation of a seepage blanket on the downstream side of the dam. The seepage blanket is 0.18 acres in total area and construction includes removal of topsoil, gravel placement and cover with earth fill and seeding. The seepage blanket would impact 0.084 acres of PEMC wetlands on the downstream side of the dam over the long-term. For Alternative 4, the cemetery berm would impact 300 feet of stream channel and new diversion channel would create 330 feet of new stream channel.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA: This alternative would cause 0.32 acres of wetland fringe impact from riprap placement to provide shoreline toe protection. This would cause negligible impacts in a localized area along the toe of the dam over the long-term.

DA: This alternative would include installation of a seepage blanket on the downstream side of the dam. The seepage blanket is 0.18 acres in total area and construction includes removal of topsoil, gravel placement and cover with earth fill and seeding. The seepage blanket would impact 0.084 acres of PEMC wetlands on the downstream side of the dam over the long-term.

Water Quality

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach would have a minor and temporary impact to water quality as it would cause rill erosion and sloughing of previously deposited submerged sediment. A portion of this sediment material would degrade water quality by traveling downstream during the uncontrolled breach.

DA: The uncontrolled breach would have a substantial negative impact to water quality on a local downstream area over the short-term. The breach would transport nutrients and sediment downstream and degrade water quality.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA: These alternatives would all have a positive effect on a local basis over the long-term to water quality by improving integrity of the dam to protect against an uncontrolled breach which would cause water quality degradation in the pond. The placement of riprap along the lakeside toe of the dam would improve water quality by minimizing shoreline erosion and sediment deposition into the lake on a minor level over the localized area of the pond for the long-term.

DA: These alternatives would have a positive effect on the local basis over the long-term to water quality downstream by protecting against an uncontrolled breach. The uncontrolled breach scenario would cause significant transportation of sediment to the downstream channel, and these alternatives would prevent that occurrence. For Alternative 4, the construction activities associated with the cemetery berm and diversion channel would cause temporary and negligible impacts to stream water quality as part of excavating and grading work near the stream channel. To protect water quality of the stream, erosion control measures and best management practices would be installed during construction in disturbed areas associated with the cemetery berm and diversion channel. The proposed measures would minimize the impacts of eroded sediment from construction on water quality. The impacts to water quality would be negligible and minor on a local level and temporary during construction. Disturbed areas would be reseeded after construction to stabilize soil and minimize erosion.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA: This alternative would have a positive effect on the local basis over the long-term to water quality by improving integrity of the dam to protect against an uncontrolled breach which would cause water quality degradation in the pond. The placement of riprap along the lakeside toe of the dam would improve water quality by minimizing shoreline erosion and sediment deposition into the lake on a minor level over the localized area of the pond for the long-term.

DA: This alternative would have a positive effect on the local basis over the long-term to water quality downstream by protecting dam structural integrity through construction of a seepage blanket to protect against under dam seepage issues in addition to a wave berm with riprap shoreline protection. The impacts to water quality would be negligible and minor on a local level and temporary during construction. Disturbed areas would be reseeded after construction to stabilize soil and minimize erosion.

Air Quality

Alternative 1 – No Action/FWOFI:

UA and DA: This alternative would have short-term and negligible impacts to air quality due to construction activities to repair the county road and other construction activities.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA and DA: Construction activities associated with these alternatives are expected to produce minor dust and emissions, which would affect local air quality for the duration of the construction period. These impacts would be minor and only in the immediate range of the project site and occur on a short-term basis during project construction activities.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: Construction activities associated with these alternatives are expected to produce minor dust and emissions, which would affect local air quality for the duration of the construction period. These impacts would be minor and only in the immediate range of the project site and occur on a short-term basis during project construction activities.

Vegetation Communities and Habitat

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach would have a negative impact on vegetation and habitat on a substantial basis on local area over the short-term. The breach would drain the 20.9 acres of open water and the associated 7.3 acres of wetland fringe, and would change the plant community type from wetland to upland after the breach.

DA: The uncontrolled breach would have negligible impact on a local basis over the long-term on vegetation communities and habitat downstream.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA: These alternatives would have negligible impacts on a local basis over the long-term to vegetation and habitat.

DA: These alternatives would have negligible impacts on local basis over the long-term on vegetation communities and habitat downstream. The new diversion channel for Alternative 4 would have a temporary and minor impact to stream habitat, but there would be a net gain in stream channel length as part of the project.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: These alternatives would have negligible impacts on a local basis over the long-term to vegetation and habitat.

Wetlands

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach would have a negative and substantial impact to the wetlands on the long-term. These quantities are included in Section 6.8.

DA: The uncontrolled breach would cause negligible impacts on a local level over the long-term to wetlands downstream.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA and DA: These alternatives would all have minor impact to wetlands in a localized area over the long-term on wetlands.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: These alternatives would all have minor impact to wetlands in a localized area over the long-term on wetlands.

Riparian Areas

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach would lead to headcutting upstream of the dam in both tributaries that contribute to Cottonwood 21-A. The headcutting would cause a negative impact on tributary stability after the breach on a moderate level over the short-term until a grade control structure could be installed to arrest headcutting without the dam in place.

DA: The uncontrolled breach would cause temporary flooding impacts such as erosion and channel headcutting downstream over the short-term in riparian areas.

Alternative 4 – Rehabilitation – New Auxiliary Spillway:

UA: The new auxiliary spillway would not impact riparian areas upstream of the dam. Existing riparian habitats would be maintained.

DA: The new auxiliary spillway would impact 1.25 miles of riparian areas downstream during a flooding event. Although this alternative does minimize the occurrence level to a 500-year event at which the auxiliary spillway operates, it would impact downstream riparian areas within the adjacent waterway. The auxiliary spillway is proposed to discharge into the adjacent waterway, which is different from that of the current spillway. The impact would be intense on a short-term basis and would be localized in the tributary reach during the breach. The new diversion channel for Alternative 4 would have a temporary and minor impact to riparian habitat but there would be a net gain in stream channel length as part of the project.

Alternative 5 – Rehabilitation – Widen Auxiliary Spillway:

UA and DA: These alternatives would not impact riparian areas of the dam. Existing riparian habitats would be maintained.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: These alternatives would not impact riparian areas. Existing riparian habitats would be maintained.

Federal and State-Listed Species (Plants)

On May 28, 2025, both the USFWS IPaC and the NGPC CERT were run again, using the ARA boundaries to determine the list of species with habitat ranges that intersect the boundaries of the ARAs. Each species is listed below with a description of how impacts were identified, and what the initial determinations were based off those findings. Please note that these findings are only associated with determining any significant impacts that would otherwise prevent the creation and signature of a FONSI. Consultation will need to occur with both USFWS and NGPC for the preferred alternative selected prior to any construction efforts to ensure impacts are properly avoided, minimized, or mitigated.

Alternatives 1, 4, 5, & 6:

UA and DA: The Western prairie fringed orchid (*Platanthera praeclara*) is the only listed plant species with a habitat range either within or downstream of the watershed boundary. The Action Area does not contain any suitable habitat for the species consisting of natively vegetated and diverse plant communities with mesic soils. Therefore, there will be no effect to federal or state-listed plants from any of the alternatives.

Invasive Species

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach could cause invasive species communities such as reed canary grass or eastern red cedar to expand into the lake footprint. Reed canary grass thrives in loose sediments and a breach would open the habitat for expansion. The impact would be minor and localized in the pond footprint and could be controlled.

DA: The uncontrolled breach could cause invasive species to move downstream in a localized area of the breach zone in the short-term. This could have a negative effect on ecosystem services.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA and DA: These alternatives would not cause invasive species community expansions aside from a negligible impact during construction. Construction activities involving dirt movement and redistribution could expand the range of invasive species in a localized area. Best management practices would be implemented during construction to reduce the risk of spreading invasive species.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA and DA: These alternatives would not cause invasive species community expansions aside from a negligible impact during construction. Construction activities involving dirt movement and redistribution could expand the range of invasive species in a localized area. Best management practices would be implemented during construction to reduce the risk of spreading invasive species.

Fish and Wildlife Species

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach could cause a loss of 20.9 acres of open water habitat. This would have a significant impact to fish and wildlife habitat over the short-term if the dam is restored or long-term if the dam is not rebuilt after an uncontrolled breach.

DA: The uncontrolled breach would impact downstream habitat on a localized area over the short-term during breach event.

Alternatives 4 & 5 – Spillway Rehabilitation:

UA: These alternatives would have negligible impacts to species on a temporary basis during construction activities. No tree clearing is anticipated during implementation of these alternatives. These alternatives would rehabilitate the dam and protect it from an uncontrolled breach and therefore would protect existing fish and wildlife habitat at the site.

DA: These alternatives would have negligible impact to habitat downstream of the dam on a temporary basis during construction.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

UA: These alternatives would have negligible impacts to species on a temporary basis during construction activities. No tree clearing is anticipated during implementation of these alternatives. These alternatives would rehabilitate the dam and protect it from an uncontrolled breach and therefore would protect existing fish and wildlife habitat at the site.

DA: These alternatives would have negligible impact to habitat downstream of the dam on a temporary basis during construction.

Migratory Birds and Eagles

Alternative 1 – No Action/FWOFI:

UA: The uncontrolled breach could have a negative impact on moderate intensity over migratory bird species habitat. The breach would drain the open water habitat and have negative effect on migratory waterfowl and shore birds over short-term if the dam is restored or long-term if the dam is not rebuilt after the uncontrolled breach.

DA: The uncontrolled breach would cause negligible impacts on a local level over the long-term to habitat downstream.

Alternatives 4, 5, and 6:

UA and DA: These alternatives would not disturb or modify any habitat from April 1 through July 15 to avoid impacts to nesting migratory birds and raptors. If tree clearing is conducted during that timeframe, bird surveys would be completed to ensure compliance with the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act. Before commencement of construction, any known bald eagle nesting sites within the ARAs would be identified and impacts would be avoided by implementing the conservation measures in the USFWS National Eagle Management

Guidelines (USFWS 2007). For these reasons, no impacts to bald eagles or migratory birds from tree clearing or construction activities are expected.

Based off the IPaC report ran on the ARAs, 17 total species of migratory birds can potentially nest in this area, and they are listed below:

- American Golden-plover (*Pluvialis dominica*)
- Bald Eagle (*Haliaeetus leucocephalus*)
- Black-billed Cuckoo (*Coccyzus erythrophthalmus*)
- Bobolink (*Dolichonyx oryzivorus*)
- Chimney Swift (*Chaetura pelagica*)
- Eastern Whip-poor-will (*Antrostomus vociferus*)
- Grasshopper Sparrow (*Ammodramus savannarum perpallidus*)
- Hudsonian Godwit (*Limosa haemastica*)
- Lesser Yellowlegs (*Tringa flavipes*)
- Prairie Loggerhead Shrike (*Lanius ludovicianus excubitorides*)
- Pectoral Sandpiper (*Calidris melanotos*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)
- Ruddy Turnstone (*Arenaria interpres morinella*)
- Rusty Blackbird (*Euphagus carolinus*)
- Semipalmated Sandpiper (*Calidris pusilla*)
- Short-billed Dowitcher (*Limnodromus griseus*)
- Upland Sandpiper (*Bartramia longicauda*)

Federal and State-Listed Species (Animals)

On May 28, 2025, both the USFWS IPaC and the NGPC CERT were run again, using the ARA boundaries to determine the list of species with habitat ranges that intersect the boundaries of the ARAs. Each species is listed below with a description of how impacts were identified, and what the initial determinations were based off those findings. Please note that these findings are only associated with determining any significant impacts that would otherwise prevent the creation and signature of a FONSI. Consultation will need to occur with both USFWS and NGPC for the preferred alternative selected prior to any construction efforts to ensure impacts are properly avoided, minimized, or mitigated.

Below are the suitable habitat descriptions for each of the species listed in the opening section paragraph based off information gathered from IPaC and CERT reports.

Northern Long-Eared Bat (*Myotis septentrionalis*) – Federally and State Endangered

Alternative 1 – No Action/FWOFI:

This alternative would have no effect on the Northern long-eared bat.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

These alternatives would have a negligible impact on the Northern long-eared bat (NLEB) over the long-term. The Action Area does not contain any known maternity roost trees and there are no known hibernacula (mines or rock outcroppings or crevices) within 10 miles of the watershed boundary. However, given the availability of suitable deciduous roost trees and with a known hibernacula being just over 10 miles from the southern boundary of the watershed, it is likely that NLEB occur in the Action Area. No trees are identified for removal for these alternatives. These effects are expected to be negligible if they occur. All work would occur during daytime hours and would not impact this species nocturnal feeding and roosting behaviors if present. Acoustic/mist net surveys were not conducted to determine their current presence, but an active presence is assumed. Because of these findings, the projects may affect- but are not likely to adversely affect the NLEB.

Tri-colored Bat (*Perimyotis subflavus*) – Proposed Endangered

Alternative 1 – No Action/FWOFI:

This alternative would have no effect on the tri-colored bat.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

These alternatives would have a negligible impact on the tri-colored bat over the long term. The Action Area does not contain any known maternity roost trees and there are no known hibernacula (mines or rock outcroppings or crevices) within 10 miles of the watershed boundary. However, given the availability of suitable deciduous roost trees and with a known hibernacula being just over 10 miles from the southern boundary of the watershed, it is likely tri-colored bats occur in the Action Area. No trees are identified for removal for these alternatives. These effects are expected to be negligible if they occur. All work would occur during daytime hours and would not impact this species nocturnal feeding and roosting behaviors if present. Acoustic/mist net surveys were not conducted to determine their current presence, but an active presence is assumed. Because of these findings, the projects may affect- but are not likely to adversely affect the tri-colored bat.

Piping Plover (*Charadrius melodus*) – Federally and State Threatened

Alternative 1 – No Action/FWOFI:

This alternative would have short-term impacts on the piping plover. The uncontrolled breach would move sediment downstream that could indirectly impact piping plover habitat in the Lower Platte River.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

The piping plover is one of three species that does not have suitable habitat within the planning area. However, suitable habitat does exist downstream that could be indirectly impacted by alternative implementation in regard to flow depletions and sediment depositions. The alternatives will not increase storage and therefore there will be no net increase in depletions. Implementation of these alternatives are not expected to impact the species indirectly by retaining some sediment from transferring downstream, but not all thus continuing to provide suitable habitat for the species downstream within the Platte River, as explained in Section 6.1 above. For these reasons, these action

alternatives are not expected to have an impact on the piping plover. However, communication with the USFWS and NGPC will occur to update any known occurrences of the species. Conservation measures will be taken based on species status and associated protocols per any updated discussions and findings prior to entering the implementation phase of any future projects. Because of these findings, the projects may affect- but are not likely to adversely affect the piping plover.

Interior Least Tern (*Sternula antillarum athalassos*) – State Endangered

Alternative 1 – No Action/FWOFI:

This alternative would have short-term impacts on the Interior least tern. The uncontrolled breach would move sediment downstream that could indirectly impact suitable habitat in the Lower Platte River.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

The Interior least tern is one of three species that does not have suitable habitat within the planning area. However, suitable habitat does exist downstream that could be indirectly impacted by alternative implementation regarding flow depletions and sediment depositions. Implementation of these alternatives are not expected to impact the species indirectly by retaining some sediment from transferring downstream, but not all thus continuing to provide suitable habitat for the species downstream within the Platte River, as explained in Section 6.1 above. For these reasons, these action alternatives are not expected to have an impact on the Interior least tern. However, communication with the USFWS and NGPC will occur to update any known occurrences of the species. Conservation measures will be taken based on species status and associated protocols per any updated discussions and findings prior to entering the implementation phase of any future projects. Because of these findings, the projects may affect- but are not likely to adversely affect the Interior least tern.

Pallid Sturgeon (*Scaphirhynchus albus*) – Federally and State Endangered

Alternative 1 – No Action/FWOFI:

This alternative would have a short-term impact on the pallid sturgeon. The uncontrolled breach would move sediment downstream that could indirectly impact pallid sturgeon habitat in the Lower Platte River.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

The pallid sturgeon is one of three species that does not have suitable habitat within the planning area. However, suitable habitat does exist downstream that could be indirectly impacted by alternative implementation regarding flow depletions and sediment depositions. Implementation of these alternatives are not expected to impact the species indirectly by retaining some sediment from transferring downstream, but not all thus continuing to provide suitable habitat for the species downstream within the Platte River, as explained in Section 6.1 above. For these reasons, these action alternatives are not expected to have an impact on the pallid sturgeon. However, communication with the USFWS and NGPC will occur to update any known occurrences of the species. Conservation measures will be taken based on species status and associated protocols per any updated discussions and findings prior to entering the implementation phase of

any future projects. Because of these findings, the projects may affect- but are not likely to adversely affect the pallid sturgeon.

Monarch Butterfly (*Danaus plexippus*) – Proposed Federally Threatened

Alternative 1 – No Action/FWOFI:

This alternative could have short-term impacts on the monarch butterfly. The uncontrolled breach could impact habitat downstream.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

The monarch butterfly may be present within the Action Area due to the presence of herbaceous vegetated areas which contain flowering plants, including milkweed, which are used by the monarch during its life cycle. Communication with the USFWS and NGPC will occur to update any known occurrences of the species and conservation measures will be used to avoid or offset impacts. This will be based on species status and associated protocol prior to entering the implementation phase of any future projects.

Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*) – Proposed Federally Endangered

Alternative 1 – No Action/FWOFI:

This alternative could have short-term impacts on the bumble bee. The uncontrolled breach could impact habitat downstream.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

The Suckley's cuckoo bumble bee may be present within the Action Area due to the presence of herbaceous vegetated areas which contain flowering plants and the colony nests of other species of bumble bee which are used by the Suckley's cuckoo bumble bee as habitat throughout its life history. Communication with the USFWS and NGPC will occur to update any known occurrences of the species and conservation measures will be used to avoid or offset impacts. This will be based on species status and associated protocol prior to entering the implementation phase of any future projects.

Fish and Wildlife Coordination Act

Coordination with both NRCS, USFWS, and NGPC was conducted to obtain feedback on the impacts that any of the alternatives had on habitat and what recommendations were offered to minimize impacts in order to comply with the Fish and Wildlife Coordination Act. The action alternative has the potential for short-term impacts to listed animal species in the planning area.

Alternative 1 – No Action/FWOFI:

This alternative would not require consultation with the U.S. Fish and Wildlife Service (USFWS) and the Nebraska Game and Parks Commission (NGPC).

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

These alternatives will have minimal effect on fish and wildlife resources and USFWS and NGPC have been engaged in discussions during the planning project.

Cultural Resources/Historic Properties

Alternative 1 – No Action/FWOFI:

An uncontrolled breach could threaten undocumented cultural resources in the project area by creating a headcut that would travel upstream of the existing dam structure. Undocumented cultural resources downstream from the dam may also be damaged or destroyed by scouring, erosion, or sedimentation caused by an uncontrolled breach. Effects would occur locally upstream and downstream, and be negative, moderate, and permanent.

Alternatives 4 & 5 – Spillway Rehabilitation:

No archaeological materials or sites were identified within the APE. The buildings identified in the cultural resource investigation will not be damaged, destroyed, or altered by this project. There may be temporary auditory and visual effects to the farmsteads during construction. Visual impacts during will be minimal. The dam is an existing feature that is already visible on the landscape, and the appearance of the dam from the viewpoint of the structures will not change. There are no buildings within the footprint of the maximum flood pool, but a portion of the Farmstead #4 yard is within the maximum flood pool elevation. In the event that the dam fills to the maximum flood pool, there may be temporary negative visual effects to Farmstead #4. Although effects will be negative, they will not permanently alter any characteristics of Farmstead #4.

The Bethesda Cemetery will be completely avoided by ground-disturbing activities. The construction of the berm to divert potential flood events will occur within the unnamed tributary of Cottonwood Creek along the northeastern boundary of the cemetery. It is unlikely that unmarked interments would be in this area. However, should unmarked interments be encountered they are protected by the “Unmarked Human Burial Sites and Skeletal Remains Protection Act (Nebraska State Statutes 12-1201 through 12-1212) [1989]” and will be treated accordingly. The northeastern boundary chain-link fence may require temporary removal during construction but will be replaced in its original location upon completion of construction. Any marked interments in that area are outside of the construction zone and will be avoided. The berm construction will include placing fill within the unnamed tributary to shift the tributary further to the northeast away from the cemetery. There may also be temporary auditory and visual effects to the cemetery during construction. Visual impacts will be minimal. The berm will be seeded with grass after construction, and the vegetation should further minimize any visual impacts.

The cultural resources investigation and Section 106 consultation did not identify any historic properties in the APE. There are no archeological sites in the APE, and none of the standing structure properties within the APE are eligible for inclusion in the NRHP. This alternative will have *No Effect* on historic properties.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

Three houses within the breach inundation zone would be removed as part of this alternative. These houses have not been formally evaluated for the National Register of Historic Places. No other archaeological materials or sites were identified within the APE. The houses are treated as eligible for inclusion on the National Register of Historic

Places for the purposes of NEPA and NHPA. As such this alternative could have an adverse effect on historic properties if implemented. Adverse effects would have to be mitigated through the development of a Memorandum of Agreement per 36 CFR Part 800.6(c).

Natural Areas and Parklands

Alternative 1 – No Action/FWOFI:

The uncontrolled breach alternative would cause a loss of the permanent pool at the project site. This would cause a direct loss of open water over the long-term which would cause loss of fishing and other passive recreation at the project site.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would maintain the permanent pool of the dam and maintain fishing and passive recreational use of the project site for the long-term.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative would maintain the permanent pool of the dam and maintain fishing and passive recreational use of the project site for the long-term.

Public Health and Safety

Alternative 1 – No Action/FWOFI:

The uncontrolled breach of Cottonwood 21-A would cause a temporary risk to public safety due to flooding flows downstream of the dam. Based on dam breach modeling, there is a potential loss of life in the event of a catastrophic dam failure due to streets and roads downstream. After a dam breach, there would not be a flood control benefit until a flood control dam structure could be reconstructed. The potential for uncontrolled breach is moderate and local in the watershed downstream. A breach would cause long-term increased flooding risk if the flood control structure is not reconstructed.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would bring the dam into compliance with current NRCS and DWEE dam performance, design and public safety standards. The alternatives would provide current levels of flood protection to reduce the potential for flood damages and loss of life from a catastrophic breach. The alternatives would cause a substantial improvement to public safety on a local level in the watershed over a long-term period.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative would rehabilitate the dam to Significant Hazard. To meet these design and safety criteria, downstream impacts and potential loss of life must be removed and modifications must be made to the embankment to fully contain the Freeboard Hydrograph (FBH). This alternative would include the buyout of three homes downstream in the breach zone.

Transportation/Infrastructure

Alternative 1 – No Action/FWOFI:

The Cottonwood 21-A dam embankment is a county road. The uncontrolled breach of the dam would cause a loss of transportation access across the county road.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would maintain the transportation infrastructure connection for the county road across the dam embankment over the long-term.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

These alternatives would maintain the transportation infrastructure connection for the county road across the dam embankment over the long-term.

Ecosystem Services

Provisioning Services

Provisioning services are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass. Within this watershed, these types of tangible goods would include agricultural crop production.

Alternative 1 – No Action/FWOFI:

This alternative would have a temporary impact on provisioning services in regard to a breach scenario that damages crop production land and limits transportation access for commerce of crops and livestock. This alternative would have a direct impact and decrease crop production on a moderate level. It would be localized to the watershed area but could expand to regional in regard to limiting transportation of agricultural goods from loss of road. This would have an impact over the short-term if the dam is replaced or over the long-term if dam is not replaced.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would have a negligible impact on crop production over the long-term downstream of the dam. The rehabilitation of dam would have positive impact to crop production on a moderate level over a local area upstream and downstream of the dam. This would lead to long-term protection of crop production as a provisioning service.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative would have a negligible impact on crop production over the long-term downstream of the dam. The rehabilitation of the dam would have a positive impact to crop production on a moderate level over a local area upstream and downstream of the dam. This would lead to long-term protection of crop production as a provisioning service.

Regulating Services

Regulating services maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe – examples include flood and disease control, water filtration, climate stabilization, or crop pollination. The Cottonwood 21-A dam structure provides flood control benefits and water quality improvements through sediment capture.

Alternative 1 – No Action/FWOFI:

The uncontrolled breach scenario would stop the regulating services of the dam on a moderate level on the local area over the short-term if the dam is replaced or over the long-term if the dam is not replaced. Sediment and nutrients would move downstream due to the breach and cause negative water quality problems and sedimentation over the local area on a long-term duration. The breach scenario would cause a negative decrease in property damage reduction and public safety on a substantial level over a localized area on a temporary basis.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would provide a benefit to regulating services over the long-term on a substantial level through dam improvements. The regulating services would be impacted in a positive way through property damage reduction and public safety improvements.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

These alternatives would provide a benefit to regulating services over the long-term on a substantial level through dam improvements. The regulating services would be impacted in a positive way through property damage reduction and public safety improvements and the buyout of 3 homes in the breach zone.

Supporting Services

Supporting services refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary productions. In this watershed, Cottonwood 21-A provides fish and wildlife habitat as well as stream and wetland habitat.

Alternative 1 – No Action/FWOFI:

This alternative would have negative impact of moderate to substantial intensity on fish and wildlife habitat and wetland habitat. Habitats would be impacted both upstream and downstream of the dam in an uncontrolled breach. This would cause a loss in migratory bird habitat, decline in water quality benefits, loss of erosion regulation, and decline in carbon sequestration all over the long-term on a local area level.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would have positive effect on supporting services by rehabilitating the dam to provide flood control benefits. This would maintain and protect migratory bird, fish and wildlife habitat while also protecting water quality, climate regulation, erosion regulation and carbon sequestration over the long-term term on a local level on a moderate level.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative would have positive effect on supporting services by rehabilitating the dam to provide flood control benefits and buyout 3 homes downstream in the breach zone. This would maintain and protect migratory bird, fish and wildlife habitat while also protecting water quality, climate regulation, erosion regulation and carbon sequestration over the long-term term on a local level on a moderate level.

Cultural Services

Cultural services make the world a place in which people want to live – recreational use, spiritual, aesthetic viewsheds, or tribal values. The Cottonwood 21-A waterbody provides fishing and passive recreational use as well as a positive aesthetic viewshed.

Alternative 1 – No Action/FWOFI:

This alternative would cause a loss of cultural services on a moderate level over the long term. There would be a decrease in cultural services of recreation and aesthetics viewsheds on a moderate level of intensity over the long-term without the dam. The loss of this habitat and pond would negatively impact the sense of place for cultural services at Cottonwood 21-A.

Alternatives 4 & 5 – Spillway Rehabilitation:

These alternatives would have a positive effect on cultural services by rehabilitating the structure. These alternatives would cause a positive increase to cultural services by maintaining the habitat and recreational benefits of the pond on a moderate level over the local area for the long term.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative would have a positive effect on cultural services by rehabilitating the structure. These alternatives would cause a positive increase to cultural services by maintaining the habitat and recreational benefits of the pond on a moderate level over the local area for the long-term.

Table 6.26.1 summarizes the rating system utilized for evaluating trade-offs. Table 6.26.2 shows the ecosystem service category that aligns with each environmental resource item or concern and then quantifies effects/impacts for three alternatives with a high to low impact rating system of symbols for (+) as positive impact and (-) as negative impact.

Rating System for Resource and Ecosystem Trade-Offs

Symbol	Description
---	Alternative will have a major effect on the item or concern. Major impacts include those that are long-term, result in significant controversy, could result in a loss of life or jeopardize the survival of a sensitive resource, or result in impacts that cannot be mitigated. These also include effects that go directly against the Federal Objective.
--	Alternative will have a moderate effect on the item or concern. Moderate impacts include those that are short-term or long-term and can be reasonably replaced or restored with mitigation measures.
-	Alternative will have a minor effect on the item or concern. Minor impacts include those that are temporary, short-term, or long-term and do not require mitigation.
0	Alternative will have a negligible impact on the item or concern.
+	Alternative will result in a minor improvement on the item of concern. Minor improvements can include those that are temporary or short-term.
++	Moderate improvements include those that are short-term or long-term. These include measurable effects that improve services but are not anticipated to result in a major benefit or life-saving measure.
+++	Alternative will result in a moderate improvement to the item or concern. Moderate improvements include those that are short-term or long-term. These include measurable effects that improve services resulting in a designation change or life-saving measure.

Environmental Effects/Impacts and Ecosystem Trade-Offs

Ecosystem Service Trade-Offs	Item or Concern	Alt 1 - FWOFI/No Action	Alt 4 – New Spillway	Alt 5 – Widen Existing Spillway	Alt 6 – Non-Structural Rehab
Provisioning	Soils Resources, Erosion, Sedimentation	Loss of sediment capture capacity of dam (-)	Maintain sediment capture capacity (+)	Maintain sediment capture capacity (+)	Maintain sediment capture capacity (+)
Provisioning	Prime and Unique Farmland	No change	Expanded embankment footprint and new diversion channel (--)	Expanded embankment footprint (--)	Expanded embankment footprint (--)

Ecosystem Service Trade-Offs	Item or Concern	Alt 1 - FWOFI/No Action	Alt 4 – New Spillway	Alt 5 – Widen Existing Spillway	Alt 6 – Non-Structural Rehab
Supporting	Geology	No change	No impact to geological materials	No impact to geological materials	No impact to geological materials
Regulating	Floodplain Management	No flood control benefits(- -)	Improved flood control benefits and cemetery berm protection (+++)	Improved flood control benefits (+++)	Improved flood control benefits (+++)
Regulating/Cultural	Regional Water Resource Plans	No flood control benefits to broader watershed flood control system (- -)	Improved flood control benefits (+++)	Improved flood control benefits (+++)	Improved flood control benefits (+++)
Supporting	Surface and Groundwater	Decreased surface water behind dam (-)	Maintain surface water and groundwater levels in watershed (+)	Maintain surface water and groundwater levels in watershed (+)	Maintain surface water and groundwater levels in watershed (+)
Supporting	Wetlands and Waters of U.S.	Loss of wetlands around lake fringe and loss of open water (-)	Maintain wetland habitat with open water (+)	Maintain wetland habitat with open water (+)	Maintain wetland habitat with open water (+)

Ecosystem Service Trade-Offs	Item or Concern	Alt 1 - FWOFI/No Action	Alt 4 – New Spillway	Alt 5 – Widen Existing Spillway	Alt 6 – Non-Structural Rehab
Regulating	Water Quality	Negative impact to water quality downstream (-)	Maintain water quality benefits (++)	Maintain water quality benefits (++)	Maintain water quality benefits (++)
Supporting	Vegetation Communities and Habitat	Loss of open water habitat and associated vegetation (-)	Maintain open water habitat and vegetation (+)	Maintain open water habitat and vegetation (+)	Maintain open water habitat and vegetation (+)
Regulating	Wetlands	Loss of open water fringe wetlands(-)	Maintain wetlands (+)	Maintain wetlands (+)	Maintain wetlands (+)
Regulating	Riparian Areas	Riparian habitat could increase through stream corridor (+)	Maintain existing riparian areas (+)	Maintain existing riparian areas (+)	Maintain existing riparian areas (+)
Cultural	Federal and State Listed Species – Plants	No change	No change	No change	No change
Supporting	Invasive Species	No change	No change	No change	No change
Regulating	Fish and Wildlife Species	Loss of open water habitat(-)	Maintain open water habitat (+)	Maintain open water habitat (+)	Maintain open water habitat (+)

Ecosystem Service Trade-Offs	Item or Concern	Alt 1 - FWOFI/No Action	Alt 4 – New Spillway	Alt 5 – Widen Existing Spillway	Alt 6 – Non-Structural Rehab
Regulating	Migratory Birds and Eagles	Loss of open water habitat (-)	Maintain open water habitat (+)	Maintain open water habitat (+)	Maintain open water habitat (+)
Cultural	Federal and State Listed Species - Animals	No change	No change	No change	No change
Cultural	Fish and Wildlife Conservation Act	Loss of open water habitat (-)	Maintain habitat (+)	Maintain habitat (+)	Maintain habitat (+)
Regulating	Extreme Weather	Increased flood risk downstream (- -)	Increase flood control capacity (++)	Increased flood control capacity (++)	Increased flood control capacity (++)
Cultural	Cultural/Historical Resources	No change	No change	No change	No change
Cultural	Natural Areas and Parklands	Loss of recreational habitat (- -)	Maintain recreational use (+)	Maintain recreational use (+)	Maintain recreational use (+)
Regulating	Public Health and Safety	Public safety threats downstream and along the roadway (- -)	Improve public safety (+++)	Improve public safety (+++)	Improve public safety (+++)
Regulating	Transportation/Infrastructure	No transportation access and loss of dam infrastructure (- - -)	Maintain access (++)	Maintain access (++)	Maintain access (++)

Geology and Geotechnical Considerations

This section presents a site-specific review and analysis of potential failure risks during a seismic event, as well as an evaluation of the auxiliary spillway's ability to resist head cutting and erosion during a major storm event. Geotechnical considerations include Seismic Evaluation, Integrity Analysis, and Seepage Analysis.

Seismic Evaluation

Alternative 1 – No Action/FWOFI:

This alternative includes continued use of an earthen embankment dam that is currently in place and operational. The normal pool elevation would not change from the existing site conditions. With no federal involvement or requirement, it is not necessary to make any structural changes to an existing structure to meet current Dam Safety Standards for the State of Nebraska Dam Safety Division. The PGA results and supportive information indicate that the structure is located on sound material and sound engineering judgement has been used in the initial construction of the structure.

Alternatives 4 & 5 – Spillway Rehabilitation:

This alternative involves modifications to the earthen embankment and structural components of an existing dam. The core embankment structure will be modified and therefore requires the understanding that modifications to it will be generally safe from seismic activity and compliance with design criteria for a new structure. Preliminary seismic analysis of the region supports reasoning that the structure is built on sound foundational material, however, further analysis of materials within the embankment to provide a detailed analysis and confirmation on foundational material stability will be required during the design phase of any structural improvement project.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

This alternative involves modifications to the earthen embankment and structural components of an existing dam. The core embankment structure will be modified and therefore requires the understanding that modifications to it will be generally safe from seismic activity and compliance with design criteria for a new structure. Preliminary seismic analysis of the region supports reasoning that the structure is built on sound foundational material, however, further analysis of materials within the embankment to provide a detailed analysis and confirmation on foundational material stability will be required during the design phase of any structural improvement project.

Integrity Analysis

Alternative 1 – No Action/FWOFI:

In this alternative, no modifications are proposed to the spillway's structural components to address current hydraulic deficiencies. During the design storm, the dam embankment will be overtopped, regardless of the auxiliary spillway's ability to handle storm flows and prevent headcutting. Without federal involvement, the requirement to meet this design standard does not apply to an existing, operational structure, provided the principal and auxiliary spillways can safely manage the allowable storm event.

Alternatives 4 & 5 – Spillway Rehabilitation:

The design of a new auxiliary spillway, or modifications to an existing one, requires that the SITES model meet stability and integrity analysis standards while safely managing the design storm. Geotechnical exploratory drilling was conducted to collect and test in-situ materials, identifying their specific properties and characteristics. This data was entered into the SITES program to simulate the spillway's response to hydraulic forces. Key factors such as vegetation cover, spillway management practices, and subsurface soil profiles play crucial roles in ensuring the model predicts safe passage of the design storm without overtopping. Detailed export summaries and graphical outputs from the SITES model illustrate the input parameters used to represent actual spillway conditions, confirming that the level section remains stable during the design storm. These graphs are available in Appendix E.

Alternative 6 – Non-Structural Rehabilitation – Rehabilitation to Significant Hazard Potential

Geotechnical exploratory drilling was conducted to collect and test in-situ materials, identifying their specific properties and characteristics. This data was entered into the SITES program to simulate the spillway's response to hydraulic forces. Key factors such as vegetation cover, spillway management practices, and subsurface soil profiles play crucial roles in ensuring the model predicts safe passage of the design storm without overtopping. Detailed export summaries and graphical outputs from the SITES model illustrate the input parameters used to represent actual spillway conditions, confirming that the level section remains stable during the design storm. These graphs are available in Appendix E.

Seepage Analysis

Alternative 1 – No Action/FWOFI:

This alternative does not involve any structural modifications, so downstream seepage concerns may persist. The dam owner must continue to monitor this area to ensure the safe operation of the embankment. If flowing water is detected, prompt action should be taken to mitigate potential underseepage piping, which could otherwise lead to dam failure.

Alternatives 4 & 5 – Spillway Rehabilitation and Alternative 6 – Non-Structural Rehabilitation:

These alternatives include constructing a seepage protection blanket and a toe drain system to address seepage concerns and enhance structural stability. The toe drain, made of filter sand in a trapezoidal shape, will be installed along most of the west downstream toe of the slope. A slotted pipe at the base of the drain will help relieve water buildup and discharge it into the existing plunge pool. This system reduces underseepage risks and lowers the phreatic surface in the embankment by being positioned near the embankment toe.

The seepage blanket will fill in the original creek channel to improve surface drainage. It will be constructed of clay borrow material from the auxiliary spillway construction to minimize ponding along the dam's downstream side and cap the area with low-

permeability soil to mitigate underseepage. The final grade will gently slope toward the existing channel to the southeast, reducing the likelihood of ponding during future inspections. These improvements are cost-effective and minimally invasive to the existing structure while enhancing the safety and operation of this High Hazard dam.

Risk and Uncertainty

Each alternative contains risk factors and uncertainty values that could involve changes in costs and benefits. The proposed alternatives are prepared to provide an additional 50-year design life with consideration of the existing principal spillway pipe condition. However, the sediment storage capacity meets the desired 100-year design life and the costs, including operations and maintenance, were based on a design life of 100 years. Significant events, like those that occurred in 2024, can impact project life and maintenance costs. Sedimentation rates were calculated using existing land use and conditions. Land use could change and therefore increase or decrease these rates and urbanization can cause a rapid influx of sediment into the basin.

Extreme Weather Events

Environmental change in Nebraska could result in an increase in extreme storm events (UNL, 2014), leading to increased flooding and an increase in stream degradation rates as well as increased periods of drought which could reduce baseflow. All NRCS regulations were followed in the design of ERPs. The most current precipitation data used was the National Oceanic and Atmospheric Administration (NOAA) Atlas 14 data and this was used to design hydraulic structures.

Land Use

Land use is projected to continue to remain predominantly agricultural and pastureland in most of the watershed. All alternatives brought forward for detailed analysis support both existing and projected future land use and therefore will have a negligible effect.

Geotechnical Considerations

Preliminary analysis suggests that geological conditions at the project site should not impose any impacts to future design. Additional geological and geotechnical investigations will be completed during the design phase of the project to support these initial analyses and confirm material suitability for any structures installed. However, future investigations could reveal unknown material characteristics that could affect potential designs.

Adaptive Management

Adaptive management can be a useful tool to reduce uncertainty and maximize goals. The alternatives were analyzed with an understanding that changes could occur between the planning process and final design and implementation. ARAs were determined and kept broad enough to adjust to potential changes and resource impacts were determined and analyzed conservatively.

Will the proposed action or action alternatives (if any) make an irreversible or irretrievable commitment of Federal resources?

No.

How will the irreversible or irretrievable commitment of Federal resources, if any, contribute to a loss of long-term productivity for the human environment?

Not applicable.

2.3 Endangered Species Act

The pertinent subject matter expert(s) reviewed the proposed action (and action alternatives, if any) and documented determinations for threatened, endangered, proposed and/or candidate species (TEPC) and/or critical habitat in a biological assessment. NRCS consulted with USFWS on the determinations of “May affect, not likely to adversely affect” for the species listed below. Conservation measures, including avoidance of migration and nesting periods and surveys to confirm species presence/absence, will be implemented during construction.

Table 2: May Affect, Likely to Adversely Affect Determination for TEPC Species/Critical Habitat

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Brief Rationale (or refer to other proposal documentation)
<u>Western prairie fringed orchid (<i>Platanthera praeclara</i>)</u>	Threatened	No	No Effect. The Action Area does not contain any suitable habitat for the species consisting of natively vegetated and diverse plant communities with mesic soils. Therefore, there will be no effect to federal or state-listed plants from any of the alternatives.
<u>Northern Long-eared Bat (<i>Myotis septentrionalis</i>)</u>	Endangered	No	May affect, not likely to adversely affect. The ARA is located within the range of the Northern long-eared bat (NLEB). There are a small number of trees which may need to be removed located within the boundary of the ARA and which could potentially provide roost habitat for this species. However, there are no known or potential hibernacula within 5.0 miles and no known maternity roost trees within 1.5 miles of the ARA. It is possible that no tree removal would need to occur prior to construction, or that any trees deemed suitable habitat could be removed outside of the active season, to avoid any impact to the species. The initial determination is that the preferred alternative “may affect – but is not likely to adversely affect” the Northern long-eared bat..

Species/Habitat	Status	Proposed or Designated Critical Habitat Present?	Brief Rationale (or refer to other proposal documentation)
<u>Tri-colored Bat</u> (<i>Perimyotis subflavus</i>)	Proposed Threatened	No	May affect, not likely to adversely affect. There are a small number of trees which may need to be removed located within the boundary of the ARA and which could potentially provide roost habitat for this species. However, there are no known or potential hibernacula within 5.0 miles and no known maternity roost trees within 1.5 miles of the ARA. It is possible that no tree removal would need to occur prior to construction, or that any trees deemed suitable habitat could be removed outside of the active season, to avoid any impact to the species. The initial determination is that the preferred alternative “may affect – but is not likely to adversely affect” the Northern long-eared bat..
<u>Piping Plover</u> (<i>Charadrius melodus</i>)	Threatened	No	May affect, not likely to adversely affect. There will be no long-term impacts to flow depletions downstream since the rehabilitated dam will have the same water level elevation. There would only be extremely minimal changes to flows caused by any re-routing of floodwater through the auxiliary spillway on an infrequent basis. Adverse impacts caused by sedimentation will be addressed by best management practices employed during construction. Finally, the timing and method to “re-fill” the impoundment after the rehabilitation is complete will be addressed in a manner to avoid downstream flow depletions at a point in time that is critical to the listed species.
<u>Pallid sturgeon</u> (<i>Scaphirhynchus albus</i>)	Endangered	No	May affect, not likely to adversely affect. There will be no long-term impacts to flow depletions downstream since the rehabilitated dam will have the same water level elevation. There would only be extremely minimal changes to flows caused by any re-routing of floodwater through the auxiliary spillway on an infrequent basis. Adverse impacts caused by sedimentation will be addressed by best management practices employed during construction. Finally, the timing and method to “re-fill” the impoundment after the rehabilitation is complete will be addressed in a manner to avoid downstream flow depletions at a point in time that is critical to the listed species.

Table 3: Applicable proposal record documentation to support ESA compliance

Documentation Type	File Name (if applicable/needed)
Consultation request to USFWS	Appendix A
USFWS consultation response	Appendix A

2.4 National Historic Preservation Act – Section 106 Review

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determination:

No historic properties affected. Section 106 Review has been completed for the project area and no National Register eligible cultural sites were found.

History Nebraska's State Archaeology Office (SAO) completed a cultural resources desktop review of the Nebraska Archaeological Sites Geographic Information System database and other online resources for the Study Area. The review also included previously performed surveys, recorded archaeological sites, and recorded historic architectural properties. There are no previously recorded archeological sites in the Study Area, nor are there any previous archeological surveys. No previously documented standing structures are in the APE, but there are numerous previously surveyed structures in the town of Malmo within the one-mile buffer of the APE.

SAO completed an intensive cultural resource field inventory of the APE in June 2024 and October 2024. The cultural resources investigation report (see Appendix E) summarizes previous investigations and previously documented archaeological sites and architectural properties; the methods of the investigation; and describes the resources recorded by the survey in more detail. The three residences included in Alternative 6 were not evaluated during this investigation.

Eight areas were subject to an intensive pedestrian survey at 20-meter transects. Ground surface visibility was generally fair to good and averaged 25%. The survey area totaled 95.5 acres. Roughly 100 acres of the APE were not surveyed. Of the areas that were not investigated, about 40 acres comprised the dam and pool. Most of the remaining unsurveyed areas in the APE were grassy and treed areas near and within the creek drainageway or extant farmsteads. Most of the agricultural fields surrounding the dam have been altered with terrace and field tile systems. No archeological materials were found during the survey. All areas of the APE that offered adequate visibility were surveyed.

Four farmsteads and one cemetery were documented during the survey. A fifth farmstead in the APE is visible on aerial photographs from 2022, but the buildings have been demolished. No archeological materials were observed at this location. All resources documented by the investigation were evaluated for NRHP eligibility following the guidance found in National Register Bulletin No. 15: *How to Apply the National Register Criteria for Evaluation*. The farmsteads and cemetery were all considered not eligible for the NRHP. NRCS determined that no historic properties would be affected by the proposed action (Alternative 5) in accordance with 36 CFR 800.4(d)(1).

The Nebraska State Historic Preservation Office concurred with the NRCS determination of No Historic Properties in a letter dated May 27, 2025. The Pawnee Nation responded that the project should have no adverse effect on the cultural landscape of the Pawnee Nation in an email received June 23, 2025.

Table 4: Applicable proposal record documentation to support NHPA compliance

Documentation Type	File Name (if applicable/needed)
Consultation letters and responses	Appendix A

2.5 Consultation with Federally Recognized Tribes

Consultation with federally recognized tribes was conducted as follows:

The NRCS consulted on a government-to-government basis with Federally Recognized Tribes who have ancestral land claims in the area and will continue to consult through implementation if cultural resources are identified after NHPA Section 106 consultation is complete. The Federally Recognized Tribes consulted from the inception of the project include:

- Three Affiliated Tribes of the Fort Berthold Reservation
- Omaha Tribe of Nebraska
- Otoe-Missouria Tribe of Indians-Oklahoma
- Pawnee Nation of Oklahoma
- Ponca Tribe of Nebraska
- Ponca Tribe of Indians of Oklahoma

Early in the planning process for this project, NRCS sent letters to representatives of the Tribes listed above and the Nebraska State Historic Preservation Office (NeSHPO) on September 28, 2023, to inform them of the project, invite them to participate in the agency NEPA scoping meeting, and to initiate NHPA Section consultation with them on concerns related to cultural resources. NeSHPO responded by email on October 20, 2023, saying they had no comments at that time (Appendix A). No other responses were received.

After the cultural resources inventory was complete, NRCS sent NHPA Section 106 consultation request letters to NeSHPO and the Tribes listed above on May 12, 2025. The consultation letter presented the area of potential effect, the proposed alternatives, the historic property identification efforts, determinations of eligibility, and the determination of effect. Copies of the cultural resource inventory report, site forms, and maps of the APE were submitted with the consultation letter to support the determination of effect.

NRCS also sent emails to all consulting parties on May 28, 2025, with a link to the supporting documentation for the project.

Copies of all correspondence related to Section 106 consultation are provided in Appendix A. NeSHPO concurred with the determination of No Historic Properties affected in a letter dated May 27, 2025. The Pawnee Nation Tribal Historic Preservation Officer responded by email on June 23, 2025, that the project should have no adverse effect on the cultural landscape of the Pawnee Nation. NRCS sent follow up emails to the other consulting parties on July 22, 2025, requesting comments or questions on the project. No other responses were received.

2.6 Clean Water Act

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determination:

Project may or will affect waters, including wetlands. Modifications/design criteria have been included to ensure compliance with CWA is met. All permits received and modifications/design features are clearly presented and documented in the analysis.

CWA Section 404 permits must be obtained from the USACE to account for fills within jurisdictional waters of the United States prior to construction. The Sponsor will obtain a 404 permit for each project prior to construction. It is anticipated that a Nationwide Permit (NWP) 3 will be sufficient to permit the measures at each site. A pre-construction (PCN) notification will be required.

2.7 Clean Air Act

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determination:

The project is expected to contribute to emissions during implementation. Modifications/design criteria have been included to ensure compliance with CAA is met. All modifications/design criteria are clearly presented and documented in the analysis. Air quality considerations will apply during construction, demolition, and grading activities in accordance with Nebraska Title 129, Chapter 15, Section 003 (Fugitive Dust). Such measures may include, but are not limited to, application of water, stabilization of exposed soils, paving or frequent cleaning of haul roads, use of dust-free surfaces, and establishment of vegetative cover.

2.8 Special Management Area Considerations

The pertinent subject matter expert has reviewed the proposed action (and action alternatives, if any) and made the following determinations based on special management area presence, proximity, or lack of:

No activities are proposed within or in the vicinity of Special Management Areas.

2.9 Pertinent Executive Orders

The applicable subject matter experts have determined the proposed action (and action alternatives, if any) are in compliance with the following Executive Orders (EO), which were deemed pertinent based on the nature of the proposal:

EO 11988, Floodplain Management – requires determination of action occurring in a floodplain, using HUD floodplain map or more detailed map if available.

There will be no changes to the 100- or 500-year floodplains either upstream or downstream from the dam.

EO 11990, Protection of Wetlands – avoid actions within wetlands unless there are no practical alternatives, and the action includes all practicable means to minimize harm to wetlands.

The Preferred Alternative will permanently impact 0.32 acres of wetland fringe due to riprap placement to provide shoreline toe protection along the dam and 0.084 acres downstream of dam for the seepage blanket. An area of 0.57 acres is proposed as mitigation offset for the impacts to pond fringe and old channel/seepage area. Any mitigation area could be designed and constructed above the conservation pool elevation. As part of this planning document, this mitigation is a concept plan that would be further evaluated and designed in the engineering design phase.

EO 13007, Indian Sacred Sites – avoid adversely affecting the physical integrity of these sites.

Consultation with Federally Recognized Tribes was completed as described above. No Indian Sacred Sites were identified.

EO 13112, Invasive Species – prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause.

Best management practices will be implemented during construction to minimize the risk of introducing Invasive Species. Seeding plans for each project site would include native species certified by the NRCS State Biologist to ensure erosion is minimized and invasive species or noxious weeds are not introduced or spread. Any watercraft or heavy construction equipment utilized will be cleaned, drained, dried, and properly decontaminated if transported between sites.

EO 13186, Migratory Birds – identify actions that may have a measurable negative effect on migratory bird populations.

- Migratory Birds: To avoid migratory bird nesting, clearing activities will be conducted between August 1 and March 31. If tree clearing must occur between February 1 – July 15, a field survey will be conducted to ensure compliance with the Migratory Bird Treaty Act.
- Eagles: Before commencement of construction, any known bald eagle nesting sites within the ARAs would be identified and impacts would be avoided by implementing the conservation measures in the USFWS National Eagle Management Guidelines (USFWS 2007).

Certifying Statement for EA Page Limit and Deadline

The Responsible Official certifies that this EA:

☒ Demonstrates the agency has thoroughly considered the factors mandated by NEPA;

- ☒ Represents the agency's good-faith effort to prioritize documentation of the substantive issues and most important considerations required by NEPA within the congressionally mandated page limits;
- ☒ Reflects the agency's expert judgment.
- ☒ Addressed briefly, or left unaddressed, any issues or considerations that were, in the agency's judgment, comparatively not of a substantive nature;
- ☒ Represents the agency's good-faith effort to fulfill NEPA's requirements within the Congressional timeline (or within the minimally extended timeline) and this effort is substantially complete; and
- ☒ Contains analysis that is adequate to inform and reasonably explain the responsible official's final decision regarding the proposed action or selected alternative.

APPENDICES

Supplemental Watershed Plan No. 5

Appendix A – Comments and Responses

Appendix B – Project Map

Appendix C – Support Maps

Appendix D – Investigation and Analysis

Appendix E – Other Supporting Information

E-1: Geotechnical Investigation

E-2: Cultural Resources Investigation

E-3: Aquatic Resources Memo

E-4: FPPA Analysis

E-5: NRCS Dam Assessment 2022

REFERENCES CITED

- Blakey, R., (2023). Deep Time Maps- Western Interior Seaway. Colorado Plateau Geosystems. <https://deeptimemaps.com/map-lists-thumbnails/western-interior-seaway/>. Accessed 2025.
- Burchett, R. R., Reed, E. C., Dreezen, V. H., & Prichard, G. E. (1975). Bedrock geologic map showing thickness of overlying Quaternary deposits, Fremont Quadrangle and part of Omaha Quadrangle, Nebraska. U.S. Geological Survey, IMAP (905). <https://doi.org/10.3133/i905>
- Dreezen, V.H., (1973). Topographic Regions Map of Nebraska – 460. University of Nebraska – Lincoln, Conservation and Survey Division. <http://digitalcommons.unl.edu/conservationsurvey/460>. Accessed 2025. Environmental Protection Agency. Sole Source Aquifers. Accessed March 2025. <https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=9ebb047ba3ec41ada1877155fe31356b>.
- Federal Emergency Management Agency, Flood Insurance Rate Maps (FIRMs), Panel 31155C0200D, Eff. 4/10/2010
- JEO Consulting Group, Cottonwood 21-A Final Dam Assessment, 2022.
- Joeckel, R., Divine, D., Hanson, P. R., & Howard, L. (2017). Geology Of Northeastern Nebraska and Environs: Cedar, Dakota, and Dixon Counties in Nebraska, and Plymouth and Woodbury County in Iowa. *Conservation and Survey Division*, 168. <https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1168&context=conservationsurvey>
- Johnson, Nolan. Cultural Resources Report for the Development of the Supplemental Watershed Plan for the Cottonwood 21-A Project; Saunders County, Nebraska. November 2024.
- Muhs, D. R., Bettis, E. A., Aleinikoff, J. N., McGeehin, J. P., Beann, J., Skipp, G. L., Marshall, B. D., Roberts, H. M., Johnson, W. C., & Benton, R. (2008). Origin and paleoclimatic significance of late Quaternary loess in Nebraska: Evidence from stratigraphy, chronology, sedimentology, and geochemistry. *The Geological Society of America Bulletin/Geological Society of America Bulletin*, 120(11–12), 1378–1407. <https://doi.org/10.1130/b26221.1>
- Nebraska Game and Parks Commission, Conservation and Environmental Review Tool (CERT). Accessed May 2025.
- National Oceanic and Atmospheric Administration. Coastal Zone Management Programs. Accessed March 2025. <https://coast.noaa.gov/czm/mystate>

- National Oceanic and Atmospheric Administration. Essential Fish Habitat Mapper. Accessed March 2025. <https://www.habitat.noaa.gov/apps/efhmapper/>
- National Park Service. Nationwide Rivers Inventory Official. Accessed March 2025. https://public-nps.opendata.arcgis.com/datasets/105a104d5a3043b0ba2a25e31ecf3ff1_0/explorer?location=42.369499%2C-102.691477%2C9.87.
- Nebraska Game and Parks Commission. Biologically Unique Landscapes of Nebraska. Accessed March 2025. <https://www.arcgis.com/apps/MapJournal/index.html?appid=a1c36663b34145b49886e7fbbf2ae581>
- Silcock, W.R., & Jorgensen J.G. (2021). Red Knot (*Calidris canutus*). Birds of Nebraska — Online. <https://birds.outdoornebraska.gov/red-knot/>
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Web Soil Survey. Available online. Accessed November 2023.
- Soil Survey Staff, Natural Resources Conservation Service, United States Department of Agriculture. Soil Survey Geographic (SSURGO) Database for Cottonwood Creek Watershed, Nebraska). Available online. Accessed November 2023.
- United States Census Bureau. Quick facts, Nebraska. [Online] Available at: <https://www.census.gov/quickfacts/fact/table/US.lancastercountynebraska.NE/PST045219> [Accessed November 2023]
- University of Nebraska-Lincoln, Aquifers of Nebraska, Conservation and Survey Division. Accessed November 2023.
- USDA Forest Service. National Forest Lands. Accessed March 2025. https://data.fs.usda.gov/geodata/rastergateway/data3/National/Chiefs_map.pdf
- USDA National Agricultural Statistics Service, 2017 Census of Agriculture, Saunders County, Nebraska and Nebraska, 2017.
- USDA Natural Resources Conservation Service, 2017. Department Manual 9500-013. Guidance for Conducting, Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments.
- U.S. Bureau of Labor Statistics, U.S. Department of Labor, Accessed November 2023.
- U.S. Geological Survey, National Hydrography Dataset, NHD, 2002-2014.
- U.S. Fish and Wildlife Service, Information for Planning and Consultation (IPaC), Accessed May 2025.
- U.S. Fish and Wildlife Service, National Wetland Inventory website. U.S. Department of the Interior, Fish and Wildlife Service. Publication date 2024.

- U.S. Fish and Wildlife Service. National Bald Eagle Management Guidelines. May 2007.
<https://www.fws.gov/media/national-bald-eagle-management-guidelines>
- U.S. Fish and Wildlife Service. 2023. Northern Long-Eared Bat information.
<https://www.fws.gov/species/northern-long-eared-bat-myotis-septentrionalis>