SUPPLEMENTAL WATERSHED PLAN #3 AND ENVIRONMENTAL ASSESSMENT FOR THE TONGUE RIVER WATERSHED CHANNEL STABILIZATION

Pembina Water Resource District
Pembina County, North Dakota

USDA United States Department of Agriculture
Natural Resources Conservation Service

SUPPLEMENTAL WATERSHED PLAN #3 AND ENVIRONMENTAL ASSESSMENT

TONGUE RIVER WATERSHED CHANNEL STABILIZATION

September 19, 2022

Prepared By:

U.S. Department of Agriculture
Natural Resources Conservation Service

In Cooperation With:

Pembina Water Resource District (Local Sponsor)

U.S. Army Corps of Engineers (Cooperating Federal Agency)

U.S. Fish and Wildlife Service (Cooperating Federal Agency)

Tongue River

Supplemental Watershed Plan #3 Agreement

between the
Pembina Water Resource District
(Referred to herein as Sponsor)

and the

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
(Referred to herein as NRCS)

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsor for assistance in preparing a plan for works of improvement for the Tongue River Watershed, State of North Dakota, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Sections 1001 to 1008, 1010, and 1012); and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, there has been developed through the cooperative efforts of the Sponsor and NRCS a watershed project plan and environmental assessment for works of improvement for the Tongue River Watershed, State of North Dakota, hereinafter referred to as the watershed project plan or plan, which plan is annexed to and made a part of this agreement;

Now, therefore, in view of the foregoing considerations, the Secretary of Agriculture, through NRCS, and the Sponsor hereby agree on this watershed project plan and that the works of improvement for this project will be installed, operated, and maintained in accordance with the terms, conditions, and stipulations provided for in this plan and including the following:

1. **Term.** The term of this agreement is for the installation period and evaluated life of the project (53 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.

2. **Costs.** The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of works of improvement.

3. **Real property.** The sponsor will acquire such real property as will be needed in connection with the works of improvement. The amounts and percentages of the real property acquisition costs to be borne by the Sponsor and NRCS are as shown in the Cost-share table in item 5 hereof.

   The sponsor agrees that all land acquired for measures, other than land treatment practices, with financial or credit assistance under this agreement will not be sold or otherwise disposed of for the evaluated life of the project except to a public agency which will continue to maintain and operate the development in accordance with the Operation and Maintenance Agreement

4. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The sponsor hereby agrees to comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. Section 4601 et seq. as further implemented

through regulations in 49 CFR Part 24 and 7 CFR Part 21) when acquiring real property interests for this federally assisted project. If the sponsor is legally unable to comply with the real property acquisition requirements, it agrees that, before any Federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance.

5. **Cost-share for Watershed Work Plan.** The following table shows cost-share percentages and amounts for Watershed Work Plan implementation.

Cost-share Table for Watershed Operation or Rehabilitation Projects					
Works of Improvement Cost-Shareable Items	**NRCS**		**Sponsor**		**Total**
	Percent	Cost	Percent	Cost	Cost
Flood Retarding Struct					
List measures by purpose and rate of assistance 1/					
Flood Damage Reduction-floodplain excavations	100	250,000	0		250,000
Watershed Protection – channel stabilization	75	2,993,700	25	977,900	3,911,600
Engineering Services	100	490,200			490,200
Subtotal: Cost-Sharable Costs		**3,673,900**		**977,900**	**4,651,800**
Non-Cost-Sharable Items 2/					
Project Administration 3/	0		100	124,800	124,800
Real Property Rights 4/	0		100	1,000	1,000
Subtotal: Non-Cost-Share Costs				**125,800**	**125,800**
Total:		**3,673,900**		**1,103,700**	**4,777,600**

1/ Installation costs explanatory notes:

(a) List each multiple-purpose measure separately. Specific cost items and joint costs of multiple-purpose measures will be shown as separate line item entries. Single-purpose measures may be grouped by kind if the rate of assistance is the same for each measure or group.

(b) For watershed protection enduring measures, the following footnote should be included: 1/ The cost-share rate is the percentage of the average cost of installing the practice in the selected plan for the evaluation unit. During project implementation, the actual cost-share rate must not exceed the rate of assistance for similar practices and measures under existing national programs.

2/ If actual non-cost-sharable item expenditures vary from these figures, the responsible party will bear the change.

3/ The sponsor and NRCS will each bear the costs of project administration that each incurs. Sponsor costs for project administration include relocation assistance advisory service.

4/ The sponsor will acquire with other than Watershed Protection and Flood Prevention Act funds, such real property as will be needed in connection with the works of improvement. The value of real property is eligible as in-kind contributions toward the sponsors' share of the works of improvement costs. In no case will the amount of an in-kind contribution exceed the sponsors' share of the cost for the works of improvement. The maximum cost eligible for in-kind credit is the same as that for cost sharing.

6. **Land treatment agreements.** The sponsor will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their land. The sponsor will ensure that 50 percent of the land upstream of any retention reservoir site is

adequately protected before construction of the dam. The sponsor will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsor will encourage landowners and operators to continue to operate and maintain the land treatment measures after the long-term contracts expire, for the protection and improvement of the watershed.

7. **Floodplain Management.** Before construction of any project for flood prevention, the sponsor must agree to participate in and comply with applicable Federal floodplain management and flood insurance programs. The sponsor is required to have development controls in place below low and significant hazard dams prior to NRCS or the sponsor entering into a construction contract.

8. **Water and mineral rights.** The sponsor will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights pursuant to State law as may be needed in the installation and operation of the works of improvement.

9. **Permits.** The sponsor will obtain and bear the cost for all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of the works of improvement.

10. **NRCS assistance.** This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.

11. **Additional agreements**. A separate agreement will be entered into between NRCS and the sponsor before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.

12. **Amendments.** This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the sponsor has failed to comply with the conditions of this agreement or when the program funding or authority expires. In this case, NRCS must promptly notify the sponsor in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsor or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the sponsor having specific responsibilities for the measure involved.

13. **Prohibitions.** No member of or delegate to Congress, or resident commissioner, may be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision may not be construed to extend to this agreement if made with a corporation for its general benefit.

14. **Operation and Maintenance (O&M).** The sponsor will be responsible for the operation, maintenance, and any needed replacement of the works of improvement by actually performing the work or arranging for such work, in accordance with an O&M Agreement. An O&M agreement will be entered into before Federal funds are obligated and will continue for the project life (50 years). Although the sponsors' responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement,

the sponsor acknowledges that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

15. **Emergency Action Plan.** Prior to construction, the sponsor must prepare an Emergency Action Plan (EAP) for each dam or similar structure where failure may cause loss of life or as required by state and local regulations. The EAP must meet the minimum content specified in the NRCS Title 180, National Operation and Maintenance Manual (NOMM), Part 500, Subpart F, Section 500.52, and meet applicable State agency dam safety requirements. The NRCS will determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the structure. EAPs must be reviewed and updated by the sponsor annually.

16. **Nondiscrimination Provisions**. 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, gender identity (including gender expression), sexual orientation, 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, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. 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, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: program.intake@usda.gov.

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By signing this agreement, the recipient assures the Department of Agriculture that the program or activities provided for under this agreement will be conducted in compliance with all applicable Federal civil rights laws, rules, regulations, and policies.

17. **Certification Regarding Drug-Free Workplace Requirements** (7 CFR Part 3021). By signing this Watershed Agreement, the sponsor is providing the certification set out below. If it is later determined that the sponsor knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, the NRCS, in addition to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

Controlled substance means a controlled substance in Schedules I through V of the Controlled Substances Act (21 U.S.C. Section 812) and as further defined by regulation (21 CFR Sections 1308.11 through 1308.15);

Conviction means a finding of guilt (including a plea of *nolo contendere*) or imposition of sentence, or both, by any judicial body charged with the responsibility to determine violations of the Federal or State criminal drug statutes;

Criminal drug statute means a Federal or non-Federal criminal statute involving the manufacturing, distribution, dispensing, use, or possession of any controlled substance;

Employee means the employee of a grantee directly engaged in the performance of work under a grant, including: (i) all direct charge employees; (ii) all Indirect charge employees unless their impact or involvement is insignificant to the performance of the grant; and, (iii) temporary personnel and consultants who are directly engaged in the performance of work under the grant and who are on the grantee's payroll. This definition does not include workers not on the payroll of the grantee (e.g., volunteers, even if used to meet a matching requirement; consultants or independent contractors not on the grantees' payroll; or employees of subrecipients or subcontractors in covered workplaces).

Certification:

A. The sponsor certifies that they will or will continue to provide a drug-free workplace by—

(1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition.

(2) Establishing an ongoing drug-free awareness program to inform employees about—
(a) The danger of drug abuse in the workplace;
(b) The grantee's policy of maintaining a drug-free workplace;
(c) Any available drug counseling, rehabilitation, and employee assistance programs; and
(d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace

(3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1).

(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee must—
(a) Abide by the terms of the statement; and
(b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction.

(5) Notifying the NRCS in writing, within 10 calendar days after receiving notice under paragraph (4)(b) from an employee or otherwise receiving actual notice of such conviction. Employers of convicted employees must provide notice, including position title, to every grant officer or other designee on whose grant activity the convicted employee was working, unless the Federal agency has designated a central point for the receipt of such notices. Notice must include the identification numbers of each affected grant.

(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4) (b), with respect to any employee who is so convicted—
(a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
(b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

(7) Making a good faith effort to continue to maintain a drug-free workplace through implementation of paragraphs (1), (2), (3), (4), (5), and (6).

B. The sponsor may provide a list of the sites for the performance of work done in connection with a specific project or other agreement.

C. Agencies will keep the original of all disclosure reports in the official files of the agency.

18. **Certification Regarding Lobbying** (7 CFR Part 3018) (for projects > $100,000)

A. The sponsor certifies to the best of their knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the sponsor, to any person for influencing or attempting to influence an officer or employee of an agency, Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned must complete and submit Standard Form LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The sponsor must require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients must certify and disclose accordingly.

B. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by U.S. Code, Title 31, Section 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

19. **Certification Regarding Debarment, Suspension, and Other Responsibility Matters—Primary Covered Transactions (7 CFR Part 3017).**

A. The sponsor certifies to the best of their knowledge and belief, that they and their principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph A(2) of this certification; and

(4) (4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

B. Where the primary sponsor is unable to certify to any of the statements in this certification, such prospective participant must attach an explanation to this agreement.

20. **Clean Air and Water Certification.**

A. The project sponsoring organizations signatory to this agreement certify as follows:

(1) Any facility to be utilized in the performance of this proposed agreement is (____), is not (X) listed on the Environmental Protection Agency List of Violating Facilities.

(2) To promptly notify the NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.

(3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.

B. The project sponsoring organizations signatory to this agreement agrees as follows:

(1) To comply with all the requirements of section 114 of the Clean Air Act as amended (42 U.S.C. Section 7414) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, issued there under before the signing of this agreement by NRCS.

(2) That no portion of the work required by this agreement will be performed in facilities listed on the EPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the EPA eliminates the name of such facility or facilities from such listing.

(3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the agreement is being performed.

(4) To insert the substance of the provisions of this clause in any nonexempt sub-agreement.

C. The terms used in this clause have the following meanings:

(1) The term "Air Act" means the Clean Air Act, as amended (42 U.S.C. Section 7401 et seq.).

(2) The term "Water Act" means Federal Water Pollution Control Act, as amended (33 U.S.C. Section 1251 et seq.).

(3) The term "clean air standards" means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 of the Air Act (42 U.S.C. Section

7414) or an approved implementation procedure under section 112 of the Air Act (42 U.S.C. Section 7412).

(4) The term "clean water standards" means any enforceable limitation, control, condition, prohibition, standards, or other requirement which is promulgated pursuant to the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. Section 1342), or by a local government to assure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. Section 1317).

(5) The term "facility" means any building, plant, installation, structure, mine, vessel, or other floating craft, location or site of operations, owned, leased, or supervised by a sponsor, to be utilized in the performance of an agreement or sub-agreement. Where a location or site of operations contains or includes more than one building, plant, installation, or structure, the entire location will be deemed to be a facility except where the Director, Office of Federal Activities, Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

21. **Assurances and Compliance.** As a condition of the grant or cooperative agreement, the sponsor assures and certifies that it is in compliance with and will comply in the course of the agreement with all applicable laws, regulations, Executive orders and other generally applicable requirements, including those set out below which are hereby incorporated in this agreement by reference, and such other statutory provisions as a specifically set forth herein.

State, Local, and Indian Tribal Governments: OMB Circular Nos. A-87, A-102, A-129, and A-133; and 7 CFR Parts 3015, 3016, 3017, 3018, 3021, and 3052.

Nonprofit Organizations, Hospitals, Institutions of Higher Learning: OMB Circular Nos. A-110, A-122, A-129, and A-133; and 7 CFR Parts 3015, 3017, 3018, 3019, 3021 and 3052.

22. **Examination of Records.** The sponsor must give the NRCS or the Comptroller General, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to this agreement, and retain all records related to this agreement for a period of three years after completion of the terms of this agreement in accordance with the applicable OMB Circular.

23. Signatures.

Pembina County Water Resource District

The signing of this plan was authorized by a resolution by the Pembina County Water Resource District governing body and adopted at an official meeting held on

JANUARY 24, 2023 at Cavalier, North Dakota

By:

Richard M Kendall

Date: 1-24-2023

Richard Kendall, Chairman
Pembina County Water Resource District

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

Todd C. Hagel

Date: 1/25/2023

Todd Hagel, Acting State Conservationist
Natural Resources Conservation Service
220 East Rosser Avenue
PO Box 1458
Bismarck, ND 58502-1458

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SUMMARY (OMB FACT SHEET)

Summary Supplemental Watershed Plan #3 – Environmental Assessment Document for:	
Name of Watershed:	Tongue River Watershed
County and State:	Pembina and Cavalier Counties, North Dakota
Congressional District:	North Dakota At-Large Congressional District
Authorization:	The Watershed Project Plan is authorized under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended and the Regional Conservation Partnership Program Project (16 U.S.C. Chapter 58, Subchapter VIII). The Watershed Project Plan was prepared per policies and guidelines contained in the Natural Resource Conservation Service (NRCS) *National Watershed Program Manual* (NWPM 2014) and *National Watershed Program Handbook* (NWPH 2014).
Sponsor:	Pembina County Water Resource District
Proposed Action:	The project will entail 1.8 miles of channel stabilization via levee removal, river restoration, grade control structures, bioengineering bank treatments, and floodplain revegetation to reduce downstream sediment delivery and halt the upstream progression of incision. Reconnection of the channel to the natural floodplain, as well as floodplain excavations, will provide downstream flood control benefits.
Purpose and Need for Action:	The purposes of the proposed action are watershed protection and flood damage reduction. The needs for action are that channel incision has increased sediment load to Renwick reservoir from 7,500 tons/year to 55,000 tons/year; phosphorus loads to the reservoir have increased by 600%; annual cropland damages downstream of Highway 32 due to flooding average $51,121; the Tongue River upstream of Highway 32 is one of the last strongholds in ND for Northern Pearl Dace, a designated state species of concern, and further upstream progression of channel incision threatens 5.5 miles of prime habitat; 2 bridges and 16-25 acres of valuable forest resources are also threatened by upstream progression of channel incision.
Description of Preferred Alternative (no more than 5 lines):	The Preferred Alternative includes restoration of natural river channel dimension, pattern, profile, gravel substrate, and floodplain connectivity to 1.8 miles of severely incised river channel. The project will also involve levee removals, construction of grade control structures, wetland restorations/creations, and revegetation of floodplains.
Resource Information:	**Latitude and Longitude:** 48.735 N, -97.9228 W
	Eight-Digit Hydrologic Unit No.: 09020316
	Climatology and Topography: The climate within the project area is continental and characterized by large variances in temperature, both on a seasonal and daily basis. Precipitation ranges from low to moderate, and air flow through the region creates windy conditions. The project resides within the eastern portion of North Dakota,

	where rainfall received is typically greater than that in the western portion of the state. In general, topography is steeper in the western and central portions of the study area, with moderating slopes to the east. The steepest slopes within the study area are near the Pembina County-Cavalier County line, where several coulees exist and rapidly drop runoff from the upper portions of the watershed (west) to lower portions of the watershed (east).
	Watershed Size (acres): 66,839 acres (full planning extent, to Renwick Dam, AOI) 486 acres (project area, DIRECT ZONE) 7,544 acres (Preferred Alternative drainage area , Indirect APE)
	Land Uses (acres): According to the Multi-Resolution Land Characteristics Consortium, 2016 National Land Cover Database for the full 66,839-acre planning watershed, the following land use types are present: Woody Wetlands: 5,099 acres, 7.6 % Emergent herbaceous wetlands: 1,954 acres, 2.9 % Developed, open space: 1,902 acres, 2.9 % Herbaceous: 1,666 acres, 2.5 % Evergreen forest: 779 acres, 1.2 % Open water: 512 acres, 0.77 % Shrub/scrub: 206 acres, 0.31 % Developed, low intensity: 153 acres, 0.23 % Mixed forest: 63 acres, 0.09 % Developed, medium intensity: 13 acres, 0.02 % Barren land: 3 acres, < 0.02 % Developed, high intensity: 1 acre, < 0.02 % The remaining land use cover types each account for less than 1% of the project area.
	Land Ownership: The following is a breakdown of ownership within the full 66,839-acre planning watershed: Private (93.1 %) State-Local (6.8 %) Federal (0 %)
	Population and demographics: According to the U.S. Census Bureau, American Community Survey (2019), the population within the project area is approximately 3,762 people (in the Indirect APE). The per-capita income for the project area is approximately $43,125. Approximately 10 % of the individuals in the project area are considered in poverty. The population includes approximately 96 % white individuals as the predominate race; and 2 % of the population within the project area account for the minority, classified as “Other”.
	Relevant resource concerns identified through scoping: <u>Soils</u> Soil Resources

	Prime and Unique Farmland, and Farmland of Statewide Significance Water Water Quantity Water Quality Aquatic Resources Riparian Areas Floodplain Management Regional Water Resources Plans Habitat and plant Communities Natural Areas Plants and Animals – Wildlife and Listed Species Fish and Wildlife Threatened and Endangered Species Migratory Birds Invasive Species Human Environment Land Use Environmental Justice and Civil Rights Cultural Resources and Historic Properties Social Issues and Public Health and Safety Recreation Resources
Alternatives considered:	Alternative plans were formulated in consideration of the purposes of the project and concerns expressed during the public scoping process. Formulation of the alternative plans considered cost effectiveness, local financing and acceptance, environmental concerns, ability to implement, and ability to maintain. Alternatives evaluated for use in the watershed to address flood damage reduction include cropland best management practices, conversion of cropland to grassland or forest, aquifer storage, channelization, drainage, diversions, road crossing capacity, on-channel dams, large scale wetland restoration/creation, metered runoff, off-channel impoundments, restoration of natural floodplain connectivity, levees, flood warning systems, and easements. Alternatives evaluated for channel stabilization included multiple natural channel design strategies, full channel armoring, beaver dam analogues, check dams, and riverbank armoring.
Brief description of components of each alternative:	Each of the final alternatives outlined in this Plan/EA include restoration of natural channel dimensions, pattern, profile, gravel substrate, and floodplain connectivity to 1.8 miles of severely incised river channel. Each would also involve levee removal, construction of a rock arch ramp grade control and fish passage structure, construction of 3 buried sheet pile grade control structures, construction of 4 rock cross vane grade control structures, wetland restorations/creations, and revegetation of floodplains. The only difference between the two is that Alternative 1 involves excavation of larger depressional areas in the floodplain to increase flood water retention. Alternative 1 has both higher construction costs and higher flood damage reduction benefits, but as outlined in the economic analysis, the additional

<table>
<tr><td></td><td>construction cost outweighed the monetized benefits to crop damage reduction.

Alternative 2 was selected as the Preferred Alternative given that it is the least cost, environmentally acceptable alternative to meet the purposes of maintaining the existing flood prevention and recreation benefits of Renwick Dam and it reduces the loss of floodplain cropland, forestland, and riparian areas due to river channel erosion. Alternative 2 does provide flood water retention and flood damage reduction benefits downstream of North Dakota State Highway 32.</td></tr>
<tr><td>Mitigation measures for alternatives:</td><td>The U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service are Cooperating federal agencies in the watershed planning effort and have indicated that construction would fall under the U.S. Army Corps of Engineers Nationwide Permit 27 - Aquatic Habitat Restoration, Enhancement, and Establishment Activities. Construction would negatively impact a 0.04-acre riverine wetland, which will be mitigated for onsite via a net increase of up to 6.71 acres of wetland restorations and creations.</td></tr>
<tr><td>Project costs:</td><td>
<table>
<tr><td></td><td>PL 83-566 Funds</td><td>Other Funds</td><td>Total Funds</td></tr>
<tr><td>Construction</td><td>$ 3,183,700 (77%)</td><td>$ 977,900 (23%)</td><td>$ 4,161,600</td></tr>
<tr><td>Engineering</td><td>$ 490,200 (100%)</td><td>$ 0 (0%)</td><td>$ 490,200</td></tr>
<tr><td>Real Property</td><td>$ 0 (0%)</td><td>$ 1,000 (100%)</td><td>$ 1,000</td></tr>
<tr><td>Project Admin</td><td>$ 0 (0%)</td><td>$ 124,800 (100%)</td><td>$ 124,800</td></tr>
<tr><td>Annual O&M</td><td>$ 0 (0%)</td><td>$ 200 (0%)</td><td>$ 0</td></tr>
<tr><td>Total</td><td>$3,673,900 (77%)</td><td>$1,103,900 (23%)</td><td>$ 4,777,600</td></tr>
</table>
Average Annual Cost- Watershed Protection: $ 154,700
Average Annual Cost- Flood Reduction: $ 8,500
Total Average Annual Cost: $ 163,200</td></tr>
<tr><td>Project benefits:</td><td>Average Annual Benefits- Watershed Protection: $ 635,700
Average Annual Benefits- Flood Reduction: $ 10,200
Total Annual Benefits- $ 645,900
Number of Direct Beneficiaries Onsite: 3
Number of Direct Beneficiaries Offsite: 118,900 per year
Project benefits include the following:

Halt the progress of river channel incision and widening upstream of Highway 89 by restoring 1.8 miles of degraded channel and protecting 5.5 miles of upstream high-quality aquatic habitat, riparian area, forest resources, and infrastructure.
Maintain existing flood damage reduction and recreation benefits of Renwick Dam into the future with avoided sediment delivery of 47,500 tons per year due to the project.
Reduce flood damages on 61 acres of cropland between Highway 89 and Renwick Dam during a 25-year rainfall event as well as enhance 21 acres of hayfield production by restoring natural groundwater tables upstream of North Dakota State Highway 32.
</td></tr>
</table>

	• Reduce the size and frequency of algal blooms in Lake Renwick in the future through avoided phosphorus delivery of 70,000 lbs per year due to the project. • Restore and enhance native vegetation and wildlife habitat on 72.6 acres of floodplain natural areas. • Protect 16-25 acres of mature, native, hardwood forests from loss to landslides due to avoided channel incision.
Period of Analysis	53 years
Project life:	50 years
Benefit-to-Cost Ratio Watershed Protection	4.1 to 1.0
Benefit-to-Cost Ratio Flood Reduction	1.2 to 1.0
Composite Project Benefit-to-Cost Ratio	4.0 to 1.0
Funding Schedule	Federal funds (budget year): $ 490,200 (2022) $ 3,183,700 (2023) Local funds (budget year): $ 26,000 (2022) $ 1,076,700 (2023)
Environmental Effects	Environmental benefits of the project include: ▪ Restoring 1.8 miles of degraded channel and protecting 5.5 miles of high-quality aquatic habitat, riparian area, and forest resources, and infrastructure. ▪ Reducing sediment delivery by 47,500 tons per year. ▪ Reducing phosphorus delivery by 70,000 lbs per year. ▪ Restoring native vegetation on 55.2 acres of degraded floodplain and natural areas. ▪ Protecting 16-25 acres of mature, native, hardwood forests from loss to landslides due to avoided channel incision. Short term effects during construction include increased turbidity and risk of harm to aquatic species during relocation operations for dewatering. Input from NDGF, USFWS, and USACE was used to develop aquatic species relocation and protection plans, as well as pollution control measures, to be utilize during construction. Construction specifications will outline requirements for cleaning equipment and import of wood, rock, and aggregate to minimize potential for invasive species spread per input from NDGF, USFWS, and USACE.
Major conclusions	The Preferred Alternative provides a unique opportunity to meet multiple objectives, including maintaining existing recreation and flood damage reduction benefits of an existing PL-566 dam for its intended lifespan, restoring and protecting fish habitat for a priority species, reducing cropland flood damages, preventing the loss of additional infrastructure and forest resources, improving water quality, and enhancing the quantity and quality of wetland and floodplain wildlife habitat.

Areas of controversy/ Controversial issues:	None
Issues to be resolved:	None
Evidence of Unusual Congressional or Local Interest	None
Compliance:	Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes

1 PURPOSE AND NEED FOR ACTION

1.1 PURPOSE AND NEED

The purpose of the proposed action is to provide watershed protection and flood damage reduction benefits to the Tongue River Watershed. This expands the original 1955 Watershed Plan flood damage reduction and recreation purposes to also include watershed protection. The project seeks to maintain the recreation and flood control benefits of Renwick Dam to the extent possible up to its intended rehabilitation lifespan, and to reduce and reverse the loss of high-quality aquatic habitat, riparian areas, floodplains, forestland, and cropland due to river channel incision and related erosion.

The need for action is as follows:

- Channel incision on the Tongue River upstream of North Dakota State Highway 32 has increased the pre-2013 sediment load to Lake Renwick from 7,500 tons/year to 55,000 tons/year since ~2013.
- The reservoir sediment pool, which was planned to have adequate capacity to 2113, is 77% full as of 2020. Without the project, if incision continues upstream, the sediment pool will be full by ~2026. The recreation (permanent pool) behind the dam would be 40% filled in 2050 and fully filled by 2086, effectively turning Lake Renwick into a dry dam or requiring cost prohibitive dredging operations. Downstream flood control benefits from Renwick Dam will be reduced by 33% by 2113 if river incision is allowed to continue unabated.
- Phosphorus loads have increased by 600% over natural background conditions due to channel incision, contributing to eutrophication of reservoir upstream of Renwick Dam. Algal bloom frequency has increased by 30% and included two confirmed Harmful Algal Blooms in 2017 and 2020. Dissolved oxygen levels in the reservoir upstream of Renwick Dam are routinely less than 5 mg/L, which is known to cause a reduction in fish growth and reproduction.
- Cropland, structure, and vehicle damage from Tongue River flooding below North Dakota State Highway 32 averages $51,121 per year.
- The northern pearl dace is designated as a Level I Species of Conservation Priority by North Dakota Game and Fish, and the Tongue River upstream of Highway 89 is one of the last strongholds of the species in the state. Channel incision has degraded 1.8 miles of prime habitat to date and threatens 5.5 miles of additional high-quality habitat.
- A private bridge was lost to channel erosion, and two additional upstream bridges would be at risk in the future. Valuable forest resources have been lost due to landslides caused by undercutting of the slope by channel incision, and an additional 16-25 acres would be at risk in the future.

1.1.1 REGIONAL CONCERNS

Flooding in the Pembina River Watershed has been a persistent problem in Pembina County. Downstream of Renwick Dam, between the City of Cavalier and the confluence with the Pembina River, flooding along the Tongue River results in agricultural damages, infrastructure damages, and community impacts. The Tongue River is also a tributary to the Red River Basin. The Red River Basin is an international, multi-jurisdictional watershed of approximately 45,000 square miles, with 80 % of the Basin contained within the United States and the remaining 20 % of the Basin located in Canada.

Flooding along the Red River and its tributaries is a prolonged issue for the region. In some cases, these floods have been significant. Impacts experienced along the Red River mainstem are a result of combined

tributary sub-watershed contributions, which includes the Tongue River Watershed. As a result, regional, basin-wide planning has occurred as far back as the early 1900s with the Boundary Waters Treaty, which addresses international issues within the Red River Basin (RRB).

Over the course of the 20th century, an increase of 20 % in precipitation produced 300 % higher annual discharge in the Red River. Mobilization of phosphorus is more strongly correlated to peak flow events than mean discharge (McCullough 2012). Climate predictions indicate that a 10-20 % further increase in average precipitation is likely by the end of the 21st century in this region (IPCC 2014). Substantial damages are often experienced during periods of excessive runoff. Since the flood of 1997, severe flooding has been observed to occur on a more frequent basis. In response to this, the Red River Basin Commission (2011) began development of the *Long-Term Flood Solutions* report, which was adopted in 2011. This report was developed with broad input from local, state, and federal officials to provide recommendations for acceptable levels of flood risk within the Red River Basin. One of the key strategies adopted was a goal of a 20 % reduction in peak flows on the Red River through development of 1.5 million acre-feet of retention in priority areas of the US portion of the Basin. Implementation of this basin wide retention goal was the primary purpose of the Red River Regional Conservation Partnership (RCPP) Project, an agreement between NRCS and the Red River Retention Authority (RRRA) which funded 20 watershed planning efforts, including this one in the Tongue River.

The approach for implementation of the floodwater retention goals is to focus on local flooding issues while also providing local practitioners with the tools required to consider regional impacts/benefits. Because the Tongue River is a tributary within the Red River Basin, it is both a contributing factor to the peak flows on the Red River as well as a potential focus for flood reduction. Secondary purposes of the Red River RCPP project were to improve water quality and wildlife habitat. This Supplemental Watershed Plan for Tongue River takes the somewhat novel approach, within the RRB, of providing floodwater retention through restoration of natural floodplain storage function rather than construction of a dam. The RRRA, as the lead RCPP Partner, supports the approach as another strategy to increase retention in the RRB.

1.1.2 WATERSHED OPPORTUNITIES

USDA-NRCS has been an active partner with the Pembina Water Resource District, in solving watershed problems in the Tongue River, for many decades. The 1955 Tongue River Watershed Plan was initiated in response to severe flood damages in 1948, 1949, and 1950 and resulted in construction of 10 dams (Appendix 1, Figure D-1), five miles of floodway, and several miles of clearing and snagging. Supplemental Tongue River Watershed Plan #2 was completed in 2006, for rehabilitation of Renwick Dam, the downstream most structure in the watershed. During planning for the Renwick Dam Rehabilitation, bathymetric surveys were completed in 1990 and 2002, indicating a measured sediment accumulation rate of 3.45 acre-feet per year; on that basis it was anticipated there was ample storage volume for another 100-years of sediment in the reservoir without negative impact to recreation. While lateral confinement from farm levee and highway fill structures existed near the Highway 89 crossing of the Tongue River during that time period, planners did not anticipate the threat these posed for future channel incision, the eroded sediment from which would ultimately reach Renwick Reservoir ~15 river miles downstream. The 2013 flood event, which was the first time that auxiliary spillways were activated on the PL-566 dams constructed in the late 1950s, occurred during the construction of the Renwick Dam rehabilitation project. This flood event triggered the channel incision process in the vicinity of the Highway 89 crossing, due to lateral confinement, and after the natural gravel channel bottom eroded down into Pierre shale material, even very minor flow events have continued to cause the channel to incise and widen, as well as progressively move upstream. Going back in time, after construction of the rehabilitation project, was obviously not practical

nor would it have been within the scope of the Watershed Rehabilitation Program to fund a major channel stabilization effort 15 miles upstream of the dam.

Landowners in the vicinity of Highway 89 began to draw attention to the channel erosion issues as they continued to lose land to channel widening, beginning in 2015. A private bridge failed due to undercutting and flanking, and landslides were initiated on the steep, forested slopes on the south side of the river. The river channel that once they could step across formed into a deep, incised gorge with eroded banks and many trees along the riverbank were lost. At the same time, long time users of Renwick reservoir noted the massive sediment deposits forming at the delta, shallower water in the reservoir, and increased frequency of algal blooms. Appendix D-1 Channel Stability Assessment provides results of the full river reach evaluation completed between Renwick Reservoir and Senator Young Dam, resulting in identification of the general reaches 4 and 5 as the primary source of erosion, as well as results of the extensive monitoring and analysis work completed on the project reach since 2016. Appendix D-8 Project Benefits provides sediment accumulation data information based on the bathymetric survey completed with this planning effort in 2020 replicating the cross sections of the reservoir originally surveyed in 2002. The resulting sedimentation rate from 2013 to 2020 was determined to be 27.2 acre-feet per year, of which 3.45 acre-feet per year is assumed to be base sedimentation rate (largely cropland erosion) of the watershed. The excess volume of 23.8 acre-feet per year, after trap efficiency and consolidation is accounted for, matches project reach erosion estimates determined from monitoring bed degradation, channel widening (bank erosion), and landslide activity within reaches 4 and 5 (project reach). Likewise, the volume of phosphorus being transported to the reservoir due to channel widening was estimated based on sampling. Appendix D-8 provides additional details of the sediment and phosphorus analysis.

Currently watershed rehabilitation planning is ongoing for 3 additional high hazard dams in the watershed: Senator Young, Olson, and Bourbanis Dam. The rehabilitation plan purpose is to address existing dam safety deficiencies at the structures. A plan for the remaining last high hazard dam, Herzog, is likely to be initiated in the near future. Senator Young and Olson Dams are located upstream of reaches 4 and 5, currently experiencing severe channel incision. While reduced sediment transport as a result of the presence of dams is noted as a minor contributing factor to channel incision in Appendix D-1, even if the result of the planning process was for these two dams to be decommissioned, re-establishing natural sediment transport at this point in time would not halt the ongoing severe incision process. Completion of the rehabilitation projects to stabilize the two dams are important in that catastrophic failure from a breach would cause massive sediment delivery and scour within the channel and floodplains downstream of the dams.

Opportunities made available through the implementation of this Plan include the following improvements to the regional economy, enhancement of the environment, and improved quality of life which are detailed in Appendix D-8, project benefits.

- Maintain public recreation opportunities and the fishery at Renwick Reservoir
- Decrease flood damage upstream of Renwick Dam
- Maintain flood resiliency downstream of Renwick Dam
- Protect, maintain, or improve water quality
- Protect, maintain, or improve fish and wildlife habitats
- Protect, maintain, or improve riparian corridors
- Improve bank stability
- Protect human health and safety

- Protect fiscal investments in public and private infrastructure and the transportation system
- Promote responsible land stewardship throughout the watershed

Consistency with the Red River Basin Commission’s Long-Term Flood Solutions Report.

2 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

Systematic scoping was used to identify problems within the watershed and to rate their significance. The potential list of resource concerns was initially presented to the public during the April 5, 2017, public meeting in Cavalier, ND (see Section 6). This meeting discussed several concerns within the watershed and also enabled for the general public to rate the level of concern for several various considerations. The concerns below were initially presented to the public.

Identified Resource Concerns:

- Agricultural Flood Damages (delayed planting, prevented planting, crop flood inundation, field erosion/deposition, floodplain management, etc.)
- Structural Flood Damages (rural residents, road damages, culvert/bridge damages, community impacts, grain storage bins, warehouses, floodplain management, etc.)
- Water Quality (surface water quality, ground water quality, etc.)
- Soil Health (Field erosion/deposition, productivity, sustainability, organic matter content, etc.)
- Wildlife and Habitat (Fish and wildlife, wetlands, endangered and threatened species, invasive species, migratory birds, forest resources, riparian areas, etc.)
- Recreation (Fishing & hunting, public access, state and federally managed lands, etc.)
- Societal Concerns (Historic & cultural resources, tribal resources, public health & safety, etc.)
- Other

Input on these concerns was solicited from the public to determine the locally perceived issues within the Tongue River Watershed upstream of Renwick Dam. The comments received generally indicated concerns associated with soil health and bank erosion along the Tongue River channel as well as some concerns with flooding. Comments received, along with other materials used to solicit public participation, can be found in Appendix A.

After engaging the public in scoping, concerns identified by the public were discussed during a meeting held with the interagency team on February 27, 2018. These concerns, and other concerns set forth in Section 501.24 of Title 390 – National Watershed Program Manual, were used to further refine a list of resource concerns within the Tongue River Watershed. Each of the concerns was addressed based on their relevance to the project objectives defined in the Purpose and Need for Action section. The results of this scoping process are listed in Table 2-1. Potential resource concerns that, after scoping, were found to be of low or no relevance to the project were eliminated from further review.

Table 2-1: Scoping Table and Evaluation of Identified Concerns (for AOI).

Item/Concern	Relevance to the Proposed Action		Rationale
	Yes	No	
SOILS			
Soil resources	X		It is intended that the Preferred Alternative will stabilize channel and bank erosion. The soils in the floodplain area are moderately erodible and some show hydric characteristics.
Prime and Unique Farmland	X		Prime farmland is present and impacted by the Preferred Alternative, however the current wildlife land use will remain, i.e., the current land use will not change under the preferred alternative.
WATER			
Surface water resources	X		It is intended that the Preferred Alternative will improve flood risk management within the AOI and could affect water resources
Waters of the United States	X		It is intended that the Preferred Alternative will improve flood risk management within the AOI and could affect waters classified by the EPA as Waters of the US.
Wetlands	X		Wetland resources will be both negatively and positively impacted by the proposed action.
Wild and scenic rivers		X	There are no wild and scenic river designations within the project area.
Sole Source Aquifers		X	There are no EPA-designated Sole Source Aquifers within the AOI.
Water quality	X		The proposed alternative will provide a water quality benefit by reducing downstream nutrient transport. This nutrient load reduction will provide a regional benefit along both the Tongue and the Red rivers as well as an international benefit in terms of helping to meet nutrient load targets at the border.
Floodplain management	X		Designated floodplains exist throughout the project AOI.
Regional water resource plans	X		The project is part of a larger planning effort to increase flood resilience within the Red River Valley.
International concerns	X		The Tongue River is included within the Red River of the North basin. There are specific water quality goals established at the international border.
AIR			
Air quality		X	The AOI is designated to be in attainment or unclassifiable (to be considered in attainment) for all National Ambient Air Quality Standards (AAQS) (U.S. Environmental Protection Agency, data current as of February 2020). The project does not involve any permanent air polluting infrastructure. Temporary use of heavy machinery for construction and maintenance on the project is not anticipated to significantly affect or change air quality in the region from its existing state.
HABITAT AND PLANT COMMUNITIES			

Item/Concern	Relevance to the Proposed Action		Rationale
	Yes	No	
Natural areas	X		There are several natural areas in the vicinity.
Riparian areas	X		Riparian corridors exist adjacent to the Tongue River, tributaries, and wetland complexes. Due to currently over-incised channel conditions, flood flows do not support historical floodplain plant communities. The proposed alternative will provide a habitat benefit at the project site and may not affect the condition downstream.
Ecologically critical areas		X	There are no ecologically critical areas designated within the project area.
Essential fish habitat		X	There are no Magnuson-Stevens Fishery Conservation and Management Act designated essential fish habitat areas within the project area.
Coral Reefs		X	There are no coral reefs within the project area.
Scientific resources		X	There are no scientific resources within the project area.
Forest resources	X		Forest resources are located in the Tongue River watershed and a small lumber mill operates in the area. Commercially valuable hardwood trees have been lost due to incision generated channel widening and related upslope landslides. Additional forest resources are at risk if incision continues to move upstream.
PLANTS AND ANIMALS			
Fish and wildlife	X		There are 27 fish species identified as characteristic to the Tongue River.
Animal species of conservation priority	X		The state of North Dakota lists a potential of 115 animal species (priority Levels I, II, and III), several of which could be in the region.
Plant species of conservation priority	X		The state of North Dakota lists 110 plant species (priority Levels I, II and III), several of which could be in the region.
Endangered and threatened species	X		The US Fish and Wildlife Service indicates there is no designated critical habitat in the project area, but two federally listed species may be present within the vicinity of the project area.
Migratory birds	X		North Dakota is located within the Central Flyway. The project is located within the Prairie Pothole Region, which is an important breeding area and a significant contributor to continental Waterfowl Populations. The US Fish and Wildlife Service has identified several species of migratory birds of conservation concern. The project will positively impact other migratory species by providing wetland habitat for migrating waterfowl and possibly for local production of migratory waterfowl.
Invasive Species	X		Zebra mussels are an invasive species of particular concern in North Dakota that have been found throughout Red River tributaries. There are 13 species of noxious weed identified within North Dakota at the state level. Pembina and Cavalier counties have identified three additional noxious weeds within their jurisdictions. Dutch Elm disease has also been confirmed in every county of North Dakota and is likely present in the project area.
HUMAN ENVIRONMENT			
Land use	X		Flooding on agricultural lands is currently a significant concern. Preservation of the local agricultural economy by ensuring lands remain in agricultural production is a priority. Limited land use change will result from this proposed project other than positively impacting the agricultural and timber uses that already exist.

Item/Concern	Relevance to the Proposed Action		Rationale
	Yes	No	
Flood damages	X		The project would increase flooding in the project reach, on lands enrolled in USFWS and USDA conservation easements, and reduce flooding on downstream cropland.
Environmental justice and civil rights	X		Screening did not identify any negative impacts to any specific population as a result of the proposed project.
Cultural resources	X		A cultural resources survey has been conducted and determined no presence of historic or culturally significant sites. A finding of "No Historic Properties" was recommended. Paleontological resources may be present.
Social Issues	X		Flooding is a source of economic loss and expense to the public and local governments.
Public Health and Safety	X		Public health and safety is currently compromised during times of flooding. Flooding presents a major public safety risk.
Scenic beauty / Visual		X	There are no designated scenic sites within the watershed AOI. Limited natural, undisturbed landscape exists within the project area as the AOI is primarily agricultural with smaller rural communities. Visual resources or scenic beauty is not a resource concern for this project.
Recreation and Parklands	X		Icelandic State Park is located on the reservoir formed by Renwick Dam. There are no federal parklands identified within the AOI. There are several state Wildlife Management Areas.

3 AFFECTED ENVIRONMENT

This section describes pertinent physical, ecological, economic, and social information within the Area of Interest (AOI, 36,390 acres) (Appendix B-1). This will provide the context for determining the effects, both direct and Indirect, of alternatives on the environment near the project area in the later sections. A map showing the benefitted areas, as well as Direct and Indirect Zones of possible effect, is provided in Appendix B-2. Each of the relevant concerns identified during the scoping process described in the previous section is described in more detail in the following sections.

3.1 SOILS

3.1.1 SOIL RESOURCES

The project area is located at the convergence of the Lake Agassiz Plains and Northern Glaciated Plains ecoregions. The eastern portion of the project is located within the Sand Deltas and Beach Ridges ecoregion, and the western portion of the project area is located within the Pembina Escarpment ecoregion (Bryce et al. 1998). The project overlays two geologic regions in North Dakota: the Red River Valley and the Drift Prairie (North Dakota Game and Fish Department 2016a). Most of the region is covered by silt and clay deposits consistent with a lake bottom. Beach ridges extending from the Drift Plains are scattered throughout the valley and mark the former shoreline of Glacial Lake Agassiz at various periods of time. The valley rises 500 feet over a bedrock escarpment to mark the natural boundary of the Red River Valley. The general topography within the area consists of steeper slopes in the western portion of the project area, with moderating slopes further east. Wetlands located within the project area provide natural water resources management because of their ability to absorb rainfall and snow melt runoff. The topography within the AOI consists of steeper slopes in Cavalier County, with slopes flattening in eastern Pembina County.

Soil characteristics that influence landscapes include hydric ratings and the erodibility factor (the “K” factor). Hydric soils are those that, in their undrained condition, are saturated, flooded, or ponded long enough during a growing season to develop an anaerobic condition that supports the growth and regeneration of hydrophytic vegetation (US Army Corps of Engineers 1987). Of the soils within the AOI, 35 % are not hydric, 42 % have low hydric ratings (1-32 %), 1.9 % are 33-65 % hydric, 14 % are 66-99 % hydric, and 6.9 % of the soils are classified with a 100 % hydric status (US Department of Agriculture Natural Resources Conservation Service Soil Survey Staff 2021, Appendix C-1). The K-factor of a soil is an index of relative susceptibility to erosion (US Department of Agriculture RUSLE Development Team 2001). The index values range between 0.02 to 0.64, with higher erosion potential at the higher values. Highly clayey soils and sandy soils tend to have low K-values, fine sandy loams typically have moderate values, and high-silt soils are the most erodible. Values of K across the AOI range from 0.02 to 0.49. Approximately 65 % of the soils in the project area have K-factor values that range from 0.2 to 0.49. The remaining approximately 35% of soils have K-factor values ranging from 0.02 to less than 0.2. Soils more susceptible to erosion are distributed throughout the watershed (Appendix C-2).

As detailed in Appendix D-1, soil erosion within the Tongue River channel was evaluated along the entire river corridor between Senator Young and Renwick dam. Results generally matched to the geomorphic evaluation indicating reaches 4 and 5 were the primary source of erosion contributing sediment to the Renwick reservoir. As summarized in Appendix D-8, bathymetric surveys at Renwick were conducted in 1990, 2002, and 2020. The sediment accumulation rate from 1990-2002 was 3.45 ac-ft/year and increased to 27.2 ac-ft per year during 2013-2020 time period (see Appendix D-8), the increase in which correlated

strongly to the estimated project reach erosion determined based on monitoring (see Appendix D-1). The analysis indicates that the 2-mile project reach generates 23.9 ac-ft/yr of sediment while the remainder of the Tongue River corridor from Sen Young to Renwick generates 3.2 ac-ft/yr of sediment.

According to the soil surveys for Pembina and Cavalier counties (US Department of Agriculture Natural Resources Conservation Service Soil Survey Staff 2021), there 117 soil map units within the AOI. The most predominant soil map units are Walsh-Vang loams (6.9 % of area), followed by Waukon loam (5.7 %) (Table 3-1). Soils within the watershed are dominated generally by fine silts and loams, which are representative of the Lake Agassiz flat valley.

Table 3-1: Predominant (top 50 %) soil units within AOI.

Map Unit Name	Acres in AOI	Percent of AOI
Walsh-Vang loams, 0 to 2 % slopes	7,625	6.9
Waukon loam, 0 to 3 % slopes	3,827	5.7
Fargo silty clay, 0 to 1 % slopes	3,113	4.7
Olga-Kloten complex, 9 to 75 % slopes	3,113	4.7
Aylmer loamy sand, 0 to 6 % slopes	2,870	4.3
Cormant loamy sand, 0 to 1 % slopes	2,724	4.1
Poppleton loamy sand, 0 to 2 % slopes	2,440	3.7
Vang loam, 0 to 2 % slopes	2,239	3.3
Rolette clay loam, 0 to 3 % slopes	2,191	3.3
Svea-Cresbard loams, 0 to 3 % slopes	2,183	3.3
Brantford loam, 0 to 2 % slopes	2,134	3.2
Olga silty clay loam, 15 to 35 % slopes	1,931	2.9

The direct effect area is located at a transitional area from the steeper-sloped Pembina Escarpment to the Lake Agassiz floodplain. The slopes cause increased water velocities, but the soils here have moderate to low erodibility. The underlying Pierre shale bedrock, however, is highly erodible therefore makes up much of the eroded sediment. Predominate soils types within this area of Alternative 1 are shown in Appendix C-10. Fairdale silty clay loam (I585B) is the main soil underlying the river and the proposed project features. This soil type is characterized as very deep, moderately well drained, moderately permeable soils that formed in recent alluvium, and they are found on low terraces and floodplains (US Department of Agriculture Natural Resources Conservation Service Soil Survey Staff 2021). Most of the soils in this area (94 %, 457 acres) are non-hydric, while only 6 % (29 acres) of the soils are hydric (66-100 % rating) (Appendix C-11). An area of the hydric soils is near the proposed sites of the excavated ponds. This indicates the topography and soils of these areas are likely already trending toward wetland condition and would readily develop into shallow wetlands. The soils here show moderate to low erodibility, as reflected by the K-factor values (Appendix C-12). The maximum value in this area is within 0.28, lower than the highest possible K-factor of 0.64 (US Department of Agriculture RUSLE Development Team 2001). Most of the soils fall within the bracket of moderate erodibility, 0.2-0.3 (77 % of the land area, 373 acres), with the remainder of the land area below this bracket or undefined. The proposed project would be located in the zone of moderate erodibility.

The erosion caused by channel incision and widening in the Tongue River channel is occurring partially in soils and partially in the underlying shale bedrock material. Pierre shale is a soft and highly erodible material which fractures easily and weathers into distinct chips and flakes. It is easily dug with a shovel near the ground surface and classifies as a lean clay in terms of engineering soil properties. In most locations within the project reach, including the forested slopes on the south side of the river, there is less than 6 inches of soil present over the shale bedrock. Throughout the EA and technical reports, erosion and sediment deposition volumes reflect a combination of soils and bedrock material that behaves as soil. As outlined in Appendix D-8, monitoring and analysis of the project reach, compared to downstream reservoir sediment surveys and adjusted by reservoir trap efficiency, determined an average annual erosion rate upstream of Renwick Dam of 55,000 tons per year since 2013. From 1962 to 2013, reservoir sediment surveys adjusted by reservoir trap efficiency determined an average annual erosion rate of 7,500 tons per year.

3.1.2 FARMLAND CLASSIFICATION

Protection for important farmland, rangeland, and forest land is established in the Farmland Protection Policy Act (FPPA), US Department of Agriculture (USDA) regulations implementing the FPPA (7 CFR Part 658) and USDA DR No. 9500-3, Land Use Policy. Section 658.5 of the FPPA defines criteria for federal agencies to consider when identifying the potential adverse effects of federal programs on farmland. Federal agencies are to consider actions that could reduce adverse effects on farmland and ensure that federal programs, to the extent practicable, are compatible with state, local government, and private programs.

Farmland designations (US Department of Agriculture Natural Resources Conservation Service Soil Survey Staff 2021) within the AOI are presented graphically in Appendix C-3 and summarized in Table 3-2. The AOI is classified predominantly as not prime farmland (40 %). Approximately 29 % is classified as prime farmland, 12 % is classified as prime farmland if drained, and 19 % is farmland of statewide importance.

Table 3-2: Farmland classification within AOI.

Farmland Classification	Acres	Percent
All areas prime farmland	20,014	29
Prime farmland if drained	8,831	12
Farmland of statewide importance	13,295	19
Not prime farmland	27,707	40
Total	69,848	100

Within the Direct Zone, 63 % (304 acres) of the area is classified as prime farmland, and 3.2 % (15 acres) is farmland of statewide importance (Appendix C-13). The Tongue River floodplain in the project reach is mapped largely as prime farmland.

3.2 WATER

3.2.1 WATER QUANTITY

The AOI includes the Tongue River Watershed downstream of Senator Young Dam and upstream of Renwick Dam. The Tongue River is located within the Red River Basin in northeastern North Dakota. It is a tributary to the Pembina River, which is a tributary to the Red River (HUC09020316). Within the AOI there are approximately 164 miles of streams and rivers, consisting entirely of the Tongue River and its tributaries (Appendix C-4). Wetlands are described separately under Section 3.2.3. There are several water bodies within the AOI, including Lake Renwick and reservoirs associated with the following dam structures: Weiler Dam, Goschke Dam, Olga Dam, Bourbanis Dam, Senator Young Dam, Hanks Corner Dam, Herzog Dam, Olson Dam, and Morrison Dam. Two dams, Senator Young and Olson, are located in the subwatershed above the proposed project reach and impact the hydrology of the affected area.

Although there is an extensive network of PL-566 dams in the watershed, concerns regarding flooding remain a local concern particularly as it relates to cropland inundation. Given the low topographic relief in the downstream portions of the watershed, floods impact extensive cropland acreage for long durations when they occur (see Appendix D-2). In addition to impacts to agricultural production, cropland flooding generates dissolved phosphorus transport into the river system which is a significant concern in the Red River watershed as well as sheet and rill erosion of sediment. There is extensive surface and subsurface drainage upstream of Senator Young and Olson Dams and that has changed hydrology in the portion of

the watershed upstream of the dams. To evaluate whether cropland drainage upstream of the dams could have contributed to channel incision in the project reach (downstream of the dams), hydrologic and hydraulic modeling was completed for the watershed in a pre-settlement condition with native prairie and forests comprising all land in the watershed and wetlands restored on all hydric soils. That analysis is documented in Appendix D-1 (Table 1). Pre-settlement peak flows for all recurrence interval floods are substantially higher (27-95%) than current conditions with both the dams and upstream drainage/farming practices in place. In short, the Tongue River Watershed dams (Senator Young and Olson) provide greater flood reduction storage capacity in the project reach than landscape storage prior to conversion to cropland and installation of drainage systems. Both dams have a predicted sediment trap efficiency of 96%, so they have effectively served to intercept sediment that would otherwise be transported to Renwick. The other 7 dams on other tributaries to the Tongue River upstream of Renwick have similarly served to collect the majority of upstream sediment supply.

The recurring flood conditions result in impacts to the water resources within the project area. Flooding results in an increased potential for channel instability, erosion, and sedimentation, most particularly in the southeastern portion of the project area. Several trends related to the magnitude and frequency of flooding in the Tongue River watershed have been observed through review of available gaging data. Review of United States Geological Survey (USGS) Gage 05101000 (Tongue River at Akra, North Dakota) indicates increasing runoff volume and magnitude of flows. Figure 3-1 presents the annual runoff yield between 1962 and 2019 as observed from daily flow. This gage is located just downstream of Renwick Dam, which regulates the flows coming from the upper regions of the watershed. Even though the dam impacts discharge at the gage, the trend at the gage is expected to be similar for the watershed upstream of the dam. Additionally, annual runoff observed during the growing season has increased. This appears to substantiate landowner comments that crop damages associated with flooding within the watershed have become more frequent in recent history. Future projections for the conditions associated with climate change indicate increases in precipitation intensity and subsequent excess runoff in the 20-year recurrence over the next three decades in this region,

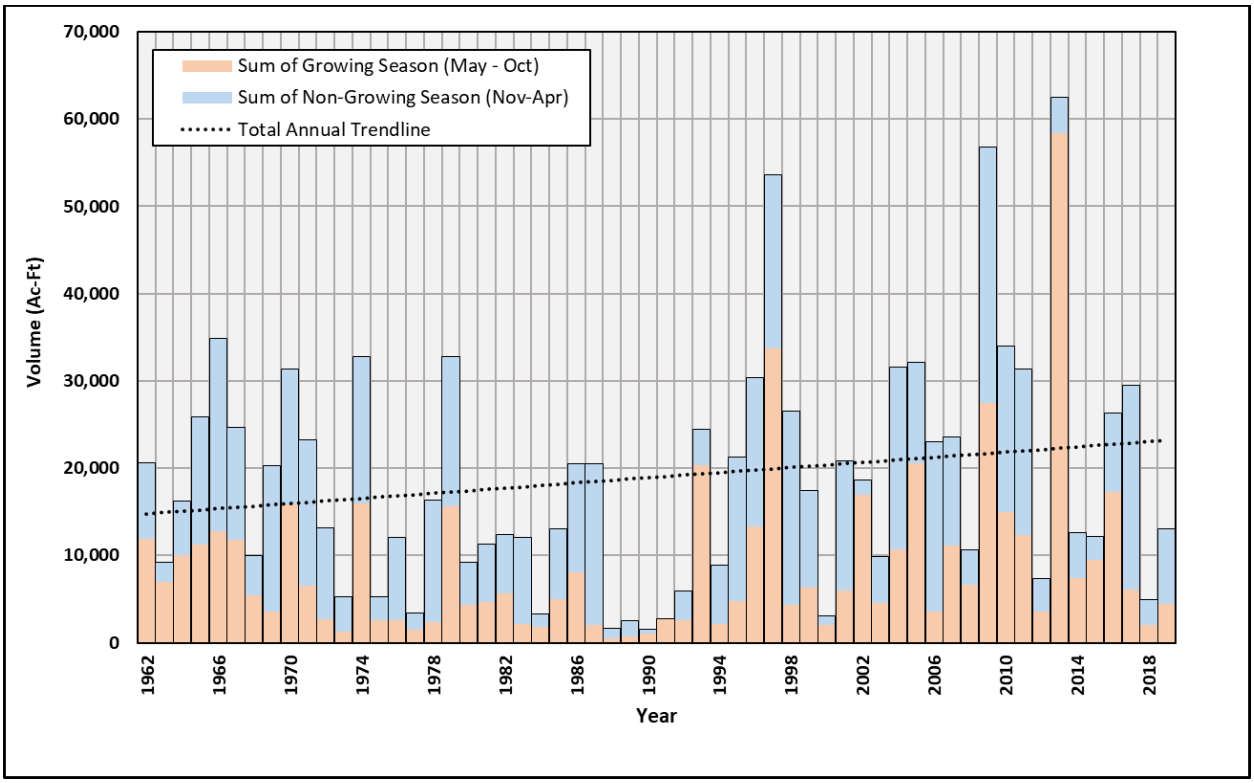

Figure 3-1: Annual runoff yield (United States Geological Survey Gage 05101000 Tongue River at Akra, ND)

Flood damages within the Tongue River Watershed upstream of Renwick Dam consist primarily of impacts to cropland during the growing season. Inundation of crop land leads to reduced yields and lost income for the local community. In an effort to reduce these damages, the NRCS built several flood control structures under the authority of Public Law (PL) 83-566 within the Tongue River Watershed. Many of these structures were constructed in the 1960s, and all have exceeded their design life. While these structures do currently provide flood damage reduction benefits for the area, additional damages still occur.

Hydrologic and hydraulic modeling results have been used to illustrate the amount of inundation on cropland compared to non-cropland during various synthetic rainfall events. Information presented in Table 3-3 include the benefit currently provided by the flood retarding structures previously constructed by NRCS under PL 83-566. Floodplain maps for the analyzed rainfall events are made available in *Existing Conditions Hydrology and Hydraulics Report* provided in Appendix D-2.

Table 3-3: Inundated Lands Summary (Project and benefitted areas)

Rainfall Event	Total Inundation Acres	Cropland Inundation Acres	Average Annual Inundated Cropland Acres
2-year, 4-day	721	113	56.5
5-year, 4-day	1084	261	52.2
10-year, 4-day	1394	428	42.8
25-year, 4-day	1875	712	28.5
50-year, 4-day	2374	1012	20.2
100-year, 4-day	2887	1312	13.1

Rainfall Event	Total Inundation Acres	Cropland Inundation Acres	Average Annual Inundated Cropland Acres
		Annual Average Inundated Cropland	213.3

**Estimated from National Agricultural Statistics Service Dataset GIS data layer*

Because duration is a key factor when evaluating flood damages to cropland, the hydraulic model was also used to determine the estimated duration of flooding on inundated acres. Hydraulic model run times were set sufficiently long to determine crop damages up to 100%, which generally occurred after 5 days of inundation (Appendix D-5, Exhibit 6). Varying length storms including 24-hour, 4-day, and 10-day duration, with appropriate adjustments to runoff curve numbers were analyzed. As summarized in Appendix D-2, which found the 4-day storm critical to crop damage, which is reflective of watershed characteristics such as shape and land slopes, that aligns sub watershed runoffs to cause highest main stem flows and extent of inundation. Shorter and longer storms than the critical 4-day duration, had slightly smaller inundation for same frequency event; therefore 4-day is critical and used for hydraulic and economic analyses, which reflects most accurately project benefits for the Tongue River watershed characteristics. Table 3-4 summarizes acres inundated for various inundation times for the 25-year, 4-day rainfall event.

Table 3-4: 25-Year, 4-day rainfall event inundation/duration summary.

Duration	Total Inundated Acres	Cropland* Inundated Acres
0 – 24 hours	700	390
24 – 48 hours	227	116
48 – 72 hours	138	61
72 – 96 hours	35	17
96 – 120 hours	27	12
> 120 hours	747	116

**Estimated from National Agricultural Statistics Service Dataset GIS data layer*

Damages also occur to public and private infrastructure (Appendix D-5). Numerous structures are impacted from flooding within the project area. Floodplains developed from the hydrologic and hydraulic model of the project area were used to estimate a count of structure impacts. These impacts consist of both occupied and unoccupied structures. A summary of structure impacts is presented in Table 3-5.

Table 3-5: Impacted Structures Summary

Recurrence Interval	Residential Structures	Non-Residential Structures	Total Structures
2-year	0	0	0
5-year	1	1	1
10-year	1	2	3
25-year	1	5	6

Recurrence Interval	Residential Structures	Non-Residential Structures	Total Structures
50-year	1	8	9
100-year	1	12	13

3.2.2 WATER QUALITY

Section 303(d) of the Clean Water Act of 1972 (CWA) requires states to monitor and assess their waters to determine if they meet water quality standards supporting the beneficial uses they are intended to provide (33 U.S.C. 1313(d)). Waters that do not meet their designated uses due to water quality standard violations are listed as impaired. States are required to develop a list of impaired waters that require TMDL studies and to submit an updated list of impaired waters to the EPA every two years. The North Dakota Department of Environmental Quality (NDDEQ), formerly the environmental section within the North Dakota Department of Health (NDDoH), maintains this list of impaired waters for the state of North Dakota. The NDDoH most recently published water quality data in its 2018 Water Quality Assessment Report (North Dakota Department of Health 2019). Of the 295 public lakes and reservoirs in the state, only 200 are listed specifically in the state's water quality standards as "classified" lakes and therefore are noted as having beneficial uses. The remaining 95 lakes and reservoirs, while included in the state's estimate of total lake acres, are not considered classified waters and thus not assessed.

Of the streams and lakes assessed within AOI, Renwick Dam and portions of the Tongue River are listed as impaired (Table 3-6, Appendix C-4). The impaired waters are Renwick Dam (ND-09020316-002-L_00), downstream from the dam (ND-09020316-009-S_00), and two stretches along the Tongue River (ND-09020316-002-L_00 and ND-09020310-011-S_00). Renwick Dam is described as threatened for the designed use for "fish and other aquatic biota, and recreation." The impairments are listed as sedimentation / siltation, nutrient / eutrophication, and biological indicators. The reservoir is classified as hypereutrophic due to the high nutrient concentrations. Total phosphorus is the critical nutrient driving water quality and associated beneficial uses—i.e., recreation and aquatic biota—in Lake Renwick. Water data from NDGFD between 1997-2020 highlight the comparison in various water quality metrics from before the start of major channel incision in 2013. The data indicate a slight increase in turbidity, surface dissolved oxygen, and bottom dissolved oxygen (see Appendix D-8 for more details). Algal blooms are a serious issue in the lake and have been reported in 7 of 13 recent years (2008-2020, NDGFD). NDDEQ observed cyanotoxins in the reservoir in 2017 and 2020, resulting in warning for Harmful Algal Blooms (HAB).

Table 3-6: Section 303(d) impaired waters within the planning area, 2016 reporting year (North Dakota Department of Health 2019).

Water Body Name	ID Number	Use Support	Affected Designated Use	Impairment
Tongue River downstream to Senator Young Dam	ND-09020316-019-S_00	Fully supporting but threatened	Fish and other aquatic biota	Combined biota / habitat bioassessments
Tongue River from Herzog Dam watershed downstream to Renwick Dam	ND-09020310-011-S_00	Fully supporting but threatened	Fish and other aquatic biota	Fishes bioassessments and benthic-macroinvertebrate bioassessments
Renwick Dam	ND-09020316-002-L_00	Fully supporting but threatened	Fish and other aquatic biota; recreation	Sedimentation / siltation; nutrient / eutrophication biological indicators
Downstream from Renwick Dam	ND-09020316-009-S_00	Fully supporting but threatened	Fish and other aquatic biota	Combined biota / habitat bioassessments / selenium / sedimentation-siltation

Water quality data collected at the USGS gauge located at the Renwick Dam outlet includes total phosphorus (TP), but the concentrations cannot be correlated with other measurements to produce total phosphorous loading estimates. From the TP concentration, an increase (doubling) of the phosphorus was noted after the start of channel incision in 2013, and these high concentrations have continued in spite of low peak flows in recent years (Appendix D-8). Data collected upstream of Renwick Dam by the Pembina Soil and Water Conservation District in 2004 show TP to be three times higher than in the outlet water, indicating the reservoir acts as a phosphorus trap. A ratio analysis of dissolved to particulate form phosphorus was completed for the adjacent Park River. The results from that analysis indicate that the phosphorus ratio is 73% dissolved and 27% particulate. Therefore erosion is not necessarily directly related to phosphorus transport and much of the overall watershed TP volume is generated via dissolution of fertilizer residue and dead vegetation (both crop residue and perennial vegetation) into the water column during long duration spring flood events.

The expected base watershed TP loading to Lake Renwick is ~14,000 lb/year, with dissolved contributing ~10,000 lb/year and particulate contributing ~4,000 lb/year. The TP delivered from the upstream channel erosion was determined to be approximately 70,000 lbs/year. The eroded TP from the project reach is approximately five times higher than the natural watershed load, and the dissolved phosphorus is likely bound to sediment particles in the river, some of which will remain bound and deposit in the reservoir and some which will convert back to dissolved form and be transported downstream to the Red River. Additional water quality data is provided in Appendix D-8 *Project Benefits Report*.

3.2.3 AQUATIC RESOURCES

Waters in the area consist of wetlands, open water (lakes), and a network of rivers. All of these are protected to varying degrees under the Clean Water Act and other legislation. When federal funding is used for construction and improvement projects, Executive Order 11990 requires federal agencies to preserve, enhance, or minimize degradation and losses to wetlands. NRCS policy for implementing the executive order can be found at 190-GM, Part 410, Subpart B, Section 410.26. The Clean Water Act Section 404 requires permitting from the USACE for activities that impact wetlands and other waters of the US. The NRCS floodplain management policy requires review of activities in wetlands that occur within the 50-year

floodplain (190-GM Section 510.25). Rivers, in addition to regulation under the USACE, may fall under the National Wild and Scenic Rivers Act of 1968 (Public Law 90-542).

The AOI includes aquatic resources classified as riverine, lacustrine (lakes), and palustrine systems (freshwater wetlands including emergent wetlands, forested/shrub wetlands, Hand ponds) (US Fish and Wildlife Service 2021). Of the total acres in the AOI, there are 2,339 acres of wetlands, 378 acres of lakes (Appendix C-5), and 164 miles of stream and river. Many of these identified wetlands have been modified (ditched, drained, cultivated) over the years to accommodate agricultural production. Most of the wetlands within the AOI occur in the central and western areas and are concentrated along tributaries to the Tongue River. Wetland type summaries are presented in Table 3-7.

Table 3-7: Wetlands within AOI, based on NWI.

Wetland Type	Acres in AOI
Freshwater emergent wetland	938
Freshwater forested / shrub wetland	802
Freshwater pond	48
Lake	378
Riverine	173
Total	**2,339**

To determine the current conditions, a field investigation was conducted by Houston Engineering, Inc. and Prairie Soil Consulting, LLC. in May 2020 and September 2020 to identify and delineate aquatic resources in the planning area. The delineation was conducted in accordance with the 1987 Corps of Engineers Wetland Delineation Manual, the Great Plains Regional Supplement (2010), and guidelines for Other Waters of the US determinations (USACE 2020). Results of the field delineation indicate there are 20 wetlands (total 13.05 acres) and 31 potential Other Waters of the US (total 5.65 miles) located in the 485.86-acre survey area (the floodplain, Appendix C-14, Appendix D-6). Some of these wetlands are listed in the National Wetland Inventory data (NWI). The floodplain includes the Tongue River, small tributaries and drainages, oxbows, and wetlands. The main channel, a perennial stream, shows a highly meandering course and many oxbows, demonstrating the historically dynamic river morphology in a relatively flat landscape. Some oxbows are dry, and others show wetland characteristics. Of the tributaries and drainages, some are intermittent streams with bed and bank characteristics, and others appear to be ephemeral swales or field drains with only a break in the topography to indicate their characteristic as a potential Other Water.

3.2.4 FEMA FLOODPLAIN MANAGEMENT

Floodplain maps and designations are developed by FEMA for the NFIP. The current FIRM identifies Special Flood Hazard Areas. These areas, which are subject to inundations by the 1 % annual chance flood, are designated by zones A, AE, AH, AO AR, A99, V, and VE (Federal Emergency Management Agency 2007). The base flood elevation is the water-surface elevation of the 1% chance flood. Zones are defined by FEMA as follows:

- **Zone A:** High risk: Areas subject to inundation by the 1 % annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

- **Zone AE:** High risk: Areas subject to inundation by the 1 % annual-chance flood event determined by detailed methods. BFEs are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.
- **Zone AH:** Areas with a 1 % annual chance of shallow flooding, usually in the form of a pond, with an average depth ranging from 1 to 3 feet. Base flood elevations derived from detailed analyses are shown at selected intervals within these zones.
- **Zone AO:** River or stream flood hazard areas, and areas with a 1 % or greater chance of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging from 1 to 3 feet. Average flood depths derived from detailed analyses are shown within these zones.
- **Zone AR:** Areas with a temporarily increased flood risk due to the building or restoration of a flood control system (such as a levee or a dam). Mandatory flood insurance purchase requirements will apply, but rates will not exceed the rates for unnumbered A zones if the structure is built or restored in compliance with Zone AR floodplain management regulations.
- **Zone A99:** Areas with a 1% annual chance of flooding that will be protected by a federal flood control system where construction has reached specified legal requirements. No depths or base flood elevations are shown within these zones.
- **0.2 % Annual Chance of Flood Hazard:** The 0.2 % annual-chance of flood hazard represent areas inundated by a 500-year flood.
- **Zones V and VE:** These are coastal zones and are not relevant to the AOI.
- **Zone D:** Undetermined risk: Areas of possible flooding, but flood hazard analysis has not been conducted.
- **Zone X:** Low risk: Areas outside the 100-year flood zone or protected by a levee for a 100-year flood.

Appendix C-6 provides a map showing the designated FEMA Flood Zones within the AOI. Pembina County has floodplain areas mapped, whereas Cavalier County remains largely unmapped. Areas within the study that have been mapped are designated as Zone A or as Zone X (areas with 0.2 % Annual Chance of Flood Hazard).

3.3 HABITAT

3.3.1 NATURAL AREAS

The AOI is composed of primarily cultivated lands and natural areas. There are several Wildlife Management Areas (WMAs), Icelandic State Park (which includes Gunlogson Nature Preserve), a waterfowl production area, and USFW easements. These areas are detailed in Table 3-8 and Appendix C-17. Other natural areas, not officially designated by government entities, exist on lands too marginal for agriculture or of limited commodity production potential.

Table 3-8: Designated natural areas with the AOI.

Name	County	Acres
Pembina Hills Wildlife Management Area (WMA)	Cavalier	0.68
Cavalier County WMA	Cavalier	3.22
Cavalier County WMA	Cavalier	320.98
Cavalier County WMA	Cavalier	158.12
Cavalier County WMA	Cavalier	38.18

Name	County	Acres
Cavalier County WMA	Cavalier	97.82
Icelandic State Park	Pembina	399.27
Jay V. Wessels WMA	Pembina	39.43
Jay V. Wessels WMA	Pembina	0.18
Jay V. Wessels WMA	Pembina	40.39
Jay V. Wessels WMA	Pembina	136.55
Eldon S. Hillman WMA	Pembina	7.35
Jay V. Wessels WMA	Pembina	3102.96
Waterfowl Production Areas	Pembina	82.61

3.3.2 HISTORICAL AND CURRENT HABITATS

The AOI falls into two Level III Ecoregions: the Northern Glaciated Plains and Lake Agassiz Plain (Bryce et al. 1998). The Northern Glaciated Plains ecoregion consists of both tallgrass and shortgrass prairie communities within a continental climate zone (North Dakota Game and Fish Department 2016a). The landforms range from level to undulating and consist of deep soils, which provide for high agricultural productivity. The region supports numerous wetlands that range from seasonal to permanent. The Lake Agassiz Glacial Plain is characterized by an extremely flat lake plain and gently rolling hills (i.e., the Agassiz Valley beach ridge) on the west and east sides of the lakebed. Historical vegetation included tallgrass prairie interspersed with many wetlands, shrublands, and forests. Most of the land has been converted primarily to farmland, but historical vegetation ranged from tallgrass prairie to shortgrass prairie and included wetland ecosystems before intensive agriculture came to dominate the landscape. Within the Northern Glaciated Plains ecoregion, the AOI also covers two Level IV subregions: the Pembina Escarpment region and the Sand Deltas and Beach Ridges region. The Pembina Escarpment was characterized by steep wooded rolling hills with a variety of microhabitats historically supporting wetlands, woodlands, and prairie. Streams running off the escarpment are somewhat steep with cobble substrates. The Sand Deltas and Beach Ridges ecoregion has parallel ridges of sand gravel formed by Lake Agassiz.

Within the AOI, there are several major habitats as defined in the *North Dakota State Wildlife Action Plan* (Dyke et al. 2015). These consist of tallgrass prairie, eastern Drift Plains mixed grass prairie, tame grassland, upland deciduous forest, riparian areas, river and stream, and wetland and lake habitats. Characteristic species and wildlife found in each habitat are tabulated below.

3.3.2.1 **TALLGRASS PRAIRIE**

Tallgrass prairie once covered much of the central plains and supports a wide variety of plant and animal species. Most tallgrass prairie has been altered for agriculture and only remnants exist in the AOI. The species found historically in this community are shown in Table 3-9.

Table 3-9: Plants and animals characteristic to tallgrass prairie habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	big bluestem, little bluestem, slender wheatgrass, porcupine grass, mat muhly, switchgrass, Indian grass, prairie dropseed, fescue sedge, meadow sedge, meadow anemone, white sage, prairie cinquefoil, wild licorice, prairie blazing star, black-eyed Susan, blue-eyed grass, tall goldenrod, western prairie fringed orchid, small yellow lady's-slipper, meadow onion, cooper's milkvetch, Bicknell's sunrose, rose pogonia, swamp smartweed, ledge-spike moss, yellow lady's-slipper
Animals	mallard, blue-winged teal, red-tailed hawk, American kestrel, ring-necked pheasant, killdeer, eastern kingbird, western kingbird, American crow, common yellowthroat, clay-colored sparrow, vesper sparrow, savannah sparrow, Henslow's sparrow, western meadowlark, brown-headed cowbird, American bittern, northern pintail, northern harrier, sharp-tailed grouse, greater prairie-chicken, willet, upland sandpiper, marbled godwit, Wilson's phalarope, short-eared owl, sedge wren, grasshopper sparrow, Le Conte's sparrow, Nelson's sharp-tailed sparrow, dickcissel, bobolink northern short-tailed shrew, white-tailed jackrabbit, snowshoe hare, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, plains pocket gopher, western harvest mouse, deer mouse, northern grasshopper mouse, prairie vole, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, raccoon, badger, striped skunk, white- tailed deer, moose, pygmy shrew, arctic shrew, plains pocket mouse, Richardson's ground squirrel American toad, Great Plains toad, northern leopard frog, chorus frog, tiger salamander, plains garter snake, common garter snake, Canadian toad, northern prairie skink, smooth green snake, western hognose snake

3.3.2.2 EASTERN DRIFT PLAINS MIXED GRASS PRAIRIE

The mixed grass prairie is the transitional area between the tallgrass prairie (wetter) and the shortgrass prairie (drier). The mixed grass prairie includes many grasses and other graminoids in addition to a variety of trees and shrubs and contains many wetland basins. This community also has been reduced significantly by agriculture and ranching practices. Species found historically in this community are shown in Table 3-10.

Table 3-10: Plants and animals characteristic to eastern drift plains mixed grass prairie habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	prairie junegrass, green needlegrass, needle-and-thread, blue grama, little bluestem, western wheatgrass, Canada wild rye, spike oats, big sandgrass, porcupine grass, mat muhly, side-oats grama, Leiberg's panicum, yellow sedge, needleaf sedge, threadleaf sedge, pasque flower, western wallflower, torch flower, prairie rose, Missouri milkvetch, purple loco, lead plant, Indian breadroot, purple prairie-clover, gaura, hairy puccoon, harebell, stiff goldenrod, smooth fleabane, purple coneflower, upland wormwood, fringed sage, sweet flag, hair-like sedge, sterile sedge, hooded ladies'-tresses, chamomile, grapefern, Chamisson's cottongrass, prairie grapefern, hair beakrush, delicate sedge, lady's-slippers, wood horsetail, buckbean, flowered penstemon, nodding ladies'-tresses, sticky false-asphodel

Taxon	Species
Animals	American wigeon, green-winged teal, mallard, blue-winged teal, Northern shoveler, gadwall, lesser scaup, red-tailed hawk, American kestrel, gray partridge, ring-necked pheasant, spotted sandpiper, killdeer, mourning dove, common nighthawk, western kingbird, western kingbird, horned lark, American crow, eastern bluebird, common yellowthroat, clay-colored sparrow, vesper sparrow, savannah sparrow, western meadowlark, brown-headed cowbird, American bittern, northern pintail, northern harrier, Swainson's hawk, ferruginous hawk, sharp-tailed grouse, willet, upland sandpiper, marbled godwit, Wilson's phalarope, short-eared owl, loggerhead shrike, sedge wren, Sprague's pipit, lark bunting, grasshopper sparrow, Baird's sparrow, Le Conte's sparrow, Nelson's sharp-tailed sparrow, chestnut-collared longspur, dickcissel, bobolink northern short-tailed shrew, white-tailed jackrabbit, snowshoe hare, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, olive-backed pocket mouse, western harvest mouse, deer mouse, northern grasshopper mouse, prairie vole, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, raccoon, badger, striped skunk, white-tailed deer, moose, arctic shrew, pygmy shrew, Richardson's ground squirrel American toad, Great Plains toad, Woodhouse's toad, northern leopard frog, chorus frog, tiger salamander, plains garter snake, common garter snake, plains spadefoot, Canadian toad, smooth green snake, western hognose snake

3.3.2.3 **TAME GRASSLAND**

The tame grassland communities are characterized as returning previously converted tilled land back into grassland. This includes land that has been enrolled in the CRP, which entails seeding cropland taken out of production and seeded with grass species. Alfalfa is the most common hay crop, but tame grassland also typically includes *Bromus inermis* (brome grass). The species found historically in this community are shown in Table 3-11.

Table 3-11: Plants and animals characteristic to tame grassland habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	smooth brome, crested wheatgrass, intermediate wheatgrass, tall wheatgrass, big bluestem alfalfa, sweet clover
Animals	American wigeon, green-winged teal, mallard, blue-winged teal, Northern shoveler, gadwall, lesser scaup, red-tailed hawk, American kestrel, gray partridge, ring-necked pheasant, spotted sandpiper, killdeer, mourning dove, common nighthawk, western kingbird, western kingbird, horned lark, American crow, eastern bluebird, common yellowthroat, clay-colored sparrow, vesper sparrow, savannah sparrow, western meadowlark, brown-headed cowbird northern short-tailed shrew, white-tailed jackrabbit, snowshoe hare, Franklin's ground squirrel, thirteen-lined ground squirrel, northern pocket gopher, olive-backed pocket mouse, western harvest mouse, deer mouse, northern grasshopper mouse, prairie vole, meadow vole, meadow jumping mouse, western jumping mouse, coyote, red fox, raccoon, badger, striped skunk, white-tailed deer, moose American toad, Great Plains toad, Woodhouse's toad, northern leopard frog, chorus frog, tiger salamander, plains garter snake, common garter snake

Tame grassland within the direct project area is dominated by smooth brome grass and common tansy. Three state noxious weeds were observed: Canada thistle, leafy spurge, and musk thistle. See further detail in Appendix D-7 Biological Inventory Report.

3.3.2.4 UPLAND DECIDUOUS FOREST

This community, which includes deciduous and coniferous forests, wooded shrubland, and rural tree plantings, is scattered throughout the state and is relatively rare (4 % of total land). Of the forests in North Dakota, most are deciduous (98 %), and larger tracts are found in the Pembina Hills, the Turtle Mountains, the Devils Lake Hills, and the Killdeer Mountains. These forests are primarily under private ownership and are utilized for cattle grazing and harvest of wood products. Concerns for these areas are reduced forest regeneration and clearing for development. The species found historically in this community are shown in Table 3-12. See further detail in Appendix D-7 Biological Inventory Report.

Table 3-12: Plants and animals characteristic to upland deciduous forest habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	bur oak, green ash, quaking aspen, balsam poplar, paper birch, American hazelnut, black currant, Missouri gooseberry, red raspberry, Saskatoon serviceberry, hawthorn, prickly rose, pin cherry, choke cherry, false lily-of-the valley, early meadowrue, yellow avens, pink wood violet, wild sarsaparilla, dwarf cornel, pink wintergreen, arrowleaf aster, meadow onion, moonwort, leathery grapefern, slender lip fern, slender-lobed clematis, round-leaved sundew, nodding buckwheat, stiff sandwort, swamp willow, pod grass, round-leaved sphagnum, flat-leaved bladderwort, small yellow lady's-slipper
Animals	turkey vulture, sharp-shinned hawk, Cooper's hawk, broad-winged hawk (Turtle Mountains), red-tailed hawk, American kestrel, merlin, ruffed grouse, wild turkey, mourning dove, great horned owl, eastern screech owl, long-eared owl, common nighthawk, ruby-throated hummingbird, yellow-bellied sapsucker, downy woodpecker, hairy woodpecker, yellow-shafted flicker, western wood pewee, eastern wood-pewee, yellow-bellied flycatcher, willow flycatcher, least flycatcher, great crested flycatcher, purple martin, tree swallow, blue jay, black-billed magpie, common crow, black-capped chickadee, white-breasted nuthatch, brown creeper, house wren, golden-crowned kinglet, ruby-crowned kinglet, eastern bluebird, veery, wood thrush, American robin, gray catbird, brown thrasher, cedar waxwing, yellow-throated vireo, warbling vireo, Philadelphia vireo, red-eyed vireo, yellow warbler, chestnut-sided warbler, yellow-rumped warbler, American redstart, black-and-white warbler, ovenbird, northern waterthrush, mourning warbler, common yellowthroat, migratory warblers, scarlet tanager, rose-breasted grosbeak, black-headed grosbeak, lazuli bunting, indigo bunting, spotted towhee, eastern towhee, chipping sparrow, lark sparrow, clay-colored sparrow, song sparrow, common grackle, brown-headed cowbird, orchard oriole, Bullock's oriole, Baltimore oriole, pine siskin, American goldfinch, evening grosbeak, golden eagle, bald eagle, Swainson's hawk, black-billed cuckoo, red-headed woodpecker little brown bat, silver-haired bat, big brown bat, eastern red bat, hoary bat, eastern cottontail, woodchuck, eastern chipmunk, gray squirrel, fox squirrel, northern flying squirrel, beaver, white-footed mouse, southern red-backed vole, meadow vole, meadow jumping mouse, western jumping mouse, porcupine, coyote, red fox, gray fox, raccoon, American marten, ermine, long-tailed weasel, least weasel, bobcat, elk, mule deer, white-tailed deer, arctic shrew, pygmy shrew, western small-footed myotis, long-eared myotis, long-legged myotis American toad, gray tree frog, wood frog, common garter snake, plains garter snake, northern redbelly snake

Upland deciduous forest in the direct project area is dominated by basswood and burr oak, with an understory of grasses, forbs, and shrubs. Landslides due to channel incision undercutting the steep slopes have caused the loss of upland forest on the south side of the river. See further detail in Appendix D-7 Biological Inventory Report.

3.3.2.5 RIVERS, STREAMS, AND RIPARIAN ZONE

Portions of the Tongue River have been designated for "fish and other aquatic biota" uses (North Dakota Department of Health 2019). Fish species found in the Upper Tongue River watershed include typical communities of warm water streams and many species occurring in the connected waters of the Red River of the North drainage area. There are 51 typical fish species present within the North Dakota/western portion of the Red River Basin, and 27 fish species have been identified characteristic to the Tongue River (Goldstein 1995). In a more recent study, stream sampling conducted in 2006-2007 along the Tongue River identified 24 fish species (Table 3-13, North Dakota Game and Fish Department 2009).

Riparian habitat occurs at the interface between a waterbody, river, stream, or tributary and drier land. The soils and vegetation here are strongly influenced by the presence of water and this results in a distinct plant community. The riparian zone, a habitat and community of special focus by the NRCS, is defined as land that occurs along waterbodies and watercourses. The vegetation here receives more water than adjacent upland areas, and the soils are subject to intermittent flooding or fluctuating water tables (US Department of Agriculture – Natural Resources Conservation Service 1996, Machtinger et al. 2007). The relationship between the riparian area to its watershed area is critical to the condition of the habitat. The amount of water that enters the drainage area, as surface or subsurface flow, and the timing, duration, and extent of flooding determine the plant composition, habitat structure, and productivity. Although federal law does not specifically regulate riparian areas, it is the policy of NRCS to integrate management of riparian areas into all plans and alternatives (190-GM, Part 411). The species found historically in this community are shown in Table 3-14 (North Dakota Game and Fish Department 2009).

There are approximately 164 miles of stream and river and associated riparian corridor within the AOI. Riparian areas within the AOI are relatively narrow throughout the Tongue River and its tributaries. One stretch of river is currently impaired. The 2018 water quality report from the North Dakota Department of Health (2019) indicates the region of the state relevant to the AOI had, based on benthic macroinvertebrate quality, 34.5 % of the rivers and streams assessed as being in good biological condition, 34.5 % in fair condition, and 32.38 % in poor condition. The condition of the riparian vegetation showed 54.8 % in good condition, 36.0 % in fair condition, and 17.8 % in poor condition.

Table 3-13: Fish characteristic of the Tongue River (surveys from 2006-2007).

Taxon	Species
Fish	blacknose dace, common carp, common shiner, creek chub, flathead minnow, longnose dace, pearl dace, sand shiner, spotfin shiner, shorthead redhorse, white sucker, black bullhead, channel catfish, stonecat, tadpole madtom, northern pike, central mudminnow, trout-perch, brook stickleback, black crappie, blackside darter, johnny darter, walleye, yellow perch

Table 3-14: Plants and animals characteristic to riparian habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	cottonwood, American elm, green ash, box elder, bur oak, basswood, hackberry, peachleaf willow, hophornbeam, prickly ash, Missouri gooseberry, black currant, buckthorn, nannyberry, Virginia wild rye, nodding muhly, charming sedge, Sprengel's sedge, Jack-in-the-pulpit, wood leek, large bellwort, false Solomon's seal, Solomon's seal, nodding trillium, carrion flower, tall nettle, wood nettle, wild four-o-clock, baneberry, wild ginger, columbine, kidneyleaf buttercup, tall meadowrue, bloodroot, yellow wood violet, pink wood violet, white avens, sweet cicely, wild sarsaparilla, honeywort, waterleaf, yellow wood parsnip, fringed loostrife, tall coneflower, meadow onion, prairie grapefern, moonwort, leathery grapefern, spiny sedge, dutchman's breeches, slender cottongrass, stickseed, small-flowered lipocarpha, dwarf mentzelia, small-flowered penstemon, downy phlox, limber pine, rose pogonia, thin-fruited knotweed, heart-leaved buttercup, nodding ladies'-tresses, hooded ladies'-tresses, bog violet
Animals	wood duck, mallard, hooded merganser, common merganser, turkey vulture, osprey, sharp-shinned hawk, Cooper's hawk, red-tailed hawk, American kestrel, ring-necked pheasant, wild turkey, American woodcock, mourning dove, yellow-billed cuckoo, great horned owl, eastern screech owl, barred owl, long-eared owl, common nighthawk, chimney swift, ruby-throated hummingbird, yellow-bellied sapsucker, downy woodpecker, hairy woodpecker, yellow-shafted flicker, pileated woodpecker, Western wood pewee, eastern wood-pewee, yellow-bellied flycatcher, willow flycatcher, least flycatcher, eastern flycatcher, great crested flycatcher, purple martin, tree swallow, northern rough-winged swallow, bank swallow, cliff swallow, blue jay, black-billed magpie, common crow, black-capped chickadee, white-breasted nuthatch, brown creeper, house wren, eastern bluebird, veery, wood thrush, American robin, gray catbird, brown thrasher, cedar waxwing, Bell's vireo, yellow-throated vireo, warbling vireo, Philadelphia vireo, red-eyed vireo, yellow warbler, yellow-rumped warbler, American redstart, ovenbird, northern waterthrush, common yellowthroat, migratory warblers, scarlet tanager, rose-breasted grosbeak, black-headed grosbeak, lazuli bunting, indigo bunting, spotted towhee, eastern towhee, chipping sparrow, lark sparrow, clay-colored sparrow, song sparrow, common grackle, brown-headed cowbird, orchard oriole, Bullock's oriole, Baltimore oriole, American goldfinch, golden eagle, bald eagle, red-headed woodpecker, blackbilled cuckoo, piping plover little brown bat, silver-haired bat, big brown bat, eastern red bat, hoary bat, eastern cottontail, woodchuck, eastern chipmunk, gray squirrel, fox squirrel, northern flying squirrel, beaver, white-footed mouse, southern red-backed vole, meadow vole, meadow jumping mouse, western jumping mouse, porcupine, coyote, red fox, gray fox, raccoon, American marten, ermine, long-tailed weasel, least weasel, bobcat, elk, mule deer, white-tailed deer, western small-footed myotis, long-legged myotis, long-eared myotis, pygmy shrew, river otter Woodhouse's toad, Great Plains toad, gray tree frog, northern leopard frog, tiger salamander, common mudpuppy, common garter snake, plains garter snake, painted turtle, false map turtle, smooth softshell, common snapping turtle, northern redbelly snake chestnut lamprey, silver lamprey, pallid sturgeon, paddlefish, sturgeon chub, sicklefin chub, silver chub, pearl dace, hornyhead chub, pugnose shiner, blacknose shiner, rosyface shiner, northern redbelly dace, finescale dace threeridge, wabash, pigtoe, mapleleaf, black sandshell, creek heelsplitter, pink heelsplitter, pink papershell

Within the direct project area, the riparian community consists of grasses, forbs, graminoids, tree, and shrub species as detailed in Appendix D-7. One state noxious weed (leafy spurge) and one county noxious weed

(common tansy) were observed. Eleven species of birds, inspects, mammals, fish, amphibians, and arthropods were noted in the field survey as well.

3.3.2.6 WETLANDS AND LAKES

Wetlands in North Dakota include fringe wetlands along rivers and lakes and depressional wetlands in the Prairie Pothole Region, many of which are not protected by the Clean Water Act. The species found historically in this community are shown in Table 3-15.

Table 3-15: Plants and animals characteristic to wetlands and lakes habitat of North Dakota (underlined species are species of conservation concern).

Taxon	Species
Plants	northern reedgrass, prairie cordgrass, phragmites, tall mannagrass, whitetop, sloughgrass narrow-leaf cattail, hybrid cattail, slender sedge, slough sedge, common spikerush, hardstem bulrush, river bulrush, slender bulrush, Baltic rush, softstem bulrush, water sedge, marsh smartweed, narrow leaf dock, western dock, marsh cress, silverweed, rough cinquefoil, lance leaf loostrife, clasping leaf dogbane, germander, marsh hedge nettle, western water horehound, wild mint, giant bur reed, narrowleaf water plantain, western water plantain, water parsnip, sandbar willow, sago pondweed, horned pondweed, grass-leaf pondweed, coontail, common watermilfoil, common bladderwort, musk grass, white water crowfoot, western wigeon grass
Animals	common loon, pied-billed grebe, red-necked grebe, eared grebe, western grebe, double-crested cormorant, great blue heron, great egret, black-crowned night heron, white-faced ibis, Canada goose, wood duck, green-winged teal, mallard, blue-winged teal, northern shoveler, gadwall, American wigeon, ring-necked duck, lesser scaup, common goldeneye, hooded merganser, ruddy duck, Virginia rail, sora, American coot, killdeer, spotted sandpiper, Wilson's snipe, ring-billed gull, California gull, common tern, Forster's tern, belted kingfisher, willow flycatcher, tree swallow, northern rough-winged swallow, bank swallow, cliff swallow, marsh wren, yellow warbler, common yellowthroat, yellow-breasted chat, savannah sparrow, song sparrow, swamp sparrow, red-winged blackbird, yellow-headed blackbird, brown-headed cowbird, beaver, muskrat, otter, American toad, Great Plains toad, Woodhouse's toad, gray treefrog, chorus frog, wood frog, northern leopard frog, tiger salamander, common mudpuppy, painted turtle, common garter snake, plains garter snake
Stocked fish	walleye, yellow perch, northern pike, black crappie, largemouth bass, bullhead catfish

Prior to development, North Dakota had an estimated 4.9 million acres of wetlands (Dahl 2014). Today, that number has been reduced by nearly 42 %. North Dakota is dominated by temporary emergent and seasonally emergent wetland types. Because wetlands are dynamic and, in many cases, dependent upon precipitation, they can be susceptible to tilling during drier years and are threatened by drainage in wetter years. In spite of this, wetlands are critical for filtering and storing water and for supporting habitat for animal populations and plant communities. The North Dakota Rapid Assessment Method (NDRAM) was used to assess wetland quality condition in North Dakota (DeKeyser et al. 2014 in North Dakota Department of Health 2019). Of the wetlands present in North Dakota, 14 % (302,000 acres) were determined to be in good condition, 62 % (1.3 million acres) in fair condition, and 24 % (514,000 acres) in poor condition. Hardening, damming, filling, and ditching are four stressors associated with impacts to wetland hydrology. Hardening is any activity that leads to soil compaction in a wetland basin or wetland buffer, and this threatens 1.2 million acres (59 % of the remaining wetlands). Of the wetlands remaining in the state, most

are identified as having a low risk for damming, ditching, and filling. For those at high risk, the stressors include damming (9 %, 192,000 acres), filling (16 %, 345,000 acres), and ditching (27 %, 585,000 acres).

Appendix D-6 provides the results of the field aquatic resources delineaiton work completed for the proejct. Results indicate there are 20 wetland areas (totaling 13.05 acres) and 31 other waters (totaling 5.65 lienar miles) located in the Direct Zone.

3.4 PLANTS AND ANIMALS

3.4.1 PLANTS AND ANIMALS - GENERAL

Most of the land area in North Dakota has been converted to agriculture or otherwise impacted by human disturbance. Animal populations have decreased, particularly for larger mammals and predators. Bird and insect populations have declined as well. Many native plants have been displaced by non-native species and crops. There are some remnant areas of relatively intact ecosystems, particularly in the Pembina Gorge area. The communities here are scarce and thus of increasing importance. The NDGFD has listed species of concern for the state's wildlife conservation strategy (Dyke et al. 2015).

Five habitat types were documented during the field survey, detailed in Appendix D-7. Over 60% of the habitat types in the planning area consisted of tame grassland and was dominated by non-native smooth bromegrass and common tansy. Other tame grass areas are enrolled the USDA Conservation Reserve Program (CRP); brome and tansy are present in the CRP as well; however more desirable wheatgrasses and alfalfa comprise a greater fraction. The CRP acres are hayed in a managed rotation as the program allows. Based on LiDAR data and aerial photography, these areas would have had native riparian woodland vegetation prior to settlement. The upland forests are located on the north and south margins of the project area. The upland forest community is predominantly native and contains the most desirable timber species such as bur oak and paper birch. There has been some limited harvesting of mature trees for timber in this habitat type. The riparian forest habitat is the largest woodland habitat. The species are predominately native and there are many desirable native shrubs and wildflowers such as chokecherry, violets, and wild ginger. The river/stream habitat community has been most affected by the downcutting action of the river. The unstable banks are often unvegetated with visible layering of clays and shale and little overhead canopy is present. This has led to the establishment of non-native species such as smooth bromegrass and reed canary grass, with little evidence of new woody seedlings other than boxelder maple. Northern pearl dace (NDGF Level 1 species of conservation priority) habitat has been documented upstream of Hwy 89.

Presence of Invasive Species: Several plant species in the AA are either listed as North Dakota state noxious weeds, county noxious weeds, or state troublesome weeds (Ikley 2020). Six of these are present in the AA (Biennial Wormwood, Canadian thistle, Common Tansy, Leafy Spurge, Common Milkweed and Musk Thistle). These were most prevalent in the tame grass areas, although common tansy was found in all the habitat types. Milkweed is likely listed as from a cropped agricultural perspective; however, this species is critical for monarch butterflies.

Biological Condition: The biological condition varied among habitat types. The greatest species diversity was found in the Riparian Forest community: 42 species (74% native) of plants and 21 species of animals were noted (Appendix D-7-A). The condition of the River/stream community is declining due to the channel cutting, streambank erosion and the subsequent lowering of the water table. The poorest community was the tame grass areas not enrolled in CRP. This community is heavily impacted by invasive smooth bromegrass and common tansy. The palustrine wetland community was very small and likely has been reduced in function due to the loss of hydrology. Excessive channel incision has kept high flows from reaching their natural floodplain.

3.4.2 PLANTS OF STATE CONSERVATION PRIORITY

The North Dakota Natural Heritage Program has assembled a list of plants of concern (North Dakota Natural Heritage Program 2013). Thirteen species are listed as Level I conservation priority (Table 3-16). These species are defined as those with low or declining populations and thus vulnerable to extinction. There are 64 species in Level II, and there are 33 species in Level III. Figure 3-2 shows the estimated distribution of priority plant species in North Dakota. There are several Level II and Level III species located within the AOI which extends 3 to 6 miles west of the Cavalier/Pembina County line and 8 to 10 miles east of the Cavalier/Pembina County Line. Several Level II and Level III species are located in downstream tributaries.

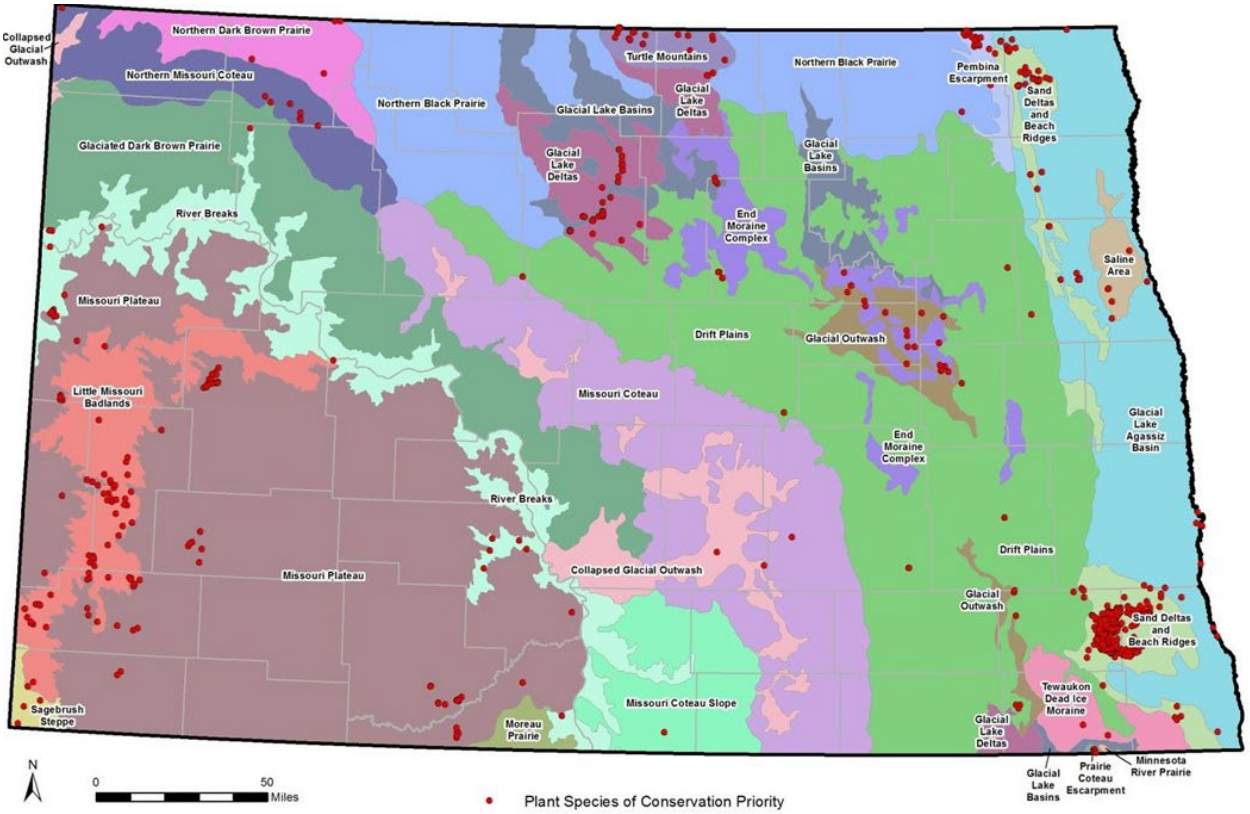

Figure 3-2: Sites of North Dakota plant species of conservation priority (from ND Natural Heritage Program 2013)

Table 3-16: Plants of Level I conservation priority and potential presence in the AOI.

Latin Name	Common Name	Preferred Habitat	Documented Presence in Cavalier and Pembina Counties	Conservation Status, in Addition to North Dakota Level I status
Allium canadense	meadow onion	Fresh (wet) meadow [2]	Yes [4]	**Critically imperiled [6]**
Asclepias lanuginosa	wooly milkweed	Prairie, open woods [2]	Yes [4], (Pembina) [5]	**Rare (Pembina) [4], Critically imperiled [6]**
Astragalus neglectus	Cooper's milkvetch	Prairie, riverbanks [2]	Yes [4], (Pembina) [5]	**Rare (Pembina) [4], Critically imperiled [6]**
Botrychium campestre	prairie grapefern	Prairies, dunes, grassy railroad sidings, and fields over limestone [1]	Yes [4]	**Critically imperiled [6]**
Carex formosa	handsome sedge	Mesic to dry deciduous forests and ravines, moist meadows, usually assoc. with calcareous soils [1]	Yes [4]	**Critically imperiled [6]**
Chenopodium subglabrum	smooth goosefoot	Sandy areas, particularly sand bars in rivers and in sandy blowouts near riverbanks [1]	Yes [4]	**Critically imperiled [6]**
Cypripedium candidum	white lady's slipper	Mesic to wet prairies and fen meadows, very rarely open wooded slopes [1]	Yes [4,]	**Imperiled [6]**
Eriogonum visheri	Dakota buckwheat	Loamy to clayey flats and outcrops, mixed grassland and saltbush communities [1]	Yes [4]	**Imperiled [6]**
Helianthemum bicknellii, syn. Crocanthemum bicknellii	Bicknell's sunrose	Sandy or rocky barrens, glades, sandhills, prairies, fields, pine-oak woodlands, oak-hickory woodlands, montane outcrops and balds [1]	Yes [4], (Pembina) [5]	**Rare (Pembina) [4], Critically imperiled [6]**
Mentzelia pumila	dwarf mentzelia	Hillside slopes, sandy and clayey soils [1]	Yes [4]	**Critically imperiled [6]**
Platanthera praeclara	western prairie fringed orchid	Mesic to wet prairies [1]	Yes [4]	**Federally listed as endangered, Imperiled [6]**
Polygonum leptocarpum (syn. Polygonum ramosissimum ssp. Ramosissimum)	thin-fruited knotweed	Disturbed places, saline marshes [3]	Yes [4]	**Critically imperiled [6]**
Triantha glutinosa	sticky false-asphodel	Marshes, wet meadows, calcareous soil [1]	Yes [4]	**Critically imperiled [6]**

1, Flora of North America Association (2020)
2, Minnesota Wildflowers (2020)
3, Regents of the University of California (2020)
4, Kartesz, The Biota of North America Program (BONAP) (2015)
5, Shipunov (2019)
6, NatureServe (2020)

Table 3-17: Key plant species of conservation priority in relevant habitats according to the Climate Change Vulnerability Index (North Dakota Natural Heritage Program 2013).

Ecoregion / Habitat / Plant Community	Key Plant Species of Conservation Concern
Tallgrass Prairie	Western prairie fringed orchid, small yellow lady's-slipper, meadow onion, Cooper's milkvetch, Bicknell's sunrose, rose pogonia, swamp smartweed, ledge-spike moss, yellow lady's-slipper
Sand Deltas and Beach Ridges	Least grapefern, prairie mimosa, Bicknell's sunrose, wooly beach-heather, upright pinweed, yellow monkeyflower, swamp smartweed, ledge spike-moss, purple sandgrass, Culver's root, graceful sedge, brook flatsedge, marsh bellflower, handsome sedge, marsh horsetail, slender cottongrass, wahoo, rhombic evening-primrose, sensitive fern, Adder's tongue fern, western prairie fringed orchid, prickly gooseberry, zigzag goldenrod, bog violet, Loesel's twayblade, Northern lady-fern, moonwort, foxtail sedge, green keeled cottongrass, oakfern, leathery grapefern, naked mitrewort, Cooper's milkvetch, dwarf spikerush, one-flowered broomrape, Wolf's spikerush, small-flowered lipocarpha, green woodland orchid, rose pogonia, delicate sedge, white lady's-slipper, showy lady's-slipper, small yellow lady's-slipper, large yellow lady's-slipper, nodding ladies'-tresses, bog bedstraw, buckbean, bog willow, flat-leaved bladderwort, wood horsetail, meadow onion, wooly milkweed
Pembina Escarpment	Moonwort, oakfern, leathery grapefern, naked mitrewort, Cooper's milkvetch, large yellow lady's-slipper, wood horsetail, wooly milkweed, leatherwood, stiff sandwort, sweet coltsfoot
Eastern Mixed Grass Prairie	Sweet flag, hair-like sedge, sterile sedge, hooded ladies'-tresses, chamomile, grapefern, Chamisson's cottongrass, prairie grapefern, hair beakrush, delicate sedge, lady's-slippers, wood horsetail, buckbean, flowered penstemon, nodding ladies'-tresses, sticky false-asphodel
Upland Deciduous Forest	Meadow onion, moonwort, leathery grapefern, slender lip fern, slender-lobed clematis, round-leaved sundew, nodding buckwheat, stiff sandwort, swamp willow, pod grass, round-leaved sphagnum, flat-leaved bladderwort, small yellow lady's-slipper
Rivers, Streams, and Riparian Zones	Meadow onion, prairie grapefern, moonwort, leathery grapefern, spiny sedge, Dutchman's breeches, slender cottongrass, stickseed, small-flowered lipocarpha, dwarf mentzelia, small-flowered penstemon, downy phlox, limber pine, rose pogonia, thin-fruited knotweed, heart-leaved buttercup, nodding ladies'-tresses, hooded ladies'-tresses, bog violet

The Climate Change Vulnerability Index (CCVI) analysis for North Dakota by NatureServe (North Dakota Natural Heritage Program 2013) scores species in each ecoregion using a metric that gauges susceptibility and adaptability to climate change (altered patterns of temperature, precipitation, and species distribution). The CCVI shows the Sand Deltas and Beach Ridges ecoregion has a high proportion of extremely vulnerable species. This area and the Pembina Escarpment have a high proportion of highly and moderately vulnerable species. This index also examines the habitats and plant communities throughout the state that are vulnerable and specific species in these habitats. Vulnerable communities present in the AA and the associated listed plant species are shown in Table 3-17.

3.4.3 ANIMALS OF STATE CONSERVATION PRIORITY

The North Dakota Game and Fish Department (NDGFD) prepared the *State Wildlife Action Plan* (SWAP) (Dyke et al. 2015), which represents the State's strategy for preserving fish and wildlife resources for the foreseeable future. The SWAP focuses on "species of greatest conservation need" and includes 47 bird, 2 amphibian, 9 reptile, 21 mammal, 22 fish, 10 freshwater mussel, and 4 insect species. Each species is

given a priority designation based on conservation need. Level I species are those that have a high level of conservation priority because of declining status in North Dakota or across their range; or have a high rate of occurrence in North Dakota, constituting the core of the species breeding range, but may be at-risk range wide. Level II species are those that have a moderate or high level of conservation priority. Level III species are those that have a moderate level of conservation priority but are believed to be peripheral or non-breeding in North Dakota. There are 36 Level 1 species, 44 level II species, and 35 Level III species within the state. The key animal species of conservation priority potentially found within the AOI are shown in Table 3-18.

There are several Level I species that have known distribution in Pembina County, and these include a species of fish, bat, butterfly, and toad as well as a variety of birds. One of these Level I species is the northern pearl dace (*Margariscus margarita*), a small minnow known to inhabit cool, small headwater streams and pools of beaver dams (Appendix D-8). They spawn in clear water at depths of 1-2 feet over a gravel or sand substrate, and males establish and defend territories during the spawning season. They do not migrate extensively and tend to be residents of a series of permanent pools (MTNHP, 2021). They are considered to be an indicator species of the Coolwater Northern Glaciated Plains Fish Assemblage and are identified as a Level I Species of Conservation Priority in North Dakota (NDGF, 2021). Fish surveys over the past three decades in North Dakota have documented the Upper Tongue River as the last stronghold of the species in the state. Degradation of habitat due to land use practices, destruction of riparian habitat, decline in water quality, and flow regime changes due to the addition of dams are considered to the causal factors in population decline (NDGF, 2021). During monitoring surveys of the river channel in 2015-2020, NRCS staff have consistently observed high numbers of dace (species unknown) above Sta 100+00 of the proposed project where limited channel incision has occurred to date. Between Sta 70+00 and Sta 100+00 dace have been observed occasionally as well. They are often observed in beaver dam pools or those formed by large woody debris jams in the channel, likely seeking the cooler water and nutrients available. Downstream of Sta 100+00 where there is minimal tree canopy cover over the river, limited large woody debris, and a higher component of fine-grained sediment from bank erosion; dace have not been observed. Beavers were once common in floodplains in this region, and their dams are still present in the area, but these structures are destroyed during normal spring flood events due to the high shear stresses within the current incised channel in the project reach. The river channel upstream of the incised reach continues to provide high quality habitat for northern pearl dace, including high density of multi-year beaver dams, but is threatened as channel incision moves upstream.

The CCVI analysis for North Dakota by NatureServe (North Dakota Natural Heritage Program 2013) scores species in each ecoregion using a metric that gauges susceptibility and adaptability to climate change (altered patterns of temperature, precipitation, and species distribution). Vulnerable communities present in the AA and the associated listed animal species are shown in Table 3-19.

Table 3-18: North Dakota animals of Level I conservation priority in Cavalier and Pembina counties (all entries are from reference no. 2 unless otherwise indicated).

Latin Name	Common Name	Preferred Habitat	Known Distribution in Cavalier and Pembina Counties
Ammodramus nelson	Nelson's sparrow	Fens, shallow-marsh and wet meadow zones of wetlands. Cordgrass and phragmites usually associated plants, tallgrass prairie	Migratory, restricted breeding range limited to North Dakota, parts of Minnesota, South Dakota, and central Canada [2]
Ammodramus savannarum	grasshopper sparrow	Idle or lightly grazed tall or mixed-grass prairie, shrub prairie meadows, and hayfields, tallgrass prairie	Migratory, statewide [2]
Anaxyrus hemiophrys	Canadian toad	Tallgrass prairie, margins of lakes, ponds, and a variety of wetlands. [4]	Pembina [3]
Botaurus lentiginosus	American bittern	Variety of wetlands, typically larger wetlands with tall emergent vegetation. Also will nest in tall, dense grasslands, tallgrass prairie	Migratory [1]
Buteo regalis	ferruginous hawk	Large tracts of native prairie, tallgrass prairie	Migratory
Buteo swainsoni	Swainson's hawk	Mix of grassland and cropland with thickets of trees, tallgrass prairie	Migratory
Calamospiza melanocorys	lark bunting	Sagebrush communities or mixed-grass prairie interspersed with shrubs, roadsides, and retired cropland.	Migratory, once common throughout state except Red River Valley, abundant south and west of the Missouri River, [2]
Calcarius ornatus	chestnut-collared longspur	Grazed or hayed mixed-grass prairie, shortgrass prairie.	Migratory, once common throughout state except Red River Valley [2]
Chlidonias niger	black tern	Shallow wetlands surrounded by grassland.	Migratory [1]
Coccyzus erythropthalmus	black-billed cuckoo	Brushy margins or woodland openings, thickets of small trees and prairie shrubs.	Migratory, Pembina Hills, Turtle Mountains, wooded hills in the Devils Lake area, wooded stream valleys [2]
Coturnicops noveboracensis	yellow rail	Fens or wet meadows with emergent vegetation, shallow water, and moist soil, tallgrass prairie	Migratory [1]
Danaus plexippus	monarch butterfly	Tallgrass prairie, variety of habitats, needs milkweed (*Asclepias* spp.) for breeding. [6]	Migratory, statewide
Eptesicus fuscus	big brown bat	Both urban and rural habitats. Insect availability is limiting factor versus a type of habitat. Commonly associated with trees. [4]	Statewide [4]

Latin Name	Common Name	Preferred Habitat	Known Distribution in Cavalier and Pembina Counties
Lasmigona compressa	creek heelsplitter	Forest River [5]	Forest River, noted in Pembina River [5]
Leucophaeus pipixcan	Franklin's gull	Large wetlands with semi-open emergent cover, often feeds in cultivated agricultural fields.	Migratory, Prairie Pothole Region [2] (Nelson County)
Limosa fedoa	marbled godwit	Forage in a variety of wetlands, nest frequently on grazed native prairie, Tallgrass prairie	Migratory, Prairie Pothole Region [1]
Margariscus nachtriebi	northern pearl dace	Tongue River	Tongue River
Melanerpes erythrocephalus	red-headed woodpecker	Natural stands of mature deciduous trees along river bottoms, shelterbelts, wooded areas of towns.	Migratory
Myotis lucifugus	little brown bat	Roosts are established in structures in the summer months but also can be found in dead trees. [4]	Statewide [4]
Opheodrys vernalis	smooth green snake	Many observations occur near wetlands surrounded by grassy uplands.[3]	Not noted [3]
Phalaropus tricolor	Wilson's phalarope	Shallow wetlands and mudflats, nest in the margins of wetlands.	Migratory, Prairie Pothole Region, [1]
Podiceps auritus	horned grebe	Ponds and wetlands with beds of emergent vegetation and substantial areas of open water.	Migratory, Prairie Pothole Region, [1]
Speyeria idalia	regal fritillary	Habitats are generally described as tallgrass prairie, wet meadows, and marshy areas; virgin prairie in North Dakota [7]	No [7]

[1] Sherfy and Anteau (2008)
[2] Dyke et al. (2015)
[3] Hoberg et al. (2018)
[4] North Dakota Game and Fish Department (2019b)
[5] DeLorme (2011)
[6] US Fish and Wildlife Service (2019)
[7] Selby (2007)

Table 3-19: North Dakota animals of Level I conservation priority in Cavalier and Pembina counties (all entries are from reference no. 2 unless otherwise indicated).

Ecoregion / Habitat / Plant Community	Key Animal Species of Conservation Concern
Tallgrass Prairie	American bittern, northern pintail, northern harrier, sharp-tailed grouse, greater prairie-chicken, willet, upland sandpiper, marbled godwit, Wilson's phalarope, short-eared owl, sedge wren, grasshopper sparrow, Le Conte's sparrow, Nelson's sharp-tailed sparrow, dickcissel, bobolink, pygmy shrew, arctic shrew, plains pocket mouse, Richardson's ground squirrel, Canadian toad, northern prairie skink, smooth green snake, western hognose snake
Sand Deltas and Beach Ridges	Greater prairie-chicken, sharp-tailed grouse, short-eared owl, upland sandpiper, sedge wren, Le Conte's sparrow, plains pocket mouse, northern prairie skink, western hognose snake
Eastern Mixed Grass Prairie	American bittern, northern pintail, northern harrier, Swainson's hawk, ferruginous hawk, sharp-tailed grouse, willet, upland sandpiper, marbled godwit, Wilson's phalarope, short-eared owl, loggerhead shrike, sedge wren, Sprague's pipit, lark bunting, grasshopper sparrow, Baird's sparrow, Le Conte's sparrow, Nelson's sharp-tailed sparrow, chestnut-collared longspur, dickcissel, bobolink, arctic shrew, pygmy shrew, Richardson's ground squirrel, plains spadefoot, Canadian toad, smooth green snake, western hognose snake
Upland Deciduous Forest	Golden eagle, bald eagle, Swainson's hawk, black-billed cuckoo, red-headed woodpecker, arctic shrew, pygmy shrew, western small-footed bat, long-eared bat, long-legged bat, northern redbelly snake
Rivers, Streams, Riparian Zones	Golden eagle, bald eagle, red-headed woodpecker, black-billed cuckoo, piping plover, western small-footed bat, long-legged bat, long-eared bat, pygmy shrew, river otter, false map turtle, smooth softshell, common snapping turtle, northern redbelly snake, chestnut lamprey, silver lamprey, pallid sturgeon, paddlefish, sturgeon chub, sicklefin chub, silver chub, pearl dace, hornyhead chub, pugnose shiner, blacknose shiner, rosyface shiner, northern redbelly dace, finescale dace, threeridge, Wabash pigtoe, mapleleaf, black sandshell, creek heelsplitter, pink heelsplitter, pink papershell

3.4.4 THREATENED AND ENDANGERED SPECIES

The Endangered Species Act (ESA) directs federal agencies to conserve endangered and threatened species. There are 12 species listed as threatened (likely to become an endangered species in the near future) or endangered (in danger of extinction now) that may occur in North Dakota. Because North Dakota does not have a state threatened or endangered species list, those species listed by the ESA of 1973, as amended, are considered listed, and the USFWS has primary oversight of these species.

USFWS has not designated any critical habitat in the AOI, but the following federally listed species may be present (Table 3-20). Descriptions of these listed species and their presence in relation to the project are provided below. Whooping crane, northern long-eared bat, and gray wolf may be present temporarily in the both the direct and Indirect Zones of potential effect, but the likelihood is low. The others either have been extirpated or their habitat is not sufficient.

Table 3-20: North Dakota threatened and endangered species with potential to occur in Cavalier and Pembina counties or presence of potential habitat within these counties.

Latin Name	Common Name	Status	Potential to Occur
Grus americana	whooping crane	endangered	Potential territory, but not within core migration route. There is final designated critical habitat for this species. These birds may migrate through North Dakota but avoid human populations.
Myotis septentrionalis	northern long-eared bat	threatened	Potential territory, key breeding habitat in summer. No critical habitat has been designated for this species in North Dakota. Bats use trees, particularly if they are part of a forest corridor, for roosting and breeding.
Canis lupus	gray wolf	endangered	No known breeding populations. There is final designated critical habitat for this species, location is not publicly available. Wolves tend to avoid human population and can roam widely.
Bombus affinis	rusty patched bumble bee	endangered	No designated critical habitat, extirpated, historic range, grassland and tallgrass prairie that provides nectar and pollen from flowers, nesting sites (underground and abandoned rodent cavities or clumps of grasses), and overwintering sites for hibernating queens (undisturbed soil).
Oarisma poweshiek	Powesheik skipperling	endangered	No designated critical habitat, extirpated, preferred habitat is intact and undisturbed mixed-grass or tallgrass prairie.
Platanthera praeclara	western fringed prairie orchid	threatened	No designated critical habitat, preferred habitat is intact and undisturbed mesic to wet prairie.

The USFSW online planning tool – Information for Planning and Consultation (IPaC) was consulted on November 10, 2022 for the direct zone of the project. The key result found the action was consistent with the USFWS January 5, 2016 Programmatic Biological Opinion and found the action “May Effect” the NLEB. Consultation with the USFWS is required and ongoing. USFWS recommends IPaC be visited at regular intervals (every 90 days) and to include the acres of tree removal to stay current with NLEB status and protocols.

3.4.5 MIGRATORY BIRDS AND BALD AND GOLDEN EAGLE PROTECTION ACT

The Migratory Bird Treaty Act (MBTA) makes it unlawful to “take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts”, nests, or eggs of such a bird except under the terms of a valid federal permit.” Provisions are in place for the protection of migratory bird, part, nest, egg, or product. Under the MBTA, “migratory birds” essentially include all birds native to the U.S.; and the law pertains to any time of the year, not just during migration.

North Dakota is located within the Central Flyway, one of the major migration paths in North America. Migratory birds may occur in the AOI during spring and fall migration as well as use the area as breeding and nesting grounds through the summer. Three-hundred seventy-five bird species can be seen in the state (North Dakota Game and Fish Department 2016c). Because the AOI is located within the Prairie Pothole Region, the area has additional importance to waterfowl species. Migratory bird species of concern (USFWS Birds of Conservation Concern list) that may be in the project vicinity and may be affected by activities in the AOI are listed in Table 3-21. Waterfowl that have been observed in both Cavalier and Pembina counties and may also be present in the planning area include snow goose, greater white-fronted goose, Canada goose, tundra swan, wood duck, blue-winged teal, northern shoveler, gadwall, American

wigeon, mallard, northern pintail, canvasback, redhead, ring-necked duck, lesser scaup, bufflehead, American coot, and ruddy duck (Cornell Lab of Ornithology 2020a).

Table 3-21: Migratory bird species of concern in AOI (not full list of all birds that may occur).

Species Name	Breeding Season		Species Name	Breeding Season
American bittern	Apr 1 to Aug 31		Lesser yellowlegs	Breeds elsewhere
American golden plover	Breeds elsewhere		Marbled godwit	May 1 to Jul 31
Bald eagle	Dec 1 to Aug 31		Nelson's sparrow	May 15 to Sept 5
Black tern	May 15 to Aug 20		Red-headed woodpecker	May 10 to Sept 10
Black-billed cuckoo	May 15 to Oct 10		Ruddy turnstone	Breeds elsewhere
Bobolink	May 20 to Jul 31		Semipalmated sandpiper	Breeds elsewhere
Dunlin	Breeds elsewhere		Short-billed dowitcher	Breeds elsewhere
Franklin's gull	May 1 to Jul 31		Willet	Apr 20 to Aug 5
Hudsonian godwit	Breeds elsewhere			

The Bald and Golden Eagle Protect Act of 1940 as amended prohibits the taking of Bald and Golden Eagles. No eagle nests were observing during the Biological Survey. Consultation with USFWS in December of 2022 recommends a nest survey be conducted during a leaf-off period prior to construction.

3.4.6 UNDESIREABLE SPECIES

Non-native and/or invasive species and pathogens can pose a threat to communities in the AOI. For plant species, there are 14 noxious weeds identified for North Dakota (Error! Reference source not found.**22**, North Dakota Department of Agriculture 2017, Ikley 2020). Cavalier and Pembina counties list several within their jurisdictions (North Dakota Department of Agriculture 2020), but there are many other troublesome species of non-native plants in North Dakota (Ikley 2020). According to the NDGFD, *Dreissena polymorpha* (zebra mussel) is present within the entire length of the Red River of the North and within its tributaries (North Dakota Game and Fish Department 2019a). *D. polymorpha* may be present in the lower reaches of the Pembina or Tongue rivers, but the species is not likely to be present within the study area. *Ophiostoma ulmi* and *Ophiostoma novo-ulmi* (Dutch elm diseases) have been confirmed within every North Dakota county and are likely present within the AOI (LeBoldus et al. 2016). According to North Dakota State University, there are three undesirable invasive insect species of concern in North Dakota which may affect deciduous trees in the survey area. The emerald ash borer has not been detected in ND; however it is expected to arrive and will potentially impact green ash trees. The Gypsy moth has been detected; however it has not established a viable population; gypsy moth has the potential to impact the native burr oak species. Finally, the Asian long-horned beetle, while currently not found in ND, has potential to invade and affect birch, willow and poplar species in the survey area. - (North Dakota State University 2020).

Table 3-22: Undesirable plant species in North Dakota (plant names follow USDA Plant Database nomenclature, US Department of Agriculture 2020, species in bold are listed noxious weeds).

Species name	Species name
Acroptilon repens **(syn. *Centaurea repens*) (Russian knapweed)** [1, 2]	*Halogeton glomeratus* (halogeton) [1]
Amaranthus palmeri **(Palmer amaranth)** [1, 2]	*Hieracium aurantiacum* (orange hawkweed) [1]
Amaranthus tuberculatus **(Waterhemp)** [1]	*Hyoscyamus niger* (black henbane) [1]
Arctium minus **(common burdock)** [1]	***Linaria dalm****atica* (Dalmatian toadflax) [1, 2]
Artemisia absinthium **(absinth wormwood)** [1, 2]	***Linaria vulgaris*** (yellow toadflax) [1, 2]
Asclepias syriaca **(common milkweed)** [1]	*Lotus corniculatus* (bird's foot trefoil) *
Bassia scoparia**. [1,3,4], *Bassia prostrata*** **(kochia)** [1]	***Lythrum salicaria, Lythrum virgatum***, and all cultivars (purple loosestrife) [1, 2]
Bromus tectorum **(downy brome)** [1]	***Matricaria recutita*** (false chamomile) [1, 3]
Cardaria draba **(hoary cress)** [1]	*Onopordum acannthium* (Scotch thistle) [1]
Carduus acanthoides **(plumeless thistle)** [1]	*Melilotus officinalis* (white/yellow sweetclover) *
Carduus nutans **(musk thistle)** [1, 2]	*Phalaris arundinacea* (reed canary grass) *
Centaurea diffusa **(diffuse knapweed)** [1, 2]	*Poa pratensis* (Kentucky blue grass) *
Centaurea solstitialis **(yellow star thistle)** [1]	*Rhamnus cathartica* (European buckthorn) *
Centaurea stoebe ssp. micranthos **(syn. *C. maculosa*) (spotted knapweed)** [1, 2]	*Sonchus arvensis* (perennial sow thistle) [1]
Cirsium arvense **(Canada thistle)** [1, 2]	*Sonchus arvensis* ssp. u*liginosus* (marsh sow thistle) [1]
Cirsium vulgare **(bull thistle)** [1]	*Sonchus asper* (spiny sow thistle) [1]
Convolvulus arvensis **(field bindweed)** [1]	*Sonchus oleraceus* (annual sow thistle) [1]
Crepis tectorum **(narrowleaf hawksbeard)** [1]	***Tamarix spp****.* (saltcedar) [1, 2]
Cynoglossum officinale **(houndstongue)** [1, 2]	***Tanacetum vulgare*** (common tansy) [1, 3,4]
Euphorbia esula **(leafy spurge)** [1, 2]	*Typha x glauca* (hybrid cattail) *
Gypsophila paniculata **(baby's breath)** [1]	*Verbascum thapsus* (common mullein) [1]

[1] Troublesome non-native species (Ikley 2020)
[2] State-listed noxious weeds (North Dakota Department of Agriculture 2017)
[3] Cavalier County-listed noxious weeds (North Dakota Department of Agriculture 2020)
[4] Pembina County-listed noxious weeds (North Dakota Department of Agriculture 2020)
**** Other species***

There are numerous undesirable species in the project area. As outlined in Appendix D-7, several plant species observed in the planning area are either listed as North Dakota state noxious weeds, county noxious weeds, or state troublesome weeds (Ikley 2020). These include Biennial Wormwood, Canadian thistle, Common Tansy, Leafy Spurge, Common Milkweed and Musk Thistle. These were most prevalent in the tame grass areas, although common tansy was found in all the habitat types. Milkweed is likely listed as from a cropped agricultural perspective; however, this species is critical for monarch butterflies. Tame grass areas in the floodplain are dominated by invasive smooth brome and Kentucky bluegrass invasive species.

3.5 HUMAN ENVIRONMENT

3.5.1 LAND USE

Historical and current land use trends within the project area were assessed by reviewing aerial photography, local zoning ordinances, relevant comprehensive land use plans, the Multi-Resolution Land Characteristics Consortium (National Land Cover Database 2016), CropScape data (US Department of Agriculture National Agricultural Statistics Service 2019), and preliminary hydraulic conditions modeling results.

The land use within the AOI is primarily cultivated crop (55 %), with deciduous forest the next highest density land use at almost 15 % (US Department of Agriculture National Agricultural Statistics Service 2019, Table 3-23, Appendix C-8). Cultivated land is typically planted in a rotation of a range of crops, including wheat, sugar beets, soybeans, dry beans, barley, and canola. Based on the US Department of Agriculture National Agricultural Statistics Service (2019), agriculture products are varied throughout the AOI, as shown in Table 3-24 and Appendix C-9. The other land uses identified within the AOI represent a very small percentage of the remaining land area and are summarized the in table.

Land use most affected within the INDIRECT ZONE will be agricultural areas within the floodplain of the Tongue River. Inundation of crop land leads to reduced yields and lost income for the local community. Typical crops within the area include soybeans, wheat, canola, hay, corn, dry beans, and alfalfa (Appendix C-19). Currently, the 25-year flood extent in the project area covers 28.6 acres, and the 4-day cropland flood inundation in the watershed upstream of Renwick Dam is currently calculated to be 712 acres during a 25-year flood event. Further details of existing condition flooding impacts on cropland, including charts, tables, and maps are provided Appendix D-5.

Table 3-23: Classification land uses within AOI (National Land Cover Database 2016).

Cover Type	Acres	% of Total Land Area
Cultivated crops	36,948	55.26
Deciduous forest	9,717	14.53
Hay/pasture	7,841	11.73
Woody Wetlands	5,099	7.63
Emergent herbaceous wetlands	1,954	2.92
Developed, open space	1,902	2.84
Herbaceous	1,666	2.49
Evergreen forest	779	1.17
Open water	512	0.77
Shrub/scrub	206	0.31
Developed, low intensity	153	0.23
Mixed forest	63	0.09
Developed, medium intensity	13	0.02
Barren land	3	< 0.02
Developed, high intensity	1	< 0.02
Total	**66,857**	

Table 3-24: Agricultural products and other land (US Department of Agricultural Statistics Service 2019).

Crop Type	Acres	% of Total Land Area	Crop Type	Acres	% of Total Land Area
Spring wheat	17,112	25	Fallow/idle cropland	87	0.13

Crop Type	Acres	% of Total Land Area	Crop Type	Acres	% of Total Land Area
Deciduous forest	11,754	18	Mixed forest	45	0.07
Grassland/pasture	6,838	10	Oats	36	0.05
Canola	6,644	9.9	Sugar beets	33	0.05
Soybeans	5,777	8.6	Barren	15	0.02
Woody wetlands	5,289	7.9	Developed/med intensity	13	0.02
Dry beans	3,068	4.6	Shrubland	13	0.02
Developed/open space	1,902	2.9	Rye	12	0.02
Herbaceous wetlands	1,658	2.5	Millet	9.0	0.01
Sunflower	1,527	2.3	Flaxseed	4.0	0.01
Corn	1,273	1.9	Durum wheat	2.0	< 0.01
Other hay/non-alfalfa	1,271	1.9	Sod/grass seed	2.0	< 0.01
Open water	572	0.86	Developed/high intensity	1.0	< 0.01
Peas	549	0.82	Triticale	1.0	< 0.01
Alfalfa	411	0.61	Other crops	1.0	< 0.01
Potatoes	292	0.44	Winter wheat	0.4	< 0.01
Evergreen forest	252	0.38	Buckwheat	0.4	< 0.01
Barley	240	0.36	Clover/wildflowers	0.2	< 0.01
Developed/low intensity	153	0.23			

3.5.1.1 LOCAL ZONING ORDINANCES

There are no incorporated cities within the AOI.

Pembina County has not published an electronic version of a comprehensive plan or zoning regulations. Cavalier County has adopted zoning regulations (Cavalier County Board 2002).

3.5.2 ENVIRONMENTAL JUSTICE AND CIVIL RIGHTS

An evaluation of environmental justice impacts is mandated by Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994). This executive order directs federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.

US Census Bureau data were obtained to develop an understanding of the demography of the AOI. Demographic statistics for the project area were generated by using census block group data. Any census block group that is incorporated into the project area was included in its entirety, therefore demographic data for the project area is only an estimate. The AOI is comprised of the following census block groups: 380199511003, 380679504001, 380679502001, and 380199511002. The population within the two counties is approximately 10,563 people, of which 96% of the population is white, with the predominant minority being classified as “other” (2%) (Table 3-25). Additional block groups that may recreate in the AOI were also considered. These include the cities of Cavalier, Wallhalla and Langdon. Populations of American Indians and Hispanics were sometimes higher in these communities. Notably, the community of Walhalla has a 12% American Indian population.

Table 3-25: Demographic Statistics within the Tongue River AOI

Location	Population (2019)[1]	Per-Capita Income (2014-2018; in 2018 dollars)[2]	People in poverty (%)[3]	Predominant Race (2019 est.)[1]	Predominant Minority (2019 est.)[1]
Cavalier County	3,762	$43,125	10.3%	White, 96%	Hispanic or Latino 1.8%
Pembina County	6,801	$36,251	10.3%	White, 93%	Two or more races, 3.4%; Hispanic or Latino, 3.4%
North Dakota	762,062	$35,373	10.7%	White, 87%	American Indian and Alaska Native, 5.5%

[1] U.S. Census Bureau (2020a), [2] U.S. Census Bureau (2020b), [3] U.S. Census Bureau (2020c) Cultural Resources and Historic Properties

3.5.3 CULTURAL RESOURCES

Section 106 (54 U.S.C. Section 306108) of the National Historic Preservation Act of 1966, as amended, states that projects (undertakings) that are federally funded, require federal approval, or are carried out with federal financial assistance, be evaluated for their potential effects on historic properties included on or eligible for the National Register of Historic Places (NRHP). To comply with Federal law, regulation and NRCS policy, two investigations (Class I literature review and Class III survey) were conducted to assess the possible effects of the undertaking on historic properties. . The investigations are dependent on establishing the area of potential effect (APE) for the undertaking. The APE is "*defined as the geographic area or areas within which an undertaking may directly or Indirectly cause alterations in the character or use of historic properties if any such properties exist*" (36CFR800.16 (d)). For the proposed Tongue River project, the APE is shown in Appendix D-9, Figure 1, which consists of all areas to be disturbed by the construction project. A Class I survey is a literature and records review to determine the existence and location of actual or potential, historic properties. The Class I literature review was conducted by NRCS in 2020. A Class III is a "boots on the ground" physical survey for known properties and documentation of newly discovered cultural resources. The Class III field investigation was conducted by NRCS in 2020 and 2021 and the report completed in May 2021, available in Appendix D-9. No cultural resources nor properties eligible for the National Register of Historic Places (NRHP) were discovered in the APE, therefore a finding of "No Historic Properties Affected" was recommended.

In compliance with federal law (54USC§3061) regulation (36CFR§800), and NRCS policy (Title 401 Part 601) the NRCS consulted with the State of North Dakota and federally recognized American Indian tribes with ancestral ties to the APE throughout the planning process so as to actively seek, discuss, and consider the views of the stakeholders. Appendix A provides copies of all correspondence with the State Historical Preservation Office and sovereign Native American Bands, Tribes and Nations that were requested to participate in the planning process and consultation.

The undertaking is located within land ceded by the Red Lake and Pembina Bands of Chippewa Indians, ancestors of the Turtle Mountain Band of Chippewa Indians, and Red Lake Nations. The Tribal Historic Preservation Officers (THPO's) for these tribes as well as the State Historic Preservation Officer (SHPO) and 28 other THPO's were invited to participate in the planning process on July 29, 2016. No THPO's replied in the affirmative to participate, One THPO for the Confederated Salish and Kootenai tribe declined participation. ND SHPO agreed to being a consulting agency for the project.

On November 5, 2018, ND Cultural Resource Specialist, Chuck Carrig sent a formal NRCS consultation letter to the 24 Tribes and SHPO. There were no responses from the tribes. Thirty-one THPO's and SHPO were invited to a Planning Update meeting held on April 7, 2021. There was no input or responses from the THPO's or SHPO's during or following this meeting. In April 2021, NRCS State Cultural Resource Specialist Christopher Plount provided clarification and justification for the appropriate list of tribes for consultation. He recommended the removal of eight tribes based on his review of six literature references (See Appendix A) including the Old Crossing Treaty (J. Rolcynski) and Cultural Affiliations of Native American Groups within North and South Dakota (Mary Jane Schneider) among others. The U.S. Department of Housing and Urban Development (HUD) online Tribal Director Assessment Tool (TDAT) was accessed in September 2022 to confirm tribes with Interest in Pembina and Cavalier Counties in North Dakota. Four tribes were listed – Apache Tribe of Oklahoma, Fort Belknap of Montana, Red Lake Band of Chippewa Indians in Minnesota and the Turtle Mountain Band of Chippewa Indians of North Dakota. Of these, only the Apache Tribe of Oklahoma had not been previously invited to consult or invited to planning meetings. Final formal consultation on the Draft Plan EA is being conducted by direct mailing of a hard copy of the Draft Plan/EA to the tribal leaders of the 22 tribes (including the Apache Tribe of Oklahoma) on Sept 26, 2022. The THPO's for these tribes as well as ND SHPO and ND State Paleontologist will receive letters and links to the online Draft Plan/EA as well as invitations to the Public Meeting and field tour on October 18, 2022. These entities will have 45 days to comment on the draft plan EA and Class III Cultural Resource Survey. Comments and responses will be provided in Appendix A of the Final Watershed Plan-EA.

In fall of 2020, an NRCS employee discovered what appeared to be a fossil embedded in a riverbank. Due to the winter weather conditions, the NRCS Sate Cultural Resources Specialist (SCRS) was unable to visit the site until 7 April 2021. The SCRS was uncertain as to the nature of the find and, on 10 April 2021, NRCS began consultation with the North Dakota Geological Survey Senior Paleontologist Dr. Clint Boyd. On 13 May, 2021 no response from Dr. Boyd's was received, therefore in accordance with 36CFR800.4(d)(i) the lack of response is interpreted as no objection and, regarding the possible paleontological resource the "…*agency's official's responsibilities under section 106 are fulfilled."* Dr. Boyd later confirmed verbally to the NRCS State Engineer that he had received the request but was uninterested in the specimen due to its relatively common occurrence. Excavation associated with the project is limited to old levee fill removal, which will not have intact paleontological resources given it was constructed between 1941 and 1962 (see Appendix D-1), and the two floodplain excavations shown on the plans in Appendix D-4 which could have potential.

During the final design phase of the project, an inadvertent discovery plan for paleontological resources, which could be uncovered during floodplain excavation, will be developed and incorporated into the NRCS inspection plan and construction contract specifications through consultation with the ND Geological Survey. The construction inspection plan and contract will also specify that if human remains, or skeletal elements reasonably suspected to be human, are discovered during construction, all work shall cease, and the discovery site secured. In that event, the inspection plan and contract will state that local law enforcement shall be notified, and the discovery site treated as an active crime scene (statutes NDCC 23-06-27 and NDAC 40-02-03) until declared otherwise by competent authority. In addition, the inspection plan and contract will state that the NRCS State Conservationist, State Historic Preservation Officer, NRCS State Engineer, and Tribal Historic Preservation Officer(s), who have been part of the consultation process, shall be notified of the discovery.

3.5.4 SOCIAL ISSUES AND PUBLIC HEALTH AND SAFETY

Socioeconomic status within the project area was reviewed on a county level, and the analysis included Pembina and Cavalier counties in North Dakota (Headwaters Economics 2021). Employment within this two-county region from 1970 to 2019 is presented below (Table 3-266). For Pembina County, the largest sector in 1970 was non-service employment. Farming was the largest fraction, followed by the services sector (retail trade) and then by government jobs. By 1990, service jobs had come to dominate the economy, with the category of other services employing the most people (including professional and technical services; management of companies; administrative and waste services; educational services; health care and social assistance; arts, entertainment, and recreation; accommodation and food services; other services, except public administration; and Information). Non-service jobs were the second highest of the three categories, still dominated by farming. By 2000, the largest employer of non-service jobs had become manufacturing. For Cavalier County, the pattern was similar to Pembina County, but farming remained a top employer in the non-services category.

Table 3-26: Employment by industry, 1970-2019.

	1970	1990	2000	2010	2019
Pembina County					
Total Employment (no. jobs)	4950	5441	5945	5506	5197
Unemployment %	n/a	8.7%	5.2%	6.2%	5.8%
Non-Services Related %	49	36	40	31	34
Services Related %	36	50	47	46	46
Government %	15	14	13	16	16
Cavalier County					
Total Employment (no. jobs)	4976	3307	3384	2924	2873
Unemployment %	n/a	4.1%	3.4%	3.0%	3.5%
Non-Services Related %	59	38	32	35	36
Services Related %	29	50	58	48	48
Government %	13	12	11	10	10

Non-Services Related includes: agricultural services, forestry, fishing & other; mining (including fossil fuels); construction; manufacturing (incl. forest products)
Services Related includes: transportation & public utilities; wholesale trade; retail trade; finance, insurance, & real estate; other services

Data for earnings was used to characterize the economic information for the counties (Headwaters Economics 2021, Table 3-27). Earnings have increased more in Cavalier County compared with Pembina County during the last two decades, but overall earnings per job is relatively low. Economics in the project area are further assessed in a separate report (*Economics Evaluation Technical Memorandum*, Appendix D-5).

Table 3-27: Pembina and Cavalier counties annual average wages

Table 3-27: Pembina and Cavalier counties annual average wages

	1970	2000	2020	Change 2000-2020	% Change 2000-2019
Pembina County					
Average Earnings per Job (2021 $s)	$ 30,943	$ 58,535	$ 74,445	$ 15,910	27.2
Per Capita Income (2021 $s)	$ 21,717	$ 50,812	$ 76,250	$ 25,438	50.0
Cavalier County					
Average Earnings per Job (2019 $s)	$ 43,849	$ 49,771	$ 88,002	$ 38,231	76.8
Per Capita Income (2019 $s)	$ 20,985	$ 51,779	$ 92,871	$ 41,092	79.4

According to the EPA's *Cleanups in My Community* online database, there are two Superfund Sites located within the project area (US Environmental Protection Agency 2021). Based on the review of information provided by the EPA, these sites, listed as the Stanley R. Mickelsen Safeguard Complex – (RSL-3) Remote Sprint LA and the Cavalier Air Force Station ND Community Center, are indicated as being under "No Further Federal Action" and no longer qualify for the National Priorities List. No other details were provided.

Safety services within the project area includes the Cavalier Air Force Station Fire Department. The project area is served by the local County Sheriff departments (Cavalier and Pembina County Sheriff's Departments), although there are no law enforcement centers located within the AOI. There are no hospitals within the AOI. The nearest medical facility is in Cavalier, which is approximately 5.5 miles east of Renwick Dam.

Renwick Dam, with its intended purposes of flood control and recreation, provides a key public safety service. The dam is important for flood control in the downstream city of Cavalier, which protects public safety. Of recent public health concern is the incidence of harmful algal blooms (HAB), for which NDDEQ issued public warnings in 2017 and 2020 at Renwick Reservoir.

3.5.5 RECREATION RESOURCES

Icelandic State Park is adjacent to the reservoir formed by Renwick Dam and encompasses 900 acres including a swim beach, boat launch, watercraft rentals, playground, amphitheater, museum, visitor center, 4 miles of hiking trails, as well as 140 modern, 10 primitive, and 7 group camp sites. The park receives an estimated 120,000 visitor days per year and serves as destination for many campers around the state and from Canada. The closest campgrounds with similar amenities would be on Devils Lake, which is a 2-hour drive to the southeast. The reservoir is one of the key features of the park and is also utilized by residents in the nearby communities of Cavalier, Walhalla, and Langdon for swimming, boating, and fishing. It is one of only three lakes stocked as a fishery in Pembina and Cavalier counties. Water-related activities are increasing over time. The surface area of the reservoir has decreased over time from an estimated 220

acres in 1962 to 154 acres in 2020, due to sediment deposition. The reservoir is also known to experience algal blooms (including HABs), resulting from nutrient loading and hypereutrophic conditions, which reduce the recreation use of the reservoir (Appendix D-8).

Additional details on recreational use of Icelandic State Park and the Renwick Dam reservoir can be found in Appendix D-5 *Economics Evaluation Technical Memorandum* and Appendix D-8 *Project Benefits Report.*

4 ALTERNATIVES

4.1 FORMULATION PROCESS

The initial phase of the development of alternatives included review of a comprehensive list of strategies that represent categorized types of alternatives for flood damage reduction. The goal of the strategy evaluation was to narrow the scope of preliminary alternative review through the acceptance or elimination of strategies based on limited technical evaluation and practical considerations. To aid in this review, strategies were categorized into five generalized groups:

1. **No-Action** involves forecasting watershed conditions if no alternative plan is selected.
2. **Reduce runoff volume** involves structural and non-structural practices that result in reductions in the excess runoff volume from the water budget during a rain event.
3. **Increase conveyance capacity** provides additional hydraulic capacity within the watershed at known damage locations.
4. **Increase temporary flood storage** provides additional flood storage within the watershed, typically through structural measures that would maximize available flood storage.
5. **Protection/Avoidance** measures include structural and non-structural practices that would reduce damages to land, structures, and infrastructure.

Practical considerations that were considered when evaluating alternative strategies included local financing and acceptance, environmental concerns, the ability of the Sponsoring Local Organization (SLO) to implement, and the ability of the SLO to maintain the project. In addition to the practicality considerations, hydrologic and hydraulic factors within the watershed were considered to determine if the potential to meet the Purpose and Need existed. This review resulted in the following strategies being selected for detailed alternative analysis:

- No-Action
- River Corridor Restoration (Increase Temporary Flood Storage)

Additional summary information is provided in Appendix D-3 *Screening of Alternatives for Detailed Review.*

4.2 FLOOD DAMAGE REDUCTION ALTERNATIVES ELIMINATED FROM DETAILED STUDY

During the initial phase of formulating alternatives, various strategies were identified and preliminarily reviewed. The following strategies were eliminated due to practicality concerns and/or the inability to meet the Purpose and Need.

4.2.1 REDUCED RUNOFF VOLUME

The reduction of runoff involves the implementation of strategies to effectively reduce runoff volume to attain a condition similar to the undisturbed condition. In agricultural areas, these types of strategies are often best management practices (BMPs) on agricultural land and/or land use conversion programs such as the FSA's CRP or the NRCS's Wetland Reserve Easement Program. Conversion from agricultural land to perennial grasses would reduce runoff volume in the watershed but eliminating large areas of agricultural

production within the watershed does not meet the objectives in the Purpose and Need and is considered undesirable for local landowners.

4.2.2 INCREASE CONVEYANCE CAPACITY

Strategies that increase conveyance capacity include increased channelization, flood water diversions, and increased roadway capacities. While these strategies will reduce inundation in areas where they are being implemented, they will also cause increased discharge downstream of those areas. For example, increasing the size of a culvert or bridge crossing may reduce headwater elevations at the structure, which would produce less inundation upstream of the crossing; however, this would allow more flow through the crossing and would cause increased discharges downstream. This would eventually cause an increased discharge into the reservoir at Renwick Dam and would subsequently cause the outflow from the dam to increase. Similarly, increased channelization or the addition of a flood water diversion may help to reduce flooding locally but will cause downstream discharge to increase. Causing an increase in discharge downstream of Renwick Dam does not meet the goals outlined in the purpose and need statement.

4.2.3 ON-CHANNEL DAM

On-channel dams are constructed to temporarily store and attenuate peak flows downstream. On-channel dams often cause adverse impacts to riparian areas and can have negative effects on water quality and aquatic life and cause loss of habitat. There are currently 10 retention structures in the AOI that need to be maintained. The ability of the SLO to implement and maintain an additional structure within the AOI is limited. Due to environmental concerns associated with an on-channel dam and the limited ability for the SLO to implement, this alternative was eliminated.

4.2.4 REDUCED BRIDGE/CULVERT CAPACITY

Culvert sizing is a technique that can be used to control runoff rates. By appropriately sizing road and drainage system culverts throughout a sub-watershed or watershed, the flow rates can be regulated to better suit downstream channel capacities by temporarily detaining excess water upstream of culverts. North Dakota Century Code provides Stream Crossing Standards that do not allow culvert sizes to be reduced beyond identified minimums. Because minimum bridge and culvert sizes are required, reduction of these structures is not practical, which is why this alternative was eliminated from consideration.

4.2.5 WETLAND REHABILITATON/CREATION

In this region, created or rehabilitated wetlands are typically implemented to attain a natural resource and/or habitat objective. Wetlands developed for natural resource and/or habitat objectives can provide temporary flood storage. Temporary flood storage is considered beneficial if the topography allows for levels to be managed to provide a reasonable assurance that flood storage is available when needed without adversely impacting other objectives. The SLO and planning team agreed it would not be feasible to implement this on a large enough scale to generate measurable flood reduction benefits given that landowners would be unwilling to sell the rights to farm productive cropland.

4.2.6 SETBACK LEVEES

Levee systems set back from the river channel can be used to increase channel retardance, channel conveyance, and floodplain connectivity, allowing for increased storage within the river corridor. Setback levees require balancing the increased channel retardance with the increased conveyance volume from containing breakout flows. Setback levees require careful consideration for drainage of lands directly

adjacent to the levees to ensure additional damages are not caused by a lack of an adequate outlet when high water conditions are present within the levee corridor. Setback levees would require several acres of agricultural land adjacent to the river corridor to be taken out of production. The ability of the SLO to implement in a reasonable timeframe and maintain sufficient locations is limited, which is why this alternative was eliminated.

4.2.7 METER RUNOFF

Drain tile and culvert sizing can be used to store runoff within the existing landscape. Runoff would be stored in existing depressions within the watershed consisting of agricultural fields bounded by existing roads. Culverts at the outlet of the depressions would be sized or drain tile outlets closed so that runoff is stored for a short time, reducing flood impacts to downstream agricultural lands. The ability of the SLO to successfully implement this approach in a reasonable timeframe is limited, which is why the alternative was eliminated.

4.2.8 OFF-CHANNEL IMPOUNDMENT

Off-channel impoundments are constructed to temporarily store and release flood waters when downstream flooding recedes. Off-channel impoundments typically consist of an embankment constructed around an area adjacent to a channel with topography conducive to storing runoff. From a locally acceptable perspective, the best suited locations are typically in already flood-prone areas, where higher value crop land or pasture is not required to be removed from production. A control structure is typically required to divert flows from the channel into the impoundment location.

There are currently 10 retention structures in the AOI that need to be maintained by the SLO. The SLO has expressed concern with the implementation of an additional structure for which the ability to maintain would be limited. Therefore, this alternative was eliminated from further consideration.

4.2.9 LEVEES

Levee systems are typically constructed to contain the natural floodwaters and can be used to protect communities, rural farmsteads, and cropland. If a levee system encroaches on the natural floodplain, the system can result in increased flows, and downstream flooding must be considered and mitigated for. As with setback levees, consideration for drainage of land directly adjacent to the levee is critical. In many urban settings, this results in large lift stations being installed to lift water over the levee during floods. Ring levees around farmsteads were not considered for an individual alternative because they would not adequately meet the objectives in the Purpose and Need.

4.2.10 FLOOD WARNING SYSTEMS

Flood warning and emergency response systems begin with long- and short-term forecasts of flood potential, and the advanced warning can provide time for sandbagging, earthen levee construction, or other emergency protection methods, including evacuation when necessary. Available timing between flood warning issuance and actual flood conditions is critical to ensure an emergency response can be coordinated. This approach is not a practical solution for the Tongue River. During the 25-year event, there is an approximately 2-day lag between the peak rainfall intensity and the peak outflow from Renwick Dam. This is not sufficient time to implement temporary measures to meet objectives defined in the Purpose and Need.

4.2.11 FLOODPLAIN EASEMENTS

Flood easements could be acquired to compensate landowners to no longer operate on flood prone areas (Emergency Watershed Protection Program, etc.). Floodplain easements would be required on the areas with inundation longer than 24 hours for the 25-year, 4-day event to meet the objectives defined in the purpose and need. Due to extensive flooding adjacent to the Tongue River during the 25-year event, the ability of the SLO to implement this approach is limited given the likely landowner opposition to taking agricultural land out of production.

4.3 CHANNEL STABILIZATION ALTERNATIVES ELIMINATED FROM DETAILED REVIEW

Channel stabilization was selected to be analyzed in additional detail after the initial strategy screening. Many channel restoration and stabilization techniques were considered for the river restoration alternative. The following channel restoration and stabilization strategies were eliminated due to concerns associated with cost, engineering feasibility, practicality, and/or operation and maintenance associated with the strategy. All stabilization strategies would incorporate removal of the historic levees along the north side of the river channel, upstream of the Highway 89 bridge (see Appendix D-1 for background information) and incorporate fish passable grade control structures to prevent the upstream progression of incision. Note that a "stable" channel in this context does not imply a goal for the channel to remain exactly in place, with no erosion or lateral migration over time; instead, a stable channel is one where erosion, deposition, and meander migration occur at natural rates for rivers in the area.

4.3.1 STAGE 0 RESTORATION

A Stage 0 restoration approach seeks to restore multithread channels in unconfined depositional valleys, on the belief that an anastomosing channel network better represents pre-disturbance conditions (Powers et al, 2019). As outlined in detail in Appendix D-1, the ~2-mile project reach is located in the transition zone from the Pembina Escarpment to the Red River Valley, and is within an unconfined depositional valley. Once the river reaches the valley elevation, and hardwood forests would have historically transitioned to tallgrass prairie, it is easy to visualize shallow multi-thread channels winding through beaver dams. Most of the project reach would have been in hardwood forests, however, prior to clearing to establish crop fields on the floodplain. Given the geologic position of the reach and erodible nature of the shale bed channel, it is difficult to image that a bankfull channel would not have formed through the forested area. Regardless, implementation of this restoration strategy is not compatible with upstream dams (Olson Dam and Senator Young Dam) that cutoff a portion of natural sediment supply to this reach, or the bridge crossings currently in place. In addition, construction of a short multi-thread channel through the project reach would require floodplain culverts to be bored under Highway 89 at a major expense and would make haying of CRP fields on the lower project reach impossible. This type of channel construction would not be locally acceptable and securing financing would be difficult. For these reasons, the alternative was eliminated from further consideration.

4.3.2 PRIORITY 1 RESTORATION- RELOCATE CHANNEL ONTO FLOODPLAIN

The Priority 1 restoration approach (Rosgen, 1997) involves reconstruction of a bankfull channel on the floodplain, sized so that the incipient point of flooding (bankfull stage) is at the elevation of the historic floodplain. The goal is to reconstruct an "equilibrium" or "natural" channel that transports water and sediment in a manner such that a river generally maintains dimension, pattern, and profile without significant degradation or aggradation. The bankfull stage is slightly less than a 2-year flood recurrence

interval so the result of this approach is that 2-year floods will inundate the adjacent floodplain. The form of the channel, whether single or multithread, and details of cross section, profile, and pattern, is dependent on variables such as geology, soils, hydrology, vegetation, and land use and is determined through measurements of stable reference channels in the hydro-physiographic region. Stream restoration design engineers, including those from NRCS, typically prefer this approach for incised channel restoration projects if floodplain restrictions allow as it typically provides maximum flexibility to design a stable channel. Construction costs are also often minimized with this approach, as excavated materials can be used to largely fill the existing incised channel leaving excess volume to be utilized as oxbow wetlands in the old channel. On the Tongue River project reach there were several factors that made this an undesirable approach:

- Floodplain soils are loose, fine-grained, remnants of shale riverbed particles that currently have the characteristics of a clay soil as the result of land leveling, tillage, and compaction by overlying floodplain soils. The ~75 pcf density of floodplain soils is lower than the density that can be achieved by compaction with proper moisture control and vibrator, or the estimated 125 pcf density of shale deposits underlying the channel (see Appendix D-4 for additional information). Therefore, excavating a channel across the floodplain would require over excavation and placement of a “seed” gravel lining that matched the characteristics of upstream natural river bedload given that the gravel sized shale particles cannot be transported with construction equipment without breaking down into a clay like material.
- The existing Highway 89 bridge is located on the far south edge of the floodplain, as is the existing river channel upstream of the severely incised reach. To maintain reference conditions for sinuosity, meander wavelength, and belt width the newly excavated channel would have to remain near the old channel as a result. Given the highly erodible soils, and the fact that trees would have to be cleared from the riparian zone on the north bank to construct the new channel, capture of the old channel by the river would be anticipated in the future. Reconstruction of a new highway bridge in the center of the valley is cost prohibitive.
- Northern Pearl Dace, designated a Class I Species of Conservation Priority by ND Game and Fish, reside in the project reach and require cool water. Relocation of the river channel away from the existing forested riparian area and into old the old hayfields, now in USFWS and NRCS conservation easements, would result in elevated water temperatures for the decades it would take new tree plantings to grow.

As a result of these factors, this alternative was eliminated from further consideration due to cost and feasibility.

4.3.3 PRIORITY 2 RESTORATION

A Priority 2 restoration approach (Rosgen, 1997) maintains the incised channel at its current bed elevation, in a form that may not represent the pre-incision channel but would function as a stable natural channel. In this particular case that would entail conversion of the current F channel to a Bc with an inset floodplain excavated out of the current floodplain and riverbanks. Grade control structures would be placed on the upstream end of the project reach, to prevent incision from continuing to progress upstream. This approach is not compatible with the watershed plan purpose of flood damage reduction, would be comparable or higher cost than the preferred alternative, and does not provide the environmental benefits associated with restoring natural floodplain hydrology so therefore was eliminated from further consideration.

4.3.4 PRIORITY 3 RESTORATION

The Priority 3 strategy (Rosgen, 1997) is similar to Priority 2 in that is maintains the incised channel at its current bed elevation, but it does so with a narrower inset floodplain. The approach is often used in urban areas where inadequate space is available and requires significant investment in bank stabilization. Grade control structures would be placed on the upstream end of the project reach, to prevent incision from continuing to progress upstream. This approach is not compatible with the watershed plan purpose of flood damage reduction, or the overarching RCPP project purpose of flood retention, because the channel is so incised that even the 50-year flood does not activate the floodplain currently. To achieve retention on the floodplain, the channel needs to be reconnected to its natural floodplain which will attenuate flood flows and provide flood damage reductions to downstream cropland. In addition, this restoration approach would be higher cost than the preferred alternative and does not provide the environmental benefits associated with restoring natural floodplain hydrology so therefore was eliminated from further consideration.

4.3.5 BEAVER DAM ANALOGUES

Beaver are effective engineers of river systems and play an important role in the form and ecology of the Tongue River, as described in Appendix D-1. Beavers are currently active in and upstream of the project reach of the Tongue River, with new dams regularly being observed over the last five years. The high velocities and shear stress in the incised channel, in even very minor spring runoff events, cause beaver dam lifespan to be less than a year, however. As described by Pollock et al (2017), an effective approach in incised channels can be construction of beaver dam analogue structures (BDAs) that either mimic a fully human constructed beaver dam or provide a support structure on which local beaver can build a dam with a higher level of reinforcement. A BDA is typically constructed with a line of wooden posts placed at intervals across the river, followed by live branches weaved between the posts, with strategically place backfill. Although the technique can be very effective in small streams, it is not practical in large rivers. Beaver dam analogues are incorporated into the preferred alternative project design, upstream of the channel reconstruction in a reach where incision has only progressed 1-2 feet deep. Even in this location design computations in Appendix D-4 indicate a short lifespan for the structures. As a stand-alone alternative to cause aggradation within the severely incised portion of the channel, BDAs are not a feasible alternative therefore were eliminated from further consideration.

4.3.6 CONSTRUCTED CHECK DAMS

On intermittent channels in farm fields gullies are occasionally treated by installation of rock, timber, concrete, or earthen check dams spaced at intervals; after which surface sediment runoff is relied on to fill between the dams naturally. This is not an effective approach on alluvial rivers and can result in major instability, either lateral migration around the check dams, dam failure due to scour, or instability due to uncontrolled depositional patterns. A serious of in-channel check dams would have an unacceptable negative impact on aquatic species and would not be permitted on the Tongue River, therefore this alternative was eliminated from further consideration.

4.3.7 RIVERBANK STABILIZATION (PRIORITY 4)

In cases where channel incision has down cut as far as it can, due to bedrock or other controls, and the channel is solely in the process of widening, an effective strategy can be to just focus on stabilizing riverbanks. In the case of the project reach, monitoring indicates that it is possible that downstream portions of the project reach are no longer degrading, so that could be an approach. Lacking a significant

flood, however, which has not occurred in the 5 years of monitoring, that conclusion cannot be confirmed. Stabilizing the existing high banks would be expensive, however, and this approach is not compatible with the watershed plan purpose of flood damage reduction, would be higher cost than the preferred alternative, and does not provide the environmental benefits associated with restoring natural floodplain hydrology so therefore was eliminated from further consideration.

4.3.8 RIVERBANK STABILIZATION WITH ARMORED CHANNEL (PRIORITY 4)

Building upon the strategy outlined in 4.3.7, in cases where the channel bottom elevation is not yet stabilized an approach of both stabilizing the riverbanks and armoring the bottom of the channel with riprap, concrete rubble, poured concrete slabs, or articulated concrete block mats can be considered. This is a very expensive option, utilized primarily in urban areas. The strategy would have an unacceptable negative impact on aquatic species and would not be permitted on the Tongue River, therefore this alternative was eliminated from further consideration.

4.4 ALTERNATIVE DESCRIPTION

The screening process summarized in more detail in *Screening of Alternatives for Detailed Review* in Appendix D-3 resulted in the identification of two alternatives for detailed consideration.

4.4.1 NO-ACTION ALTERNATIVE

The No-Action Alternative assumes that without NRCS financial assistance, implementation of flood damage reduction projects within the project watershed would be limited. Future pressure from changing climatic conditions and subsequent changes in precipitation patterns, in addition to land use changes including conversion of perennial vegetation to annual crops, drain tile installation, and ditching, can expect to result in frequency and magnitude of flood damages to continue and upward trend. Channel incision would continue to progress upstream, deepening and widening the river channel, and when it reached the tributary to Olson Dam, would initiate incision upstream on that channel as well. As forested hillslopes are undercut landslides will continue to occur. Sediment delivery to Renwick Dam would continue at the current average rate of 55,0000 tons/year, filling the sediment pool by 2027 and the permanent (recreation pool) fully by 2086. Due to sediment infill, downstream flood control benefits from Renwick Dam would be reduced by 33% by 2113. By 2040 the permanent pool would be 40% full, leaving the current reservoir in wetland condition unlikely to support fish populations or recreational use. Additional details and supporting analysis are provided in Appendix D-8.

4.4.2 ALTERNATIVE NO. 1 – PRIORITY 1 RIVER RESTORATION IN PLACE, WITH LARGE FLOODPLAIN EXCAVATIONS

The proposed channel stabilization project involves restoring natural pattern, profile, and dimension to 1.8 miles of the Tongue River starting at a location approximately 1.3 river miles downstream of the Tongue River crossing with North Dakota State Highway 89 in Section 28 of Beaulieu Township, Cavalier County, ND. The proposed project will raise the elevation of the riverbed to within 3.0 feet of the natural floodplain, at the low point of the riffles, to just the capacity of the bankfull channel flow. Approximately 336,000 cubic yards (210 ac-ft) of material will be excavated from the floodplain, of which approximately 65,000 cubic yards will be placed and compacted within the river channel. Excess excavation material would be hauled to an offsite location procured by the contractor, likely to be placed as fill in one of many old gravel pits in

the local area. An additional 3,000 cubic yards of fill material for the channel will come from excavation of old levees within the Direct Zone, to remove lateral confinement features on the channel, which were part of the APE for cultural resources as outlined in Appendix D-9. Approximately 14,400 tons of a custom gravel mix will be imported and placed to a 2 ft thickness underlying riffles, runs, glides, and point bars to mitigate the extent to which the Pierre Shale derived gravel particles in the riverbed will degrade under construction activities. Riverbanks of the new channel will be temporarily stabilized by approximately 7,000 feet of Type 1 treatment, consisting of a ballasted large wood debris toe with overlying encapsulated soil lifts, and 9,300 feet of Type 2 treatment consisting of a brush and cobble toe with coir erosion control fabric. Long term bank protection will be provided from the over 55,000 stems of live willow and dogwood cuttings, 30 mature willow clump transplants and 500 prairie cordgrass plugs to be planted on or immediately adjacent to riverbanks.

A fish passable rock arch rapids structure on the downstream end of the project will raise the channel nearly 8 feet over a length of 180 feet. A buried sheet pile wall, driven down into the existing riverbed at the top of the structure, will provide an emergency scour countermeasure in the event some catastrophic event (such as an upstream dam failure) re-initiated incision. A buried rock sill constructed across the lower elevation floodplain on the north side of the river will provide flanking protection to the rock arch rapids and sheet pile wall. Additional grade control measures just downstream of the Highway 89 bridge and midway from that to the end of the project include two rock cross vanes installed below the constructed channel, with buried sheet pile walls driven into the existing riverbed. Cobble patches will be placed on the upstream end of riffles as 12 scattered locations in the channel as well, to act as minor grade control features. Upstream of the channel restoration section, two rock cross vanes and two debris collectors will be placed to elevations to encourage 1-2 foot of aggradation in 740 feet of slightly incised channel upstream. The debris collectors include driven posts, to encourage beavers to form dams, and ballasted full trees to encourage formation of natural log jams. Sediment fence would be installed along the edges of the bankfull channel, behind bank protection treatments, and removed after the floodplain is fully revegetated.

Following construction completion, revegetation of the floodplain and disturbed areas will consist of 54.8 acres of a temporary cover of oats or rye applied with hydro-mulch. In the following spring the 16.6 acres to be planted as a riparian forest buffer will be drill seeded to a non-competitive grass mix, after which 5,770 bare root trees (with tree protectors) and 2,885 shrubs will be hand planted. The remaining floodplain areas, surrounded the excavations on USFWS conservation easements, will be drill seeded to native grasses including the 6:1 slopes on the excavations as far down as water elevations will allow. Disturbed areas due to construction on the downstream end of the project, currently enrolled in the CRP program, will be drill seeded to a CRP mix.

Alternative 1 was focused on stabilizing the channel via a Priority 1 Restoration approach in combination with maximizing temporary flood storage via floodplain excavations. Design of floodplain excavations follows NRCS Conservation Practice Standard 378 for Excavated Pond. The floodplain excavations would provide 210 ac-ft of temporary flood storage under this alternative and require removal of existing utility poles. Nodak Electrical Cooperative was consulted, and indicated that lines will be relocated and buried, and provided the cost estimate which was incorporated into the estimate as a Sponsor cost in Appendix D-5. Preliminary construction drawings for the project are provide in Appendix D-4. Analysis results for the resulting flood control, sediment reduction, phosphorus reduction, and other important project benefits is provided in Appendix D-8.

Planning and design of the project is under NRCS Conservation Practices 582- Open Channel, 410- Grade Stabilization Structure, 378- Pond, 391- Riparian Forest Buffer, 390- Riparian Herbaceous Cover, 512- Pasture and Hayland Planting, 342- Critical Area Seeding, and 484 Mulching.

4.4.3 ALTERNATIVE NO. 2 – PRIORITY 1 RIVER RESTORATION IN PLACE, WITH SMALL FLOODPLAIN EXCAVATIONS

Alternative 2 is identical to Alternative 1 in all aspects but the size of the floodplain excavations are reduced to approximately 70,000 cubic yards (40 ac-ft). The floodplain excavations under this alternative were sized to generate exactly the fill material required for channel restoration. Side slopes remain at 6:1 and bottom elevations remain identical, but the extents of the excavations are smaller. The excavations were sized to ensure trucks would not need to haul fill material across Highway 89. At this size of excavation, utility poles will not need to be relocated. The smaller pools are shown on the preliminary design drawings in Appendix D-4 and analysis results for the resulting flood control, sediment reduction, phosphorus reduction, and other important project benefits is provided in Appendix D-8.

4.5 SUMMARY AND COMPARISON OF ALTERNATIVE PLANS TABLE

The No-Action Alternative, Alternative 1, and Alternative 2 have been compared for their potential effects (both positive and negative) on the environmental concerns identified in the scoping section of the report (Table 4-1). This table provides a comparison of environmental effects presented in the alternatives. The structure of this table describes the overall effects of the No-Action Alternative, followed by the impacts of Alternative 1 and Alternative 2 in the two zones of potential effect: (a) the project area (Direct Zone, 485 acres) and (b) potential effects downstream (the project watershed) to Renwick Dam (Indirect Zone, 7,311 acres). Consideration is also given to the effects of the alternatives downstream of Renwick Dam since the purpose of the project is to maintain the flood damage reduction and recreational benefits associated with Renwick Dam.

Table 4-1: Anticipated environmental effects of three alternatives carried forward, Alternatives 1 and 2 are divided into three assessment areas: Direct-Zone of potential impact (project area), Indirect-Zone of potential impact (downstream of project to Renwick Dam (RD)), and downstream of Renwick Dam.

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Measures to Address: • Watershed Protection • Flood Damage	• Channel incision continues to progress upstream on the Tongue River generating high rates of bed, bank, upslope erosion, and loss of forest resources. • Renwick Dam (RD) continues to fill with sediment at a rapid rate • High rate of phosphorus delivery to RD continues rapid rate of eutrophication and algal blooms and fish kills become more common • Instream habitat quality for aquatic species continues diminish over time • Recreation use decreases as permanent pool at Renwick Dam fills • Continued periodic flood damages to agriculture and rural infrastructure	Direct Zone • Significantly reduce damage from erosion (sediment transport, riparian habitat loss) • Improved wildlife habitat • Enhanced/created riverine, riparian, and wetland acres • Protect upstream habitat and infrastructure InDirect Zone • Decreased sediment transport into RD • Improve water quality in river, maintain RD • Reduced flood damage • Maintain recreation value of RD Downstream of Renwick Dam • Maintains designed flood retention for the life of the RD rehabilitation project	Direct Zone • Significantly reduce damage from erosion (sediment transport, riparian habitat loss) • Improved wildlife habitat • Enhanced/created riverine, riparian, and wetland acres • Protect upstream habitat and infrastructure InDirect Zone • Decreased sediment transport into RD • Improve water quality in river, maintain RD • Reduced flood damage • Maintain recreation value of RD Downstream of Renwick Dam • Maintains designed flood retention for the life of the RD rehabilitation project
Installation Costs			
NRCS Contribution	$ 0	$ 11,1448,300	$ 3,673,900
SLO Contribution	$ 0	$ 1,123,700	$ 1,103,700
Total	$ 0	$ 12,572,200	$ 4,777,600
National Economic Development (NED) Account - Average Annual Costs			
Installation	$ 0	$ 298,700 (Flood Reduction) $ 154,700 (Watershed Protection) $ 453,400 (Total)	$ 8,500 (Flood Reduction) $ 154,700 (Watershed Protection) $ 163,200 (Total)
Operation, Maintenance, and Replacement	$ 0	$ 200	$ 200
Total Annual Costs	$ 0	$ 453,600	$ 163,400

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Annual Benefits	$ 0	*$ 11,720 (Flood Reduction)* *$ 635,700 (Watershed Protection)* *$ 647,400 (Total)*	*$ 10,200 (Flood Reduction)* *$ 635,700 (Watershed Protection)* *$ 645,900 (Total)*
Environmental Quality (EQ) Account			
Soil Resources	• Erosion resulting from channel incision will continue at a rate of 55,000 tons/year • RD sediment pool full in approximately 2027 • RD reservoir 40% full 2050, 100% full by 2086 • Flood control benefits downstream of RD reduced by 33% in 2113	Direct Zone • Short-term construction impacts with potential for temporary erosion, mitigated by use of BMPs • Long-term decreased erosion potential InDirect Zone • RD sediment pool full in approximately 2026 • RD permanent pool 40% full 2050 Downstream of RD • Flood control benefits downstream of RD reduced by 3% in 2113	
Farmland Classification	• Farmland designation will remain the same • Flooding of “prime farmland” in Indirect Zone • Flooding of “prime farmland” increases at RD flood pool starts to fill	Direct Zone • 7.1 acres of prime farmland will be converted; however land use will remain as wildlife as is currently the case InDirect Zone • Decreased flooding of “prime farmland” adjacent to Tongue River downstream of project reach Downstream of RD • Maintain current flood protection for “prime farmland”	
Water Quantity	• 25-year, 4-day flood in INDIRECT ZONE inundates 584 acres of cropland • 25-yr peak at Hwy 32 is 1,225 cfs • Continued INDIRECT ZONE flood damages	InDirect Zone • 25-yr, 4-day flood in INDIRECT ZONE inundates 481 acres of cropland • 25-year peak at Hwy 32 reduced to 809 cfs Downstream of RD • No change	InDirect Zone • 25-yr, 4-day flood in INDIRECT ZONE inundates 523 acres • 25-yr peak at Hwy 32 reduced to 884 cfs Downstream of RD • No change

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Water Quality	• Continuing and exacerbated erosion causing sediment and nutrient transport downstream • Water temperatures increasing as riparian shade is reduced • Phosphorus loading to the reservoir is approximately 84,000 lbs / yr • RD is hypereutrophic and has recurring harmful algal blooms	Direct Zone • Water temperatures decrease with decreased width/depth ratio of channel and increased shade as trees and shrubs grow • Increased frequency of flooding, residence time, and water infiltration into the floodplain soils will enable physical and microbial filtration of pollutants • Wetland phytoremediation results in nutrient uptake and metals sequestration • Short term increase in turbidity after water is let back into each constructed reach InDirect Zone • Phosphorus loading to RD decreased by 83 % • Potentially increased water quality due to reduced phosphorus loading Downstream of RD • Increased water quality due to deeper water depth and decreased dissolved phosphorus transport	
Aquatic Resources (wetlands and surface water resources)	Continuing incision of riverbed, both within project reach and moving upstream potentially straightening the meanders, forming new oxbows, draining adjacent or creek bed wetland. Natural density of multi-year beaver dams not present in incised reaches.	Direct Zone • 0.03 acres palustrine wetland hydrology removed by adjacent excavation • .02 acres palustrine wetland temporarily impacted by construction road. • 9,588 feet of river restored • 1,201 river feet gained • 1,491 feet ephemeral drainages converted to wetland/deep water habitat • 17.81 acres wetland/deep water habitat gained (maximum) • Channel conditions will support natural density of multi-year beaver dams. InDirect Zone • No change Downstream of RD • No change	Direct Zone • 0..03acres palustrine wetland hydrology removed by adjacent excavation • .02 acres palustrine wetland temporarily impacted by construction road. • 9,588 feet of river restored • 1,201 river feet gained • 614 feet ephemeral drainages converted to wetland/deep water habitat • 6.71 acres wetland/deep water habitat gained (maximum) • Channel conditions will support natural density of multi-year beaver dams. InDirect Zone • No change Downstream of RD • No change
FEMA Floodplain Management	FEMA Regulatory 100-year floodplains would remain unchanged.	FEMA Regulatory 100-year floodplains would remain unchanged.	
Natural Areas (designated)	RD will continue to fill with sediments (full by 2086). Iceland State Park will remain, but the lake will become a wetland.	Direct Zone • No change InDirect Zone • Improvements in water quality of RD in Iceland State Park • Increased lifespan of reservoir	

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Habitat	Uplands- poor vegetation quality is not providing ideal food and cover for wildlife in tame grass, invasive species will continue to proliferate.	Direct Zone • Approximately 72.6 acres of poor herbaceous and streambank vegetation will be enhanced with native herbaceous and woody plant materials. 16-25 acres of land with desirable timber will be preserved, increasing desirable wildlife habitat. InDirect Zone • Invasive species seed sources reduced Downstream of RD • No change	Direct Zone Approximately 72.6 acres of poor herbaceous and streambank vegetation will be enhanced with native herbaceous and woody plant materials. 16-25 acres of land with desirable timber will be preserved, increasing desirable wildlife habitat. InDirect Zone • Invasive species seed sources reduced text Downstream of RD • No change
Riparian Areas	Poor vegetation quality and the lack of the river's access to the floodplain is not providing ideal food and cover for fish and wildlife. Channel incision is causing tree loss and loss of stream habitat.	Direct Zone • Project will have temporary impacts to the channel and within the riparian floodplain construction routes. Water will be temporarily diverted with measures to safely block fish with steel screening upstream of the pump intake and hand-relocating fish in the dewatered sections. InDirect Zone • Project will stabilize the river and reduce sediment downstream which may improve downstream riparian areas. Downstream of RD • No change	Direct Zone • Project will have temporary impacts to the channel and within the riparian floodplain construction routes. Water will be temporarily diverted with measures to screen aquatic species k fish with steel screening upstream of the pump intake and hand-relocating aquatic species prior to dewatering reaches for construction. InDirect Zone • Project will stabilize the river and reduce sediment downstream which may improve downstream riparian areas. Downstream of RD • No change
Plants of State Conservation Concern	Invasive tame grass species are inhibiting native grasses and forbs. Channel incision is decreasing desirable timber species such as oak and ash.	Direct Zone • 55.2 acres Desirable native species will be planted. Channel stabilization will stop the loss of riparian timber trees. InDirect Zone • No change Downstream of RD • No change	Direct Zone • 55.2 acres Desirable native species will be planted. Channel stabilization will stop the loss of riparian timber trees. InDirect Zone • No change Downstream of RD • No change

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Animals of State Conservation Concern	• Continuing channel incision will inhibit persisting beaver dams • Continuing habitat fragmentation and decreased presence of fish and wildlife • Continuing decline of northern pearl dace habitat	Direct Zone Long eared bat habitat may be present. Construction contract will ensure that Conditions for Implementing Conservation Practices for the Long-eared Bat and Whooping Crane are followed. Habitat will be more favorable to the northern pearl dace post construction. Fish will be hand-netted and relocated downstream during de-watering of construction reaches. InDirect Zone • Improved water quality Downstream of RD • No change	
Threatened and Endangered Species	Continuing and increasing habitat decline, disturbance, and fragmentation	Direct Zone • Long eared bat habitat may be present. Construction contract will ensure that Conditions for Implementing Conservation Practices for the Long-eared Bat and Whooping Crane are followed. • Restored acres of forest, tree roosting sites for northern long-eared bat InDirect Zone • Improved habitat quality Downstream of RD • No change	
Migratory Birds	Continuing and increasing habitat decline, disturbance, and fragmentation	Direct Zone • Improved habitat quality • Construction will cease if a whooping crane is observed InDirect Zone • Improved habitat and water quality in RD Downstream of RD • No change	
Undesirable Species	Six species of state/county noxious weeds are present and will continue to proliferate.	Direct Zone 55.2 acres of undesirable tame grass/noxious weeds will be planted to desirable native grass, forb and tree species. InDirect Zone • Lower incidence of opportunistic species due to less erosion from floodwaters in river Downstream of RD • No change	
Land Use	Continuing loss of land and plant communities from erosion and landslides	Direct Zone • Some land use changes from grassland to riparian forest or wetland, other land uses, such as hay harvesting, will not be affected • Hayfields benefit from restored floodplain hydrology InDirect Zone • no change in land use expected Downstream of RD • No change	

Item or Concern	No-Action Alternative	Alternative 1	Alternative 2
Cultural Resources	Unchanged from the existing condition	Direct Zone • No change InDirect Zone • No change Downstream of RD • No change	
Social Issues, Public Safety, Environmental Justice	• Continued phosphorus loading into RD cause increased HAB incidents • Continued sediment loading into RD eventually results in flooding downstream to the City of Cavalier. • Continuing channel incision, climate-related precipitation changes, and land use practices will exacerbate the downstream water quality problems	Direct Zone • No change InDirect Zone • Improved water quality and less frequent toxic HABs • Reduced flood damages Downstream of RD • Maintain flood damage reduction benefits of the Renwick Dam Rehabilitation Project for its full lifespan.	
Recreation Resources	• Reduced swimming and boating due to more frequent algal blooms and HAB incidents • Reduced boating and fishing due to shallow reservoir depth, low oxygen conditions will eventually preclude game fish survival • Reduced fishing opportunity due to decline in the fish populations caused by poor water quality and smaller reservoir area	Direct Zone • No effect InDirect Zone • Maintain existing recreational use of Icelandic State Park • Maintain recreation benefits of the Renwick Dam Rehabilitation Project for its full lifespan. • Potential reduction in algal blooms in swimming waters due to decreased phosphorus input • Potential reduction in risk of fish kills Downstream of RD • No effect	

5 ENVIRONMENTAL CONSEQUENCES

This section provides the analytical basis for the comparisons of effects presented in the alternatives. This section will describe the environmental, economic, and social effects of each alternative. The relevant concerns identified in the scoping section are discussed in this section of the plan for each alternative.

The structure of this section describes the overall effects of the No-Action Alternative, followed by the impacts of the evaluated alternatives (Alternative 1 and Alternative 2) in three zones, the project area (Direct Zone, 486 acres) (Appendix B-2), downstream from the project (from the project to Renwick Dam (Indirect-Zone, 7,544 acres), and downstream from Renwick Dam.

The impacts evaluation is based on the framework of the project design (Appendix D-4) and the project benefits (Appendix D-8).

5.1 SOILS

5.1.1 SOIL RESOURCES

Effects on geology and soils would be significant if they would alter the lithology, stratigraphy, and geological structures that control groundwater quality, distribution of aquifers and confining beds, and groundwater availability; or change the soil composition, structure, or function—including prime farmland and other unique soils—within the project planning area.

The erosion caused by channel incision and widening in the Tongue River channel is occurring partially in soils and partially in the underlying shale bedrock material. Pierre shale is a soft and highly erodible material which fractures easily and weathers into distinct chips and flakes. It is easily dug with a shovel near the ground surface and classifies as a lean clay in terms of engineering soil properties. In most locations within the project reach, including the forested slopes on the south side of the river, there is less than 6 inches of soil present over the shale bedrock. Throughout the EA and technical reports, erosion and sediment deposition volumes reflect a combination of soils and bedrock material that behaves as soil.

5.1.1.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, continued negative effects channel incision and associated riverbank erosion will persist. As outlined in Appendix D-8, monitoring and analysis of the project reach, compared to downstream reservoir sediment surveys and adjusted by reservoir trap efficiency, determined an average annual erosion rate upstream of Renwick Dam of 55,000 tons per year since 2013. Without stabilization, this rate would be expected to continue as channel incision continues to progress upstream on the Tongue River.

5.1.1.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.1.1.2.1 DIRECT ZONE OF POTENTIAL IMPACT

After construction of the channel stabilization project, via either Alternatives 1 or 2, the average annual erosion delivered to Renwick Dam is expected to drop from 55,000 tons per year to 7,500 tons per year, which was the base rate for the watershed prior from 1962 to 2013, as detailed in Appendix D-8. Additional direct impacts to soil resources include excavation (ponds, levee removal, reconnection of historical meander channels) and fill (earthwork to raise the channel elevation and rock cross vanes). Under Alternative 2 the project is designed to excavate only that material needed for the construction project,

between levee removals and floodplain excavations. Under Alternative 1 excess excavation in the floodplain would occur, via deeper ponds, to maximize flood damage reduction benefits of the alternative. Excess excavated materials would be hauled off site, likely to one of the many old gravel pits in Pembina County, for disposal.

During construction there is increased erosion and sedimentation potential, which would be managed by use of BMPs during and immediately after construction. Appendix D-4 outlines sediment control measures incorporated into the conceptual design, including silt fence, coir fabric, straw bales, and revegetation of disturbed areas as soon as possible after disturbance. Also, in compliance with Section 402 of the CWA, a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit and Stormwater Pollution Prevention Plan (SWPPP) would be required for this project. Compliance would require use of construction BMPs to minimize soil erosion. During construction activities requiring significant earth moving, topsoil would be segregated from subsoil prior to excavation and any backfilling. If appropriate, topsoil would be replaced on the recovered subsoil. Disturbed areas would then be reseeded with appropriate seed mixes, see Appendix D-4 for revegetation plans. No significant adverse impacts on soils would be anticipated with the implementation of BMPs. Post-construction monitoring would ensure successful revegetation.

Indirect impacts to soil resources includes the overflow of the river to the historical floodplain to provide additional water storage in the excavated ponds. These measures, in addition to the increased capacity of the flow into the historical meanders and grade control structures, will increase the hydric soil area (and wetland development) and significantly reduce soil erosion in the area by decreasing the velocity of floodwaters.

Compared to the No-Action Alternative, Alternative 1 or Alternative 2 will result in short-term, direct impacts with potential for temporary erosion and sediment transport. The long-term effect is significantly reduced channel incision and erosion, and thus decreased sediment transport downstream.

5.1.1.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The project will result in decreased channel incision, riverbank erosion, and landslides in the project reach, but will not have any significant on downstream base levels of soil erosion on cropland or riverbanks downstream.

Compared to the No-Action Alternative, Alternative 1 or Alternative 2 will prevent soil erosion on the Tongue River channel within the project reach and upstream but will not have significant impacts on soil erosion occurring downstream.

5.1.2 FARMLAND CLASSIFICATION

5.1.2.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no change on the size or distribution of prime farmland, farmland of statewide importance, or farmland of unique importance in the planning area. Under this alternative, erosion issues associated with flooding would continue with the associated adverse impacts to soil resources. The project purpose and need would not be met as no additional protection to agricultural lands would be provided, and no action would be taken to reduce out-of-bank flooding which currently, adversely affects topsoil resources through erosion and sedimentation throughout the planning area.

5.1.2.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.1.2.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The project will result in a small amount of prime farmland (7.1 acres) to be directly converted as a result of the earthwork in the excavated ponds. The landuse of these soils has been wildlife or idle for approximately 20 years, with occasional haying. It is apparent from LiDAR and aerial photography that the soil properties of this land were negatively impacted by historic flooding, and that while mapped within a prime farmland unit, did not meet the production value typical of this map unit. The converted land areas are also surrounded by USFWS easements, making production unpractical due to the small size of the cropable unit. The USDA AD-1006 Farmland Conversion Impact Rating form is located in Appendix E, which documents the low ratio of the relative value of farmland of the 7.1 acres to be converted.

Compared to the No-Action Alternative, Alternative 1 or Alternative 2 will decrease the acreage of land designated as prime farmland by 7.1 acres, however there will be no loss of highly productive farmland due to the condition, location, and land use of this acreage.

5.1.2.2.2 INDIRECT AREA OF POTENTIAL IMPACT

In the Indirect Zone, “prime farmland” is generally in a zone adjacent to the river, with a wider zone on the western half of the Indirect Zone (Appendix C-13). There is very little “farmland of statewide importance.” Most of the land is designated as “prime farmland if drained”, and this land would be flooded less frequently due to the flood control benefits of Alternative 1 or Alternative 2.

Compared to the No-Action Alternative, Alternative 1 or Alternative 2 will not change the acreage of land designated as prime farmland.

5.1.3 CUMULATIVE EFFECTS

Actions with the potential for cumulative effects on local soils in the planning area would include existing and future flood (pre-planned) mitigation projects and existing and future emergency (un-planned) flood management practices. As outlined in Section 1.1.2 these include dam rehabilitation projects on Senator Young Dam and Olson Dam upstream of the project reach. These activities could result in potential to change flow characteristics within the planning area or result in soil erosion or degradation of soil health. However, erosion control and restoration would be required to reduce direct, indirect, and cumulative soil impacts. Rehabilitation planning for the two dams is being completed because they do not meet current federal and state dam safety standards; therefore if rehabilitation is not completed there will remain a heightened risk of dam failure which would generate substantial erosion to dam embankments, the downstream river channel, and cropland (including prime farmlands).

Ground disturbing activities and movement of construction vehicles and equipment during construction of Alternative 1 or Alternative 2 would contribute to a minor short-term disturbance and potential for loss of soils. These impacts would be incremental to other regional effects occurring as a result of ongoing agricultural land uses. Soil effects in the long-term would be considered minor. Because the project would restore and stabilize a section of river that had been significantly degraded and increase floodplain retention, the project would significantly decrease erosion and improve farmland in the project area.

5.2 WATER

5.2.1 WATER QUANTITY

The water resources primarily under review for potential Environmental Consequences include the Tongue River east of 127th Avenue NE in Beaulieu Township, Pembina County, to the upstream end of the Renwick Dam reservoir. Incised river channel conditions through the project reach prevent natural retention of floodwater on the floodplain until well in excess of the 25-year, 4-day rainfall event, thereby increasing the frequency and extents of downstream flooding.

5.2.1.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no stabilization actions taken on the Tongue River and floodplain retention will not be restored. Flood inundation will continue to be as outlined in Tables 3-3, 3-4 and 3-5. Currently flows less than the 25-year flood are confined to the incised channel, however some seasonal surface water may be present in wetland areas on the natural floodplain in the spring after snowmelt or periods of heavy rainfall. The pre-project 25-year flood extent in the project area covers 28.6 acres. Downstream flooding would continue, and implementation of emergency flood risk reduction measures may be needed during flood events. The current 4-day cropland flood inundation downstream of the project area is currently calculated to be 682 acres during a 25-year flood event. Currently, the 25-year flood event inundates a total of 1,875 acres. Flooding occurs along the river, and there are extensive flooding areas north and south of the river in areas of low relief and hydric soils. Flooding in the river increases as water flows downstream into Renwick Dam. Future pressure from continuing channel incision, climate-related precipitation changes, and land use practices (e.g., continued drainage of unprotected pothole wetlands, expanded ditch systems) will exacerbate the downstream flooding problems.

5.2.1.2 ALTERNATIVE 1

5.2.1.2.1 DIRECT ZONE OF POTENTIAL IMPACT

Restoring the natural floodplain inundation will increase the flooding frequency and expand the inundation within the Direct Zone from 28.6 acres to 118.7 acres during the 25-year flood event. As outlined/shown on drawings in Appendix D-4, old levees along the floodplain will be removed and the river channel will be raised back up to its pre-incision elevation (maximum riffle depth of 3.0 feet). As a result, flows will start to break out of the channel onto the floodplain at the 2-year recurrence interval flood rather than at approximately the 25-year flood elevation that is the case now, due to channel incision. Appendix D-4, Table 8 shows the results of restoring floodplain connectivity in terms of flow reductions both above and below the Highway 89 bridge; at the 25-year flood for example, flows in the channel are reduced by 49% due to the fact that water is spread out across the floodplain and moving slowly down the valley. Appendix D-8, Figures 9-14 illustrate flood extents by recurrence interval with existing conditions versus the two alternatives, illustrating increased flood extents upstream of the project and decreased flood extents downstream of the project.

The two excavated basins will be between 14 to 21 feet deep and store a maximum of 151 acre-feet of water and are located in those only area of the floodplain neither forested nor in existing conservation easements. Alternative 1 maximized the size of those excavations up to easement boundaries in order to maximize downstream flood benefits; excavated materials would be hauled off site. Given that all Direct Zone lands are enrolled in perpetual USFWS conservation easements or CRP, or are forested land, the additional (natural) level of floodplain inundation is considered a benefit in terms of wildlife habitat, hay, and

timber production. Further detailed information is available in Appendices D-5 and D-8 regarding additional flood retention in the project reach and flood reductions downstream.

Compared to the No-Action Alternative, the project will restore natural floodplain hydrology and reduce flow velocities and increase floodplain retention within the Direct Zone.

5.2.1.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

There would be no significant effects to water quantity within the short-term construction period for Alternative 1. Construction is not anticipated to affect water quantity within the Alternative 1 footprint or downstream. Long-term, with Alternative 1 in operation, increased floodplain storage in the Direct Zone would bring flood relief to the project watershed. Once the project is completed, peak flood flows would be reduced for the Tongue River from North Dakota State Highway 32 to the outlet at Renwick Dam (see Table 5-1, Appendix D-8). Peak flow reductions at North Dakota State Highway 32 would reach 34 % during the 25-year event and 5 % during the 100-year event. A similar trend is also seen at the Tongue River crossing with North Dakota State Highway 5, where the peak flow is reduced by 19 % for the 25-year event and 1 % for the 100-year event. Peak flow reduction also occurs downstream of the planning area at the outlet of Renwick Dam. The peak flow reductions at the outlet of Renwick Dam range from 1 % for the 2-year event to 6 % for the 50-year event. In addition to reductions to peak flows within the planning area, reductions to cropland inundation will occur as a result of implementing Alternative 1. Cropland inundation for a 25-year flood event will be reduced by approximately 107 acres (to 605 acres), or 15 %, when compared to the No-Action Alternative. Reduced flood velocities would decrease losses of forest land and damage to riparian areas.

Table 5-1: Alternative 1 Peak Flow Changes

Location	Percent Change in Peak Flow Per Event					
	2-year	5-year	10-year	25-year	50-year	100-year
Tongue River at ND Highway 32	-9%	-15%	-31%	-34%	-15%	-5%
Tongue River at 131st Ave NE	-3%	-14%	-30%	-33%	-10%	-1%
Tongue River at ND Highway 5	-2%	-14%	-26%	-23%	-9%	-1%
Tongue River at 133rd Ave NE	-1%	-5%	-13%	-15%	-7%	-12%
Renwick Dam Inflow	-1%	-4%	-11%	-18%	-11%	-9%
Renwick Dam Outflow	-1%	-1%	-2%	-5%	-5%	-5%

Compared to the No-Action Alternative, the project will reduce peak flows, reduce cropland inundation area, and reduce overall inundation area and related infrastructure damages.

5.2.1.3 **ALTERNATIVE 2**

5.2.1.3.1 DIRECT ZONE OF POTENTIAL IMPACT

This alternative is different from Alternative 1 only in that it will have two smaller, excavated basins that can store a maximum of 40 acre-feet of water, 170 acre-feet less than Alternative 1. The excavations were sized to provide just the fill quantity necessary for the project. Similar to Alternative 1, the floodplain inundation is increased within the Direct Zone for Alternative 2. During a 25-year flood event, inundation within the

Direct Zone increases from 28.6 acres under the No-Action Alternative to 104.0 acres with Alternative 2 in place. Given that all Direct Zone lands are enrolled in perpetual USFWS conservation easements or CRP, or are forested land, the additional (natural) level of floodplain inundation is considered a benefit in terms of wildlife habitat and hay production.

Compared to the No-Action Alternative, the project will restore floodplain hydrology and reduce flow velocities, increase floodplain storage, and reduce peak flows.

5.2.1.3.2 INDIRECT ZONE OF POTENTIAL IMPACT

There would be no significant effects to water quantity within the short-term construction period for Alternative 1. Construction is not anticipated to affect water quantity within the Alternative 1 footprint or downstream. Long-term, with Alternative 1 in operation, increased floodplain storage in the Direct Zone would bring flood relief to the project watershed. Once the project is completed, peak flood flows would be reduced for the Tongue River from North Dakota State Highway 32 to the outlet at Renwick Dam (see Table 5-3, Appendix D-8). Peak flow reductions at North Dakota State Highway 32 would reach 9 % during the 25-year event and 0 % during the 100-year event. A similar trend is also seen at the Tongue River crossing with North Dakota State Highway 5, where the peak flow is reduced by 4 % for the 25-year event and 0 % for the 100-year event. Peak flow reduction also occurs downstream of the planning area at the outlet of Renwick Dam. The peak flow reductions at the outlet of Renwick Dam range from 1 % for the 2-year event to 3 % for the 50-year event. In addition to reductions to peak flows within the planning area, reductions to cropland inundation will occur as a result of implementing Alternative 1. Cropland inundation for a 25-year flood event will be reduced by approximately 64 acres (to 648 acres), or 9 % when compared to the No-Action Alternative. Reduced flood velocities would decrease losses of forest land and damage to riparian areas.

Table 5-2: Alternative 2 Peak Flow Changes

Location	Percent Change in Peak Flow Per Event					
	2-year	5-year	10-year	25-year	50-year	100-year
Tongue River at ND Highway 32	-9%	-10%	-20%	-9%	-1%	-0%
Tongue River at 131st Ave NE	-3%	-10%	-19%	-9%	-1%	0%
Tongue River at ND Highway 5	-2%	-9%	-16%	-4%	-2%	-0%
Tongue River at 133rd Ave NE	0%	-3%	-7%	-4%	-2%	-7%
Renwick Dam Inflow	-1%	-3%	-6%	-6%	-8%	-5%
Renwick Dam Outflow	-1%	-1%	-1%	-2%	-3%	-3%

Compared to the No-Action Alternative, the project will reduce peak flows and decrease cropland inundation acres.

5.2.2 WATER QUALITY

Water quality in the region is a continual problem due to many issues, including erosion, nonpoint source pollutants, land use practices, removal of natural vegetation, and water channelization. The Renwick Dam reservoir, an artificial waterbody, is particularly vulnerable to poor water quality because it has an extensive and damaged contributing watershed (see Section 3.2.2).

5.2.2.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no action to improve water quality or address issues, such as flooding and erosion, that affect water quality within the planning region. The Tongue River receives sediments and various agricultural chemicals (e.g., pesticides, herbicides, fertilizers, metals, and petroleum) from the contributing watershed and locally as runoff from the roads and nearby fields during precipitation events. The river transports these substances quickly through the hydraulic network and away to the project watershed. There are no water quality issues or designated impaired waters in the Direct Zone, but this area contributes, through erosion and rapid transport of nutrients that have deposited on the floodplain for decades, too much of the water quality problem downstream, particularly hypereutrophic conditions in Lake Renwick and recurrence of harmful algal blooms. Appendix D-8 documents that the eroded TP from the project reach is approximately five times higher than the natural watershed load and that the current annual phosphorus loading to the reservoir is approximately 84,000 lbs/yr. Future pressure from continuing channel incision, climate-related precipitation changes, and land use practices (e.g., continued drainage of unprotected pothole wetlands, expanded ditch systems) will exacerbate the downstream water quality problems.

5.2.2.2 ALTERNATIVE 1 AND ALTERNATIVE 2

5.2.2.2.1 DIRECT ZONE OF POTENTIAL IMPACT

Currently, there are no impaired waters in the area.

Short-term construction impacts would be mitigated by use of BMPs. Long-term, the project would slow flow velocities and retain water, resulting in a longer residence time in the Direct Zone. Slowing the water velocity and causing the floodwaters to inundate into the floodplain will reduce erosion of the channel and also increase localized sediment deposition. Increased residence time and water infiltration into the floodplain soils will enable physical and microbial filtration of pollutants. Establishment of the floodplain excavations, which act as water-retention basins, will support wetland ecosystems which are known for sediment and pollutant phytoremediation capabilities through nutrient uptake and metals sequestration in the soils.

Compared to the No-Action Alternative, Alternative 1 or Alternative 2 will result in significantly improved water quality in the flow downstream from the Direct Zone.

5.2.2.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Alternative 1 or Alternative 2, by first reducing the sediment and nutrient loads from upstream and then reducing additional erosion in the project watershed, would provide water quality benefits, particularly to Renwick Dam. Appendix D-8 estimates the project would decrease the phosphorus loading to Lake Renwick from 84,000 lbs/year to 14,000 lbs/year, which is a decrease of 83 %. Over the long term, this should help to alleviate water turbidity and algal blooms at Renwick dam caused by excess nutrients in contributing waters, dependent on current internal loading. Large quantities of phosphorus are already present within sediments deposited in the lake at this point, but the project will reduce future accumulations. As compared to the No Action alternative, implementation of Alternative 1 or 2 will maintain deeper water, cooler summer temperatures, more productive fishery, and have a lower frequency of algal blooms. Uncertainty is high for water quality constituents and related algal blooms to Renwick Dam as there is very limited gauging efforts in the watershed, and no internal loading analysis or model for the lake. An example lake nutrient model is BATHTUB, which has been setup for Matejcek Reservoir as part of the Nutrient and Dissolved Oxygen TMDL in 2017. Although, similar to Renwick, it has high internal loading modeling indicated that phosphorus reductions would help to reduce algal blooms and low dissolved oxygen in the

future. It is likely that the ND DEQ 319 Program will complete a TMDL on Renwick Reservoir at some point in the future. This may also benefit the recreation resources of the reservoir by reducing the potential for spring fish kills and the potential for toxic algae in swimming waters. Water quality would improve in the downstream stretch of the river currently designated as an impaired water.

Once the project is completed, the water quality in the project watershed would improve compared to the No-Action Alternative.

5.2.3 AQUATIC RESOURCES

Aquatic resources, including wetlands, lakes, and river systems, are highly productive ecosystems, support a large variety of ecosystem services, and are of increasing importance due to significant loss of acres across the state and in the region (42 % wetland loss in North Dakota, Dahl 2014). Results of field wetland delineation are detailed in Appendix D-6.

5.2.3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, variable change to aquatic resources within the planning area is anticipated. Riverine and lake resources would continue to experience degraded quality and quantity as further channel incision is expected. Existing wetland acreage in the project area is small – 13.05 acres. The majority of these wetlands are present due to hydrology from precipitation and runoff. It's possible Wetland 12w and 16w (0.23 acres total) may continue to lose hydrology with continued incision. Also, as incision moves further upstream, the further loss of oxbow wetlands and small linear wetland areas will continue to increase. Intensity and frequency of precipitation events and snowmelt would continue to influence these resources throughout the planning area. The Tongue River will continue to be eroded and incised and future pressure from climate-related precipitation changes and land use practices upstream will exacerbate this condition. There is one wetland in a connected meander that may be drained with continuing erosion of the channel. Currently, the Tongue River in the targeted construction area is 8,207 feet and there is one wetland connected to the channel (0.04 acres) (Appendix D-6). Where the proposed excavated ponds are located in Alternative 1 and Alternative 2, there are currently two ephemeral drainages (3184.14 feet total length). Wetland functions were evaluated by using the riverine hydrogeomorphic method (HGM) developed by NRCS-South Dakota, as depressional riverine floodplain wetlands. These Functional Capacity Units (FCUs) were determined to be between 0.1 and 0.4 over a variety of functions (Appendix D-8).

5.2.3.2 ALTERNATIVE 1

5.2.3.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The project construction consists of adding fill to the river channel, removing several levees, restoring natural hydrology to several abandoned oxbow wetlands. One existing oxbow wetland (ID16 – 0.03 acres) will be expanded, five oxbow wetlands will be restored (ID22-26 – 0.57 acres), as shown in Appendix D-6 and D-8. The restoration project will raise the river thalweg and remove levees, to reconnect previously cutoff oxbows, thus increasing the length of the river channel. Compared to the No-Action Alternative, the project will restore 9,588 feet of river channel. By doing this, one existing wetland will be permanently impacted due to fill placement and one will be impacted due to temporary culvert placement for construction access roads(Table 5-3). After the project, floodplain hydrology will be restored with 2-year 4-day flood events inundating another 9.9 acres and 25-year 4-day flood events inundating an additional 83.4 acres.

The proposed two excavation areas are located north of the river on either side of Highway 89. The pond to the west will be 17 feet deep and cover 7.6 acres at its maximum depth, providing approximately 32 acre-

feet of storage. The bottom area of the pond, likely to convert to wetland habitat over time, would be 4.7 acres. This pond will require the excavation of part of a potential Other Waters of the US (497 feet of ephemeral drainage), and this drainage will be interrupted with the outlet of the pond using a different flow path. The pond to the east will be 10 feet deep and cover 10.6 acres at its maximum depth, providing approximately 85.5 acre-feet of storage. The bottom area of the pond, likely to convert to wetland habitat over time, would be 8.3 acres. This pond will also require excavation of part of a potential Other Waters of the US (994 feet of ephemeral drainage), and the outlet of this pond follows the original path of the drainage. These ponds are designed to retain water that flows into the floodplain during peak flow events (in excess of the 2-year flood). They would also receive surface water from the surrounding land via the ephemeral drainages. These ponds have the potential to develop wetland characteristics and support wetland vegetation and associated fauna. The slopes of the basins are relatively steep (1 foot vertical for every 6 feet horizontal), so the development of wet meadow communities would be limited to a narrow zone, but the west pond may retain water depth for a (semi-)permanent deep water or deep marsh habitat, and the east pond deep/shallow marsh habitat.

Table 5-3: Potential Alternative 1 aquatic resources impacts (resource ID numbers from the aquatic resources delineation report).

Resource ID	Impact type	Amount	Reason
Wetland 12	Fill	0.04 acres	Tongue River channel fill
Wetland 4	Temporary culvert placement	0.02	Temporary Construction route
Wetland 9	Hydrology removal	0.03	Excavation of west storage pond will remove hydrology
OW19-d	Excavation	497 feet	West storage pond
OW20-d	Excavation	994 feet	East storage pond
	Total acres impacted:	.05	

Ecosystem services of the wetlands and river ecosystems will be enhanced due to rehabilitation of natural vegetation in the stream channel, in the enhanced wetland areas, and in the created wetland basins. An early analysis of the project using the riverine geomorphic method had provisionally determined an increase in the functional capacity units of the wetlands by a significant amount. Wetland functional improvements were calculated for this alternative (estimated FCUs ranged between 8.64-11.03), and they show significant improvement over the No-Action Alternative (Appendix D-8).

The outcome of Alternative 1, compared with the No-Action Alterative, will be

- a gain of 1,201 feet of main river channel,
- a loss of 0.03 palustrine wetland
- a potential gain of 13.43 acres of wetland/deep water habitats, and
- a gain of 151 acre-feet of floodwater storage capacity.

As a result of the project, the channel incision will be repaired and stabilized, floodplain hydrology restored, additional wetland/deep water habitat created, floodwater storage capacity increased, and the quality of habitats increased significantly.

5.2.3.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The wetlands in this area (approximately 716 acres**,** Appendix C-15) include the following types: lake, riverine, freshwater emergent, freshwater forested/scrub-shrub, and freshwater ponds. The lake is identified as the major waterbody of Lake Renwick, and most of the other wetlands are associated with branches of the Tongue River and numerous tributaries. The total river length is estimated to be 39.7 miles (Appendix C-4). Many of the original stream channels have been channelized, and it is likely many of the historical drainage swales have been converted to field drains.

Water retention upstream to reduce peak flows in the project watershed will not adversely affect wetlands in this area. The source of the water supply for the current wetlands is groundwater or surface water, and the contributing watersheds for these wetlands appear to be large enough to continue this pattern. What additional water is supplied by flood events only occurs periodically and for a short duration. Decreased duration and frequency of flood events should not adversely affect the wetland water supply. Decreased peak flow to the rivers and streams will reduce adverse effects of erosion and will foster channel stabilization.

Once the project is completed, wetland area will be similar to the No-Action Alternative, but channel stability will be significantly greater.

5.2.3.3 **ALTERNATIVE 2**

5.2.3.3.1 DIRECT ZONE OF POTENTIAL IMPACT

The project construction for this alternative is the same as in Alternative 1 except the excavated basins will be smaller (total 6.71 acres, 11.10 acres smaller than Alternative 1). Wetland functional improvements were calculated for this alternative (estimated FCUs ranged between 5.51-7.03), and they show significant improvement over the No-Action Alternative, but lower than Alternative 1 (Appendix D-8).

The pond to the west will be 6.5 feet deep and cover 2.65 acres at its maximum depth, providing approximately 3 acre-feet of storage (4,930 cubic yards). This pond will avoid the potential Waters of the US. The pond to the east will be 10.7 feet deep and cover 4.06 acres at its maximum depth, providing approximately 15 acre-feet of storage (23,769 cubic yards). This pond will also require excavation of part of a potential Other Waters of the US (614 feet of ephemeral drainage) (Table 5-4), and the outlet of this pond follows the original path of the drainage. The slopes of the basins are relatively steep, so the development of wet meadow communities would be limited to a narrow zone, but the west pond may retain water depth for a (semi-)permanent shallow marsh habitat, and the east pond deep/shallow marsh habitat.

Table 5-4: Potential Alternative 2 aquatic resources impacts (resource ID numbers from the aquatic resources delineation report).

Resource ID	Impact type	Amount	Reason
Wetland 4	Temporary culvert placement	0.02	Temporary Construction route

Wetland 9	Hydrology removal	0.03	Excavation of west storage pond will remove hydrology
OW20-d	Excavation	614 feet	East storage pond
	Total acres impacted:	.05	

The outcome of Alternative 2, compared with the No-Acton Alterative, will be

- a gain of 1201 feet of main river channel,
- a loss of 0.03 acres palustrine wetland, and
- a potential maximum gain of 6.6 acres of wetland habitats, and
- a gain of 30 acre-feet of floodwater storage capacity.

As a result of the project, the channel incision will be repaired and stabilized, floodplain hydrology restored, additional wetland habitat created, floodwater storage capacity increased, and the quality of the habitats increased significantly.

5.2.3.3.2 INDIRECT ZONE OF POTENTIAL IMPACT

The conditions here will be similar to that of Alternative 1.

5.2.4 FEMA FLOODPLAIN MANAGEMENT

Designated FEMA Flood Zones have been mapped for the entire AOI (Appendix C-16).

5.2.4.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no changes anticipated in the short-term to the existing FEMA floodplains. In the long-term the floodplain designations would remain unchanged unless there are changes to new construction along the flood corridor. If the peak flows continue to increase as a result of climatic changes in precipitation patterns or contributing watershed land use changes, FEMA may complete revisions to flood maps, however, is improbable as these rural areas with little new construction remain very low priority for FEMA.

5.2.4.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.2.4.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The current FEMA floodplain designations in this area are Zone A along the river and Zone X at higher elevations (Appendix C-16). Zone A is defined as area subject to inundation by the 1-percent-annual-chance-flood event generally determined using approximate methods. Zone X is defined as areas determined to be outside the 0.2% annual chance floodplain. As noted in Zone A definition, the analysis to determine these zones were approximate methods, which does not include detailed hydraulic analysis or Base Flood Elevations (BFEs).The project will raise the channel, but this will not impact the upstream FEMA zones because they were established prior to the incision of the channel in 2013.

With the project, the flooding frequency would increase back to the same mapped Zone A extent of the 25-year interval. This will have no effect on properties requiring flood insurance (none present).

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will have no effect on flood insurance requirements.

5.2.4.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Currently the FEMA flood map indicates all areas outside the main river channel, a few tributaries, and Lake Renwick (all designated as Zone A) are designated as Zone X (Appendix C-16). This means these areas have been mapped to show they are outside the 100-year flood frequency. However, the 25-year flood map indicates there are many areas that are flooded at a higher frequency.

With the project, the flooding frequency will decrease for a significant area, but this smaller flood extent still falls within Zone X. This indicates the FEMA map is on a scale too coarse to be informative.

Once the project is completed downstream, flooding will decrease, but FEMA mapping does not reflect this fine-scale determination. Upstream flood zones will not be affected because existing FEMA maps reflect a pre-incision (post-project) condition.

5.2.5 CUMULATIVE EFFECTS

Actions with the potential to cumulatively affect wetland, riparian, water quality, and water quantities in the planning area include other and future projects and natural conditions that would compound the effects of this project. Other projects may include flood risk management projects that would compound the benefits of this project, both to the regional Red River Basin and also internationally. As outlined in Section 1.1.2, planning for the rehabilitation of Senator Young and Olson Dams upstream of the project reach is currently underway. Rehabilitation planning for the two dams is being completed because they do not meet current federal and state dam safety standards; therefore if rehabilitation is not completed there will remain a heightened risk of dam failure which would result in long term increased peak flows and sediment load within the Tongue River watershed. During the single, catastrophic dam breach a large quantity of sediment would be transported and erosion throughout the watershed would occur.

Other cumulative variables, including normal climatic fluctuations (flood, drought), increased intensity of precipitation events predicted to be associated with climate change, and intensity of upstream land use practices that affect the drainage or retention of water on the landscape, could impact the region's water resources and their ability to support natural habitat in the future. Due to all these natural variables, flooding will continue or increase, water quality will continue to decline, and habitats will continue to be adversely affected. When put into the context of past, present, and reasonably foreseeable activities, the project would be highly beneficial for natural flood management, aquatic resources, and water quality interests.

5.3 HABITATS

5.3.1 NATURAL AREAS

The major designated natural area in the project watershed is Iceland State Park (Appendix C-17), which includes the Gunlogson Nature Preserve Multiple other designated natural areas in the watershed also exist, as detailed in Table 3-8 and shown in Appendix C-17. Other natural areas, not officially designated by government entities, exist on lands too marginal for agriculture or of limited commodity production potential; these include the steep forested slopes along the river in and upstream of the project reach.

5.3.1.1 NO-ACTION ALTERNATIVE

Under the No Action alternative the Tongue River channel will continue to widen through the project reach, and incision will progress 1.8 miles upstream towards Senator Young Dam. Loss of mature 50- to 80-year-old basswood, oak, elm, and ash tree floodplain forest due to incision and associated channel widening is 1.6 acres per year currently, which would be expected to continue under this alternative. In total, 35 acres of floodplain forest would be lost to erosion with this alternative. In addition, 16-25 acres of upland forestland is at risk if channel erosion is allowed to proceed. See Appendix D-8 for additional information on projected natural area losses. The natural areas of Icelandic State Park are located predominantly on uplands or downstream of Renwick Dam, therefore there are no impacts projected under the No Action alternative.

5.3.1.2 ALTERNATIVE 1 OR ALTERANTIVE 2

5.3.1.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are three USFWS easements (waterfowl production areas) for a total of 71.74 acres in the project area. Current conditions are detailed There will be some direct impacts from the construction activities. Two of these easements will experience increased floodplain inundation, and some areas will be replated/seeded to deep-rooted native warm season grasses and forbs. The area of improved floodplain habitat will be 15 acres on the west side of North Dakota State Highway 89 and 20 acres on the east, for a total of 35 acres.

Once the project is complete, the wetlands and riparian areas in these parcels will benefit from inundation. The native seeding and planting will rehabilitate the natural vegetation and improve the habitat.

Compared with the No-Action Alternative, Alternative 1 and Alternative 2 would improve the habitats within the USFWS easements.

5.3.1.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The project will result in decreased sediment and nutrient loads and decreased erosion of the river downstream, which will cause reduced sediment and nutrient loading to Lake Renwick. The sediment survey study in Renwick Dam (Appendix D-8) estimated the project sediment delivery to be 6.7 acre-feet/year, only slightly more than the original design (6.1 acre-feet/year). This means if the proposed channel stabilization project is completed, the sediment pool will still fill prior to the designed lifespan of the rehab project; however, that would not occur until 2043, an additional 16 years compared to the No-Action Alternative. The reservoir lake that supports a fishery and recreation use would be only 2 % filled by 2050. Downstream flood control benefits will decline but at a much lower rate; by 2113, they would be reduced by an estimated 3 % from the current flood control benefits provided by the dam. This will result in improved water quality in the reservoir and thus improved habitat for waterfowl, other migratory birds, and other animals.

Compared with the No-Action Alternative, Alternative 1 and Alternative 2 would improve the water quality and habitats within Icelandic State Park.

5.3.2 HABITAT – GENERAL

The Direct and Indirect Zones are within the tallgrass prairie habitat. Historic plant communities included tallgrass prairie, eastern drift plains mixed grass prairie, tame grassland, upland forest, riparian zones (including riparian fringe vegetation and rivers and streams habitat), and wetlands and lake habitats.

Current land use has converted much of these historical vegetation communities to cultivated agriculture. Some upland forest, riparian forest, and wetland areas remain. Species found within the area are described in Section 3.3.2. Natural habitats, other than those listed as designated sites outside of the Tongue River riparian corridor in the Direct and Indirect Zones, are fragmented and unlikely to support dense or diverse populations of wildlife or vegetation.

While the project covers areas that are included in the range of the threatened northern long-eared bat (*Myotis septentrionalis*) and the endangered whooping crane (*Grus americana*), there are no critical habitats located within either the Direct or Indirect Zones.

5.3.2.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, channel incision would continue to move upstream, the channel would continue to widen until it can begin to form an inset floodplain at the bankfull elevation, and erosion would continue to increase. In the process, much of the high quality forested riparian habitat both within the project reach and upstream would be lost. Likewise, landslides on the south slope would cause loss of mature hardwood forests. The old hayfields now in permanent USFWS easements would remain in poor habitat conditions, consisting largely of smooth brome grass with a heavy infestation of common tansy as described in Appendix D-7. Erosion along this stretch of the Tongue River would continue to increase which would cause further aggravation of the issues outlined in the Purpose and Need, which include loss of forests and riparian areas within the Direct Zone and upstream towards Senator Young Dam. The continued loss of these areas will result in a narrowed and interrupted riparian corridor, subsequently negatively affecting plant and animal populations and biodiversity resilience in the area. Future pressure from changing climatic conditions and subsequent changes in precipitation patterns, in addition to forest pest infestations, land use changes that could result in conversion of perennial vegetation areas to annual crops, drain tile installation, and ditching, could result in frequency and magnitude of flood damages to continue their upward trend which will only exacerbate the loss of habitat area and function.

5.3.2.2 ALTERNATIVE 1

5.3.2.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The Tongue River, within the Direct Zone, experiences significant channel instability due to channel incision and widening. The Preferred Alternative aims to increase channel stability, and the addition of two excavation areas will increase flood storage. Construction activities within the Direct Zone will cause temporary disturbances to some vegetation communities and may temporarily disrupt some habitats (Appendix D-4). Native seeding plans will rehabilitate and expand native prairie and riparian habitats. Additionally, the project will result in stabilized riparian areas, increased wetland areas, and rehabilitated native grasslands within the Direct Zone. These areas can provide valuable, sustained habitat for organisms within the Direct Zone. Ecosystem services that will improve include fresh water, carbon storage, water regulation, water quality, erosion control, biological control, pollination, and a variety of supporting services.

Compared to the No-Action Alternative, Alternative 1 will result in increased quantity and quality of various habitats.

5.3.2.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Reductions in peak flows and subsequent decreased erosion in the river will enable the riparian corridor to regrow where allowed by adjacent landowners, and thus increase soil stabilization. The quantity and quality of the riparian habitats would thus increase. Other habitats, such as grasslands and upland deciduous

forest, will not be affected much by the flood impact improvements. Wetland and lake habitats may experience fewer flood events and less inundation.

Once the project is completed, the habitats associated with the river will improve compared with the No-Action Alternative.

5.3.2.3 ALTERNATIVE 2

5.3.2.3.1 DIRECT ZONE OF POTENTIAL IMPACT

The Tongue River, within the Direct Zone, experiences significant channel instability due to channel incision and widening. The Preferred Alternative aims to increase channel stability, and the addition of two excavation pools will increase flood storage. Construction activities within the Direct Zone will cause temporary disturbances to some vegetation communities and may temporarily disrupt some habitats (Appendix D-4). Native seeding plans will rehabilitate and expand native prairie and riparian habitats. Additionally, the project will result in stabilized riparian areas, increased wetland areas, and rehabilitated native grasslands within the Direct Zone. These areas can provide valuable, sustained habitat for organisms within the Direct Zone. Ecosystem services that will improve include fresh water, carbon storage, water regulation, water quality, erosion control, biological control, pollination, and a variety of supporting services.

Compared to the No-Action Alternative, Alternative 1 will result in increased quantity and quality of various habitats.

5.3.2.3.2 INDIRECT ZONE OF POTENTIAL IMPACT

Reductions in peak flows and subsequent decreased erosion in the river will enable the riparian corridor to regrow where allowed by adjacent landowners, and thus increase soil stabilization. The quantity and quality of the riparian habitats would thus increase. Other habitats, such as grasslands and upland deciduous forest, will not be affected much by the flood impact improvements. Wetland and lake habitats may experience fewer flood events and less inundation.

Once the project is completed, the habitats associated with the river will improve compared with the No-Action Alternative.

5.3.3 RIPARIAN ZONE

Riparian areas are zones of vegetation that populate land at the interface between a watercourse and land surface. The health and stability of riparian areas are important and directly related to the vegetation, soil types, and influences from adjacent waterbodies within the watershed. Ecosystem services provided by riparian vegetation include soil stabilization (root systems), a decrease in water velocity, an uptake of excess nutrients in the water, water purification through root-microbial metabolism, metal sequestration in the soil (oxidation-reduction mechanisms), biodiversity in this complex habitat, and habitat for species of conservation concern.

Adjacent land use can have significant negative impacts on river condition. Removing vegetation through cultivation or tree/shrub removal results in riverbank instability, erosion, and sediment transport downstream. Once this process begins, it causes a vicious cycle because establishment of new plants is prevented by continued erosion.

5.3.3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, riparian areas within and upstream of the project reach will continue to erode due channel incision; downstream riparian areas are not anticipated to change. The riparian area on the north side of the project reach will continue to have a high density of non-native and invasive species and mature trees on both sides of the river will continue to be lost. These impacts will progressively move upstream as channel incision proceeds. Riparian areas would continue to be influenced by adjacent land uses, flooding, and erosion. Future pressure from changing climatic conditions and land use in the contributing watershed will exacerbate the flooding and erosion issues.

5.3.3.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.3.3.2.1 DIRECT ZONE OF POTENTIAL IMPACT

Currently, the area has some susceptible riparian forest along the river on the western half of the Direct Zone (Appendix B-2). Near the center of the area and also along the eastern half, much of the historical riparian forest has been cleared for cultivation, some of which has since become tame grassland.

Temporary negative impacts of construction (levee removal, reconnection of oxbows, restoration of some meanders) and equipment access will result in removal or damage to some riparian vegetation. Fill may cover over some vegetation growing in the riverbed. Once construction is completed, the hydrology of the floodplain will be rehabilitated, and the current riparian zone will expand to more of a natural historical extent. The project plans include native grass seeding (approximately 38.6 acres, Appendix D-4) and tree planting to establish a 300-foot riparian buffer (approximately 16.6 acres) in this zone. Other areas within the Direct Zone and outside the riparian zone include USFWS easements that may be managed for ecological integrity, some private land that will likely remain as hayfields, and other private land that will be sprayed and replanted with native grassland species.

Once hydrology and vegetation are re-established, Indirect effects of the project will include increased inundation frequency and replenishment of nutrients to the floodplain. This would continue to provide hydrology for riparian species and subsequently enrich the soil. Successional ecosystem development from initial plantings would enable the riparian zone to become a naturalized, if not returning to historical, plant community. Improved/resumed ecosystem services would be associated with this project, including increased soil stabilization via developed root systems, restored canopy cover, vegetation that will slow flow velocity during floods, nutrient uptake, habitat support for increased biodiversity, and climate change resiliency.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will result in significant increases in channel and bank condition, increased riparian habitat quantity and quality, and improvements in the associated ecosystem services and to adjacent land.

5.3.3.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

In the project watershed, decreased peak flows would reduce erosion of the river channel. This may enable riparian vegetation to become better established (or reestablished where allowed by landowners) and thus support increased bank stability. This would, in turn, provide a measure of reduced sediment and nutrient loading to Renwick Dam, in addition to the ecosystem services provided by riparian habitat.

Once the project is completed, the quantity and quality of riparian vegetation will improve compared with the No-Action Alternative.

5.3.4 CUMULATIVE EFFECTS

Cumulative impact analyses look 50 years into the future and consider vegetation communities and habitat resources within the planning area, particularly downstream. Present and future activities in the analysis area affecting habitats include ongoing and future flood improvement projects and any other watershed or adjacent land use changes that may also influence the drainage patterns. Natural climatic variations such as drought, flooding, and snow melt patterns would continue to affect the region's plant communities and habitat in the future. Impacts of climate change on ecosystems have the potential to alter vegetation patterns and food web interactions. Increasing pressure on food production and natural land conversion will continue to exacerbate fragmentation of habitats, and thus jeopardizing species distributions and migration during climate change disruptions.

The project would enhance a variety of habitats, increasing the potential for climate-induced migration corridors—and, thus, resiliency in the system—while supporting flood risk management. Overall, the project will benefit many habitats, in some cases changing one habitat type for another, and some of these sites will be rehabilitated to better represent historical habitats. In this way, the incremental positive impacts of the project will help defray continuing environmental degradation in the region.

5.4 PLANTS AND ANIMALS

The planning area is located in the Lake Agassiz Plain Ecological Province, Glacial Lake Agassiz Basin (USEPA 2019). The plant and animal communities are affected by the transitioning landscapes of the Northern Glaciated Plains Pembina escarpment region to the west and the Lake Agassiz Plain Sand Delta and Beach Ridge to the east (USEPA 2016). The Pembina Escarpment is one of the few forested areas in North Dakota. The planning area is dominated by riparian woodland and tame grassland habitat, some of which is enrolled in the Conservation Reserve Program (CRP). The habitats found in the planning area could include tallgrass prairie; tame grassland; upland deciduous forest; rivers, streams, riparian; and wetlands and lakes. There is a large variety of animal and plant groups supported by the varied habitats (see Section 3.4). Much of the native/natural cover that supports the plant and animal species has been altered by development for cultivated agricultural production.

5.4.1 PLANTS AND ANIMALS – GENERAL

Five habitat types were documented during the field survey Over 60% of the habitat types in the planning area consisted of tame grassland and was dominated by non-native smooth bromegrass and common tansy (Appendix D-7). Other tame grass areas are enrolled the USDA Conservation Reserve Program (CRP); brome and tansy are present in the CRP as well; however more desirable wheatgrasses and alfalfa comprise a greater fraction. The CRP acres are hayed in a managed rotation as the program allows. Based on LiDAR data and aerial photography, these areas would have had native riparian woodland vegetation prior to settlement. The upland forests are located on the north and south margins of the project area. The upland forest community is predominantly native and contains the most desirable timber species such as bur oak and paper birch. There has been some limited harvesting of mature trees for timber in this habitat type. The riparian forest habitat is the largest woodland habitat. The species are predominately native and there are many desirable native shrubs and wildflowers such as chokecherry, violets, and wild ginger. The river/stream habitat community has been most affected by the downcutting action of the river. The unstable banks are often unvegetated with visible layering of clays and shale and little overhead canopy is present. This has led to the establishment of non-native species such as smooth bromegrass and reed canary grass, with little evidence of new woody seedlings other than boxelder maple. Northern pearl dace (NDGF Level 1 species of conservation priority) habitat has been documented upstream of Hwy 89.

5.4.1.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, T&E species may be affected, Flooding, channel incision, climatic and weather variability, and land use management practices will continue to pose concern for habitat fragmentation and potentially decrease the occurrence of T&E species that have the potential to occur within the planning area.

5.4.1.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.1.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The alternatives may affect, but are not likely to effect threatened and endangered species. There are no known critical habitats within the DIRECT ZONE (See Appendix E), Short-term impacts could include activities and noise from construction. The USFWS is a cooperating agency and they have been consulted in the planning process. The USFWS was informally consulted on the use of their programmatic biological opinion to utilize the Conditions for Implementing Conservation Practices (CICP's) for PL-566 watershed plans and they concurred with the NRCS use of these for watershed plans. The USFWS will also be formally consulted on the applicability of these Conditions for Implementing Conservation Practices (CICP's) on the conceptual design. Concerns with threatened and endangered species have been addressed in the conceptual design by requiring strict adherence to the CICP's. The CICP for the Whooping Crane requires construction to cease if Whooping Cranes are observed As of April, 2022, there are no known NLEB maternal roost trees or hibernacula in North Dakota. However, the NLEB CICP still prohibits construction from June 1st through July 31st . There are no CICP's designated for the gray wolf at this time; construction will cease and USFWS will be contacted if gray wolves are observed during construction. Long-term negative impacts to threatened and endangered species are not anticipated. The species may benefit from increased riparian zone and habitat continuity in the long-term.

Compared to the No-Action Alternative, Alternative 1 or 2 will result in increased quality and quantity of natural habitat, potentially supporting increased distribution of T&E species.

5.4.1.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Species of conservation concern have been identified in the project watershed. In Icelandic State Park, there are seven sites containing Level II and Level III species. Outside of the park, there are two sites, one along the Tongue River, that contain Level II species. There could be other sites that have not been yet identified. Reduced peak flows and decreased erosion along the river may reduce loss of habitat and of individuals of these species.

Compared with the No-Action Alternative, the project will provide enhanced protection of these species of if the plants are located in erosion-prone areas.

5.4.2 PLANTS OF STATE CONSERVATION PRIORITY

The North Dakota Natural Heritage Program has assembled a list of plants of concern (North Dakota Natural Heritage Program 2013). Thirteen species are listed as Level I conservation priority. These species are defined as those with low or declining populations and thus vulnerable to extinction. In Level II there are 64 species, and in Level III there are 33 species. No plant species of state conservation priority were identified in the biological inventory, however there may have been species not yet emerged, or species not sufficiently identified to species type.

5.4.2.1 NO-ACTION ALTERNATIVE

Under the No-Action alternative, there would be no direct changes to existing conditions. Any species occupying the riparian corridor may experience ongoing disturbances as the river channel widens and as banks are incised and down cut over time. Downstream areas will continue to experience flood events, and current land use management practices would continue across the planning area, which can pose a concern for habitat fragmentation and negatively affect plant and animal populations and resilience in the area.

5.4.2.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.2.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are no sites of known conservation priority plant species identified in the project area, but there could be potential habitat for some of these species. The biological inventory showed tame grass areas with invasive noxious plants, however many desirable riparian species were present in the understory such as wild ginger and anemones. (see Appendix D-7). No fens were identified. The proposed construction project limits disturbance to riparian forest vegetation, to the minimum necessary for levee removal and construction access.

Compared to the No-Action Alternative, Alternative 1 or 2 could result in protection or improvement of habitats supporting these species.

5.4.2.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Species of conservation concern have been identified in the project watershed. In Icelandic State Park, there are seven sites containing Level II and Level III species. Outside of the park, there are two sites with Level II species, and one of these sites is located along the Tongue River. There could be other sites that have not been yet identified. Reduced peak flows and decreased erosion along the river may reduce loss of habitat and of individuals of these species.

Compared with the No-Action Alternative, Alternative 1 or 2 would provide enhanced protection of these species if the plants are located in erosion-prone areas.

5.4.3 ANIMALS OF STATE CONSERVATION PRIORITY

State designated species of conservation priority are included in the state wildlife action plan (Dyke et al. 2015). There are 36 Level I species, 44 Level II species, and 35 Level III species within the state. There are several Level I species that have known distribution in Pembina County, and these include a species of fish, bat, butterfly, and toad as well as a variety of birds.

One of these Level I species is the northern pearl dace (*Margariscus margarita*), a small minnow inhabiting small headwater streams and pools of beaver dams (Appendix D-8). The Upper Tongue River has been identified as one of the last strongholds of the species in the state. Degradation of habitat due to land use practices, destruction of riparian habitat, decline in water quality, and flow regime changes due to the addition of dams are considered the causal factors in population decline (NDGF, 2021). This species is found in habitats that have clean, less turbid water; tree canopy cover; narrower and deeper channels with deep pools; and floodplain connectivity with beaver dams for additional pool habitat/temperature refugia. Beavers were once common in floodplains in this region, and their dams are still present in the area, but these structures are destroyed during normal spring flood events due to the high shear stresses within the current incised channel. The river channel upstream of the incised reach continues to provide high quality habitat for northern pearl dace, at this point in time, but is threatened as channel incision moves upstream.

5.4.3.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no direct changes to existing conditions. Any species occupying the riparian corridor may experience ongoing disturbances as the river channel widens and as banks are incised and down cut over time. As the channel deepens and widens, water will become more turbid, and silt will deposit in pools. Riparian trees will be toppled into the channel, reducing shade and increasing summer temperatures. Fish species, including the northern pearl dace, benefit significantly from the presence of beaver dams, but progression of channel incision upstream will prevent dams from persisting through spring runoff events. Erosion of the bed and banks associated with channel incision, as well as landslides from forested uplands, will create turbid water conditions and sediment in gravel spawning habitat for northern pearl dace. Downstream areas will continue to experience flood events, and current land use management practices would continue across the planning area, which can pose a concern for habitat fragmentation and a decreased presence of fish and wildlife.

5.4.3.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.3.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are no known populations of species of conservation priority located within the DIRECT ZONE, although presence of northern pearl dace is likely, but there could be suitable habitat to support these species. The biological inventory found potential Level 1 Species of Concern as unidentified species of woodpeckers and soaring hawks were observed during the May 2021 survey. Level II species observed/heard included the Western Meadowlark, Bobolink and Sharp-tailed grouse. The Western Meadowlark and Bobolink are listed as level II due to moderate levels of decline. The Sharp-tailed grouse is level II as North Dakota makes up one-third of the species' range (Appendix D-7). During monitoring surveys completed for channel stability assessments in 2015-2020, NRCS staff have consistently observed high numbers of dace (species unknown) above Sta 100+00 of the proposed project where limited channel incision has occurred to date (refer to the preliminary plan set provided in Appendix D-4, Figure 18 for project stationing).

The construction activities associated with this project will result in short-term, temporary impacts to water quality and disturbance to any fish and other animals. Locally, movements and forage patterns of mammals would be temporarily disrupted due to human presence and machinery noise. However, most mammal species are widespread and readily disperse across the landscape to other suitable habitat in response to disturbance. Completing construction and vegetation reestablishment activities in the shortest practical timeframe and in the season with the lowest river flows will minimize direct disturbance impacts to local wildlife populations. The planned construction timeframe of August 1 to November 30 will have low flows, typically less than 1 foot other than in pools, which may have up to 3 ft of water depth.

Dewatering plans for the project have been developed in consultation with USFWS, NDGF, and USACE and are detailed in the conceptual design report (Appendix D-4). The project will start with construction of the rock arch ramp on the downstream end and then proceed upstream, dewatering in 8 sections as shown on sheets 24-25 of the conceptual design drawings (Appendix D-4, Figure 18). Dewatering will involve placement of a screen with 0.38"x0.38" openings, buried into the bed and banks, placed at the upstream end of the reach to be dewatered. With that screen in place, and prior to dewatering, aquatic species will be removed with the use of kick nets and hand nets and transported out of the reach with buckets. Electroshocking will then be used to remove any remaining fish out of the reach not captured with hand methods. Sediment delivery to the river, as the result of the construction project, will be minimized through the use of construction best management practices including temporary sediment fence placement at the top of bank and biodegradable coir fabric, grass seed, large woody debris, willow cuttings, and live willow

clumps to be placed on exposed banks. Areas disturbed for construction will be tilled, harrow packed, and hydro mulched with a temporary cover of oats and rye. Permanent seeding to native perennial grasses, trees, and shrubs will occur the spring following construction.

The long-term results of the project will provide benefits to fish and wildlife from the decreased incising of Tongue River and resulting water quality improvements. This reconstruction of the stream will restore natural channel dimensions, deep pools, gravel substrate, floodplain connectivity, and riparian tree planting. It will also result in fewer landslides on upslope, erosion of bed and banks, and maintain mature forestlands in the floodplain and uplands. Water quality, both in terms of turbidity and phosphorus loads, is also anticipated to improve due to less sediment erosion within this segment of the Tongue River. Animals that use riparian and wetland habitats would benefit from expanded habitat area.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will result in long-term benefits to animals of conservation priority.

5.4.3.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

There is one site in the INDIRECT ZONE where an animal of conservation priority has been identified (Northern Pearl Dace, Level I species inventoried upstream of the project reach). There are no other sightings within the project watershed, but suitable habitat may exist. The construction activities taking place within the DIRECT ZONE may have minimal downstream effects on fish and wildlife. Water quality may be temporarily decreased during the construction period, although due to ongoing erosion there is currently high turbidity; measures will be used to minimize sediment delivery. After the construction activities have been completed and vegetation establishes, reduced bank erosion will result in higher water quality and more frequent access of the river to its floodplain, which will benefit animals within the INDIRECT ZONE. Animals that use the riparian zone will benefit from increased vegetation stability and potentially increased habitat area and continuity.

Northern Pearl Dace will benefit long-term due to protection of the existing high quality instream habitat and forested riparian zone upstream of the decraesed turbidity, coarser bed mateiral, high quantites of instream large woody debris, and a channel with natural connectively to the floopdlain where multi-year beaver dams may establish.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will result in long-term benefits to animals of conservation priority.

5.4.4 THREATENED AND ENDANGERED SPECIES

As described in Section 3.4.4, a desktop analysis was conducted to identify the potential ESA-protected species that may occur within the planning area. The northern long-eared bat (NLEB) (*Myotis Septentrionalis*), whooping crane (*Grus Americana*), and Canis lupus (gray wolf) are the T&E species that may have potential to occur within the project area. There are no designated critical habitat areas. As outlined in Appendix D-7, the field biological inventory conducted by NRCS noted that maternity/rooting habitat for northern long-eared bat is present in the project area.

5.4.4.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there is expected to be very little effect to T&E species due to remaining river corridor and forest resources in the region and range of species listed. Flooding, climatic and weather variability, and land use management practices would continue across the planning area, which would

continue to pose concern for habitat fragmentation and potentially decrease the occurrence of T&E species that have the potential to occur within the planning area.

5.4.4.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.4.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are no known critical habitats within the DIRECT ZONE, but there is potential for these species to occur. Short-term impacts could include activities and noise from construction. The USFWS is a cooperating agency and they have been consulted in the planning process. . Consultation with USFWS following the publishing of the Draft Plan/EA provided a recommendation to run the most recent online planning tool – Information for Planning and Consultation (IPaC). The IPaC was consulted on November 10, 2022 for the direct zone of the project. The key result found the action was consistent with the USFWS January 5, 2016 Programmatic Biological Opinion and found the action "May Effect" the NLEB. USFWS recommends IPaC be visited at regular intervals (every 90 days) and include the acres of tree removal (2.5-acre estimate) to stay current with NLEB status and protocols.

The construction contract will follow the recommendations of the USFWS provided under consultation. Additionally, the construction contract will adhere to the Conditions for Implementing Conservation Practices (CICP's). The CICP for the Whooping Crane requires construction to cease if Whooping Cranes are observed As of April, 2022, there are no known NLEB maternal roost trees or hibernacula in North Dakota. However, the CICP still prohibits construction from June 1st through July 31st , therefore the construction project will take place August 1 to November 30. There are no CICP's designated for the gray wolf at this time, however construction will cease and USFWS will be contacted if gray wolves are observed during construction. Long-term negative impacts to threatened and endangered species are not anticipated. The species may benefit from increased riparian zone and habitat continuity in the long-term.

Compared to the No-Action Alternative, Alternative 1 or 2 will result in increased quality and quantity of natural habitat, potentially supporting increased distribution of T&E species.

5.4.4.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The USFWS via the IPaC program indicates the potential presence of the same threatened and endangered species as listed above. Habitat is fragmented, and the number of trees ideal for roosting bats have declined over the decades due to various land use practices. During construction there will be no tree removal or disturbance of habitats (roosting trees or hibernacula) in the INDIRECT ZONE. If Whooping Cranes are observed in the INDIRECT ZONE, construction will cease as required by the CICP. There may be temporary changes to water quality (i.e., increased sediment due to work taking place within the stream). There are no other anticipated impacts that may affect threatened or endangered species during the construction period. Long-term effects of the project will include improved water quality, reduced flooding, and increased riparian zone and wetland areas.

Once the project is completed, the occurrence of T&E species may be similar to slightly higher than the No-Action Alternative.

5.4.5 MIGRATORY BIRDS

The project area is part of the Prairie Pothole Region and is located within the Central Flyway for migratory birds. These geographic regions or zones have historically provided the natural environments and habitats

for resting grounds during spring and fall migrations as well as breeding and nesting grounds throughout the summer season.

5.4.5.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, barring any significant changes in habitat areas, there would be no change in the bird occurrence in the planning area. However, continued loss of forest areas to river erosion and associated upslope landslides or increasing sediment and nutrient loading to Renwick Dam reservoir could cause increasingly degraded habitat for migratory waterfowl and other birds.

5.4.5.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.5.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The project plans include new wetland areas, restored river channel with increased length, and replanted native grasslands and riparian tree species. Indirect effects include a redeveloped larger riparian zone. Temporary disturbances from construction activities may displace some birds, but they may have the ability to move out of the area unless they are nesting. Long-term impacts to birds are expected to be positive—the project will increase the quantity and quality of suitable habitats.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will result in beneficial outcomes for migratory birds.

5.4.5.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The Jay V. Wessels WMA and Icelandic State Park are located at the eastern portion of the Indirect Zone. The commonly identified bird species in the Jay V. Wessels WMA includes the hairy woodpecker, northern shrike, blue jay, American crow, common raven, black-capped chickadee, white-breasted nuthatch, barn swallow, red crossbill, and wood duck (Cornell Lab of Ornithology 2020b). The state park is home to a wide variety of bird species, and more than 150 species have been identified in the last 10 years (Cornell Lab of Ornithology 2020b). Among the most sighted are the Canada goose, dark-eyed junco, red-winged blackbird, sandhill crane, Forester's tern, Franklin's gull, red-eyed vireo, purple martin, cliff swallow, and yellow-rumped warbler.

There will be no adverse effects to migratory birds within the INDIRECT ZONE. Completion of the project will result in improved water quality in Lake Renwick, which will thus improve the habitat for migratory birds that depend on wetland or lake ecosystems.

5.4.6 UNDESIREABLE SPECIES

Undesirable species are those that can disrupt the natural equilibrium of plant and animal ecosystems and can include non-native species (plants, animals), invasive species (plants, animals), listed noxious weeds, and pathogens. Such species present in North Dakota and Cavalier and Pembina counties are detailed in Section 3.4.6 and in the project area in Appendix D-7.

5.4.6.1 NO-ACTION ALTERNATIVE

The No-Action alternative would result in increasing potential for undesirable species to become established in erosional areas where native plants have not stabilized the soil and formed populations with sufficient density to outcompete weedy species. In addition, the existing undesirable plan species within the floodplain in the Direct Zone are likely to remain in place.

5.4.6.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.4.6.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are numerous undesirable species in the Direct Area currently, as outlined in Appendix D-7 including Biennial Wormwood, Canadian thistle, Common Tansy, Leafy Spurge, Common Milkweed and Musk Thistle. These were most prevalent in the tame grass areas, although common tansy was found in all the habitat types. Revegetation plans for the project within these tame grass areas, detailed in Appendix D-4, include mowing and then spraying with a broad-spectrum systematic herbicide. After construction, all areas will be disked, harrow-packed, and seeded to a temporary cover of oats. The following spring, the floodplain excavation sites will be seeded to a native grass/forb mixture tolerant of wet conditions including prairie cordgrass, switchgrass, western wheatgrass, and Canada milkvetch. Likewise, in the spring following construction herbaceous vegetation areas (Planting Zone 3, Appendix D-4) will be seeded to a diverse mixture of native grasses and forbs designed to benefit wildlife and pollinators, including green needle grass, western wheatgrass, big bluestem, little bluestem, switchgrass, American vetch, and purple prairie clover. One mechanical weed control treatment will be performed late in the summer following establishment.

Construction specifications for the project will outline that equipment be properly cleaned before and after use, to ensure it does not transport undesirable species.

Once the native species have become established, the abundance of non-native species will be lower than before the project. As for pathogens, they may be present in the area, but increased biodiversity provides resilience of habitats to emergence of new pathogens. Also, an established and healthy ecosystem restricts the foothold and spread of non-native species.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will increase the quantity and quality (native abundance) of the plant communities.

5.4.6.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Disturbances from overland flooding often enable opportunistic non-native species to become established due to destruction of the natural vegetation. This project will likely reduce disturbances from overland flooding and subsequently reduce establishment of non-native species in some areas. Much of the area targeted for reduced flooding, however, appears to be cultivated land that is already prone to non-native species spread.

Once the project is completed, the incidence of new spread of non-native plant species may be slightly lower than the No-Action Alternative. Non-native animal species and pathogens will likely not be different.

5.4.7 CUMULATIVE EFFECTS

Cumulative effects on plants and animals should take into consideration the current and future local and regional impacts of various land use and climatic conditions. Continued conversion of native wetlands, prairie, and other natural habitats to agricultural or other uses greatly decreases the long-term presence, vitality, and diversity of vulnerable species (e.g., pollinators, birds, plant species with very specific habitat requirements). Climatic variations, drought, flooding, and other natural environmental events would continue to affect the region's vegetation communities and habitat in the future, potentially making conditions for the spread of invasive species more favorable. Species with declining populations or those that are vulnerable to effects of climate change are less resilient to changes or necessary adaptations. The

project will result in an increase in suitable habitat for species in addition to reduced impacts to these habitats from increasing flood events. This project will also reduce the disturbances that often allow invasive species to become established in some areas where vegetation is impacted by recurring overland flooding.

5.5 HUMAN ENVIRONMENT

5.5.1 LAND USE

Land use in the Direct and Indirect Zones consists generally of agriculture (cultivated and pasture), forested areas (upland deciduous and riparian), and some wetland areas and rural residential properties. Most of the land area in the project area and the watershed downstream to Renwick Dam is used for cultivation (53 %), while another 12 % is used for hay and grazing.

5.5.1.1 NO-ACTION ALTERNATIVE

No land use changes are anticipated under the No-Action Alternative. There would be continued flood damage and continued erosion of the Tongue River. Land use most affected within the INDIRECT ZONE will be agricultural areas within the floodplain of the Tongue River. Inundation of crop land leads to reduced yields and lost income for the local community. Typical crops within the area include soybeans, wheat, canola, hay, corn, dry beans, and alfalfa (Appendix C-19). Currently, the 25-year flood extent in the project area covers 28.6 acres, and the 4-day cropland flood inundation in the watershed upstream of Renwick Dam is currently calculated to be 712 acres during a 25-year flood event.

5.5.1.2 ALTERNATIVE 1 OR ALTENATIVE 2

5.5.1.2.1 DIRECT ZONE OF POTENTIAL IMPACT

Land use in the DIRECT ZONE was noted during the both the project wetland delineation and is forested with some agricultural areas (cultivated and hay/pasture) and a few wetland areas (Appendix C-18). Lands within the DIRECT ZONE that will have floodplain connectivity restored through the project and will therefore for experience more frequent (pre-incision conditions) flooding are forestlands, old hayfields now managed for wildlife habitat (the majority of which enrolled in USFWS perpetual conservation easements), and approximately 10 acres of hayfield (Planting Zone 4, Appendix D-4) on the north side of the river immediately upstream of the proposed arch ramp. While the hayfield will flood more frequently, particularly during spring runoff, production is likely to be restored to pre-incision rate with the combination of a raised water table in summer and increased frequency of flood events that provide nutrient and sediment resupply to the soils. The floodplain areas managed for wildlife habitat through USFWS conservation easements will benefit from conversion of non-native smooth bromegrass with a heavy infestation of common tansy to a mix of native herbaceous species, shrubs, and trees. Likewise, the two areas being excavated to generate fill for the project will provide topographic diversity that will benefit wildlife.

Compared to the No-Action Alternative, Alternative 1 will result in some land use changes from grassland to riparian forest or wetland. Other land uses, such as hay production, will benefit.

5.5.1.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Land use within the INDIRECT ZONE consists mainly of cultivated and hay/pasture agriculture, wetlands, and forested areas (Appendix C-18). These areas will benefit from reduced flooding, particularly in the south part of the Indirect Zone. Refer to Table 5 in Appendix D-8 for summary information on total and cropland

inundation for Alternative 1 and Alternative 2 when compared to the No-Action Alternative. For Alternative 1, the 4-day cropland flood inundation within the watershed upstream of Renwick Dam is estimated to be 481 acres during a 25-year flood event. For Alternative 2, the 4-day cropland flood inundation within the watershed upstream of Renwick Dam is estimated to be 523 acres during a 25-year flood event. Additional detail on the economic merits of Alternative 1 over Alternative 2 are provided in Appendix D-5.

Once the project is completed, the land used for cultivated crops will benefit compared to the No-Action Alternative due to flood reduction. The current land use is expected to not change with the project.

5.5.2 ENVIRONMENTAL JUSTICE AND CIVIL RIGHTS

Demographic statistics are provided in Section 3.5. Executive Order (EO) 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minority and low-income populations and communities. While populations within the AOI do not meet minority population thresholds, populations from nearby communities may recreate at Renwick Dam. The American Indian population at Walhalla (12%) was compared with the reference community of the state of North Dakota (5.5%). Both the 50% Analysis and Meaningfully Greater analysis was conducted to determine if the America Indian population is considered a significant minority population. Using a threshold of 10%, the Native American population at Walhalla does not meet the 50% analysis but *is* meaningfully greater than the reference community. Therefore recreational usage of Renwick Reservoir/Icelandic State Park for American Indian populations was considered for all alternatives.

5.5.2.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, there would be no reduction in flooding impacts to rural and agricultural communities. Flooding events would continue to result in issues within the planning area. Future pressure from continuing channel incision, climate-related precipitation changes, and land use practices (e.g., continued drainage of unprotected pothole wetlands, expanded ditch systems) would exacerbate the downstream water quality and quantity problems. The recreational value of Renwick Reservoir would continue to decline as it fills with sediment and algal blooms increase in frequency, reducing the quality of experience for visitors as well as the economic benefits tourism brings to the local economy.

5.5.2.2 ALTERNATIVE 1 OR ALTERNATIVE 2

Decline in the recreational value of Renwick Reservoir would be avoided, to the extent possible, by preventing channel incision and related erosion to continue unabated. In addition, both downstream crop fields and the hayfield adjacent to the project will benefit in terms of generating income and goods. Impacts to all human populations from these alternatives are positive.

5.5.2.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The DIRECT ZONE does not have elevated levels of minority and low-income populations relative to neighboring counties or the state. Neither Alternative 1 nor Alternative 2 are anticipated to cause a negative impact to any human populations, including American Indian populations.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 would have no effect on social justice and civil rights.

5.5.2.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The INDIRECT ZONE does not have elevated levels of minority and low-income populations relative to neighboring counties or the state. However, American Indian populations from nearby communities may recreate in the Indirect Zone. Neither Alternative 1 nor Alternative 2 are anticipated to cause a negative impact to any human populations, including American Indian populations.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 would have no effect on social justice and civil rights.

5.5.3 CULTURAL RESOURCES AND HISTORIC PROPERTIES

In compliance with federal law (54USC§3061) regulation (36CFR§800), and NRCS policy (Title 401 Part 601) the NRCS consulted with the State of North Dakota and federally recognized American Indian tribes with ancestral ties to the APE throughout the planning process so as to actively seek, discuss, and consider the views of the stakeholders. Appendix A provides copies of all correspondence with the State Historical Preservation Office and sovereign Native American Bands, Tribes and Nations that were requested to participate in the planning process and consultation. On November 5, 2018, ND Cultural Resource Specialist, Chuck Carrig sent a formal NRCS consultation letter to the 24 Tribes and SHPO. There were no responses from the tribes.

The Class I literature review was conducted by NRCS in 2020. The Class III field investigation was conducted by NRCS in 2020 and 2021 and the report completed in May 2021. No cultural resources nor properties eligible for the National Register of Historic Places (NRHP) were discovered in the APE, therefore a finding of “No Historic Properties Affected” was recommended.

Thirty-one THPO’s and SHPO were invited to a planning update meeting to review planning alternatives held on April 7, 2021. No input or responses were received from the THPO’s or SHPO’s during or following this meeting. Tribal leaders will again be formally consulted on the Draft Plan/EA and all comments will be addressed before the plan becomes final.

In fall of 2020, an NRCS employee discovered what appeared to be a fossil embedded in a riverbank. Due to the winter weather conditions, the NRCS Sate Cultural Resources Specialist (SCRS) was unable to visit the site until 7 April 2021. NRCS began consultation with the North Dakota Geological Survey Senior Paleontologist Dr. Clint Boyd. On 13 May, 2021; no response from Dr. Boyd’s was received, therefore in accordance with 36CFR800.4(d)(i) the lack of response is interpreted as no objection and, regarding the possible paleontological resource the “*…agency’s official’s responsibilities under section 106 are fulfilled.”* Dr. Boyd later confirmed verbally to the NRCS State Engineer that he was uninterested in the specimen due to its relatively common occurrence and not concerned with the fact that fill to be placed with the project would make future excavation of it more difficult.

5.5.3.1 NO-ACTION ALTERNATIVE

There would be no protection or reduction in flood impacts to the existing historic and cultural resources under the No-Action Alternative and no benefits from flood risk reduction management activities. Continued channel widening would further expose what is presumed to be a fossil in the riverbank.

5.5.3.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.5.3.2.1 DIRECT ZONE OF POTENTIAL IMPACT

Excavation associated with the project is limited to old levee fill removal - which will not have intact paleontological resources given it was constructed between 1941 and 1962 (see Appendix D-1), and the two floodplain excavations shown on the plans in Appendix D-4, which could have potential for additional cultural or paleontological discovery.

During the final design phase of the project, an inadvertent discovery plan for paleontological resources, which could be uncovered during floodplain excavation, will be developed and incorporated into the NRCS inspection plan and construction contract specifications. The construction inspection plan and contract will also specify that if human remains, or skeletal elements reasonably suspected to be human, are discovered during construction, all work shall cease, and the discovery site secured. In that event, the inspection plan and contract will state that local law enforcement shall be notified, and the discovery site treated as an active crime scene (statutes NDCC 23-06-27 and NDAC 40-02-03) until declared otherwise by competent authority. In addition, the inspection plan and contract will state that the NRCS State Conservationist, State Historic Preservation Officer, NRCS State Engineer, and Tribal Historic Preservation Officer(s), who have been part of the consultation process, shall be notified of the discovery.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will show no effect.

5.5.3.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

The Class III cultural survey showed four historic structures/features. One feature is a bridge, and two other features are described in the report as “RR, road, Hwy and trail features.” The fourth feature, the Hallson Lutheran Church, was located in an area that is predicted to receive some flood reduction benefit once the project is complete (south portion of the INDIRECT ZONE). However, evidence from aerial imagery indicates the church is no longer at that site.

Compared to the No-Action Alternative, Alternative 1 and Alternative 2 will show no effect.

5.5.4 SOCIAL ISSUES AND PUBLIC HEALTH AND SAFETY

The area of potential effect is rural with low density development with employment predominantly services-related (e.g., transportation & public utilities; wholesale and retail trade; finance, insurance, real estate, and services). Residents in the planning region also hold non-services related employment, including farming; agricultural services, forestry, fishing, and other; construction; and manufacturing. Refer to Section 3.5.4 for socioeconomic statistics within the planning area. Highway 89 provides the only paved access to the Cavalier Space Force Station and bisects the proposed project. Upstream of the project are public road bridges on 127th Ave NE and 92nd Street NE, and downstream of the project are multiple private and public bridges. Appendix D-8, Figure 21 provides a location drawing of Tongue River bridges within the vicinity of the project. No habitable structures are located within the 100-year floodplain per either FEMA mapping or the hydraulic modeling generated for the project from Senator Young Dam to the downstream most end of the proposed project.

5.5.4.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, continued erosion of the Tongue River channel will generate sediment infill at unplanned for rates within Renwick Reservoir. Downstream flood control benefits will steadily

decline if the proposed project is not constructed; by 2113, they would be reduced by an estimated 33% which will create a public safety risk. Continued phosphorus loading into the reservoir and shallow water depths (generating higher summer water temperatures) will generate more frequent incidences of harmful algal blooms endangering public health during water-based recreation. The Highway 89 bridge piers will continue to be subjected to scour and as channel incision progresses upstream

5.5.4.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.5.4.2.1 DIRECT ZONE OF POTENTIAL IMPACT

The DIRECT ZONE is located in an area with low population density and no habitable structures are located in the floodplain, however Highway 89 bisects the project and there are two public road bridge crossings over the river. From a s The channel restoration within the DIRECT ZONE will provide stabilization of the banks. The floodplain excavations that provide fill for the project, and in the case of Alternative 1 generate additional flood retention to benefit downstream properties, are being placed on the limited non-forested floodplain area not within conservation easements. Two excavation areas are designed into the project to ensure that trucks do not need to cross Highway 89, thereby avoiding a public safety concern. The three landowners impacted by the project have been consulted for input and advice throughout planning and will continue to be during the final design phase. Long term public safety on Highway 89 is maintained post construction given that the bridge was originally designed for the pre-incised channel elevation; at the 100-year flood the bottom of the Highway 89 bridge girders (elevation 1133.8 ft) will have 8.7 ft of clearance from the post-project modeled water surface (elevation 1125.4 ft). The grade control measures to be installed by the project prevent further scour of the Highway 89 bridge piers, protecting public safety. At the next upstream bridge, at 127th Ave NE, both the existing and proposed water surface elevations remain identical at 1153.8 ft. Given the short span of this bridge, the proposed project protects it from failure if channel incision and widening were allowed to continue upstream. See Appendix D-8, Figures 21-22 for a map of bridge locations and a projection of future channel changes at the 127th Ave NE bridge if the project is not completed. Note that the This alternative would have no significant short-term or long-term social and human safety impacts within the DIRECT ZONE.

Compared to the No-Action Alternative, Alternative 1or 2 will result in no change in social issues or public health and safety.

5.5.4.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

With the project, Renwick Dam will experience delayed reservoir infilling and increased duration of flood protection to Cavalier, improved water quality and less frequent toxic HABs, and reduce flood damages between the project and Renwick Dam.

Compared to the No-Action Alternative, Alternative 1 or 2 will result in decreased social issues and improved public health and safety.

5.5.5 RECREATION RESOURCES

Renwick Dam / Icelandic State Park is the major recreational resource in the watershed, as described in Section 3.5.5 and Appendix D-5. Most of the recreation is associated with the reservoir and includes swimming, boating, tubing, jet skiing, and fishing during both summer and winter. The surface area of the reservoir has decreased over time from an estimated 220 acres in 1962 to 154 acres in 2020, due to sediment deposition. The reservoir is also known to experience algal blooms (including HABs), resulting

from nutrient loading and hypereutrophic conditions, which reduce the recreation use of the reservoir (Appendix D-8).

5.5.5.1 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, the trend of infilling and phosphorus loading will continue in the reservoir, resulting in more and more limited recreation use. Sediment accumulation in Lake Renwick is expected to continue at a rate of 55,000 tons per year with associated phosphorus delivery to the lake of 84,000 lbs/year. As a result the sediment pool would be full by 2026 and the permanent pool would be 24% full by 2040, 40% full by 2050, and 100% full by 2086 if the channel incision is allowed to progress upstream. Between 2026 and 2050 the sediment depositional patten would result in the lake front migrating away from the swimming beach and boat launch, limiting recreational access. As water depth becomes increasingly shallow, fish species will be limited to those that can tolerate, warm, low dissolved oxygen content water. After 2030, it is expected that a fishery could not be maintained and by 2040 sediment depths in the reservoir would preclude most boating. Hypereutrophic conditions will cause more frequent algal blooms as well as HAB incidences. Continued sediment loading and infilling of the reservoir will gradually decrease the navigable reservoir area, warm the water in the summer, have a lower proportion of frozen to unfrozen layers in the winter, and cause low dissolved oxygen conditions that will eventually cause decline, then loss of the fish populations, and eventually a transition to a marsh community. Appendix D-5 Economics Evaluation Technical Memorandum and Appendix D-8 Project Benefits Report provide additional details and supporting analyses.

5.5.5.2 ALTERNATIVE 1 OR ALTERNATIVE 2

5.5.5.2.1 DIRECT ZONE OF POTENTIAL IMPACT

There are no recreation resources in the DIRECT ZONE.

5.5.5.2.2 INDIRECT ZONE OF POTENTIAL IMPACT

Historic and expected future recreation conditions are outlined in Appendix D-5 Economics Evaluation Technical Memorandum and Appendix D-8 Project Benefits Report. With the project, sediment loading to Renwick Dam will be significantly reduced, thus extending the duration in which recreation is available to at least 2070. Sediment accumulation in Lake Renwick is projected to be 7,500 tons/yr, a decrease of 47,500 lbs/year, with construction of either Alternative 1 or 2. Associated phosphorus delivery would drop to 14,000 lbs/yr, a reduction of 70,000 lbs/year. Large quantities of phosphorus are already present within sediments deposited in the lake at this point, but the project will reduce future accumulations. As compared to the No Action alternative, implementation of Alternative 1 or 2 will maintain deeper water, cooler summer temperatures, more productive fishery, and have a lower frequency of algal blooms. This would benefit the recreation value of the reservoir.

5.5.6 CUMULATIVE EFFECTS

Farming communities and rural landowners who reside within the Red River Basin benefit from the fertile lands within this basin but face regular challenges with managing agricultural productivity given climatic and weather variability. Cumulatively, the project will contribute to establishing project components that provide multipurpose benefits throughout the basin. Given the maturity of development of communities within the basin, projects that offer both flood resiliency and environmental stewardship benefits (e.g., water quality, supports habitat vitality, and natural resources conservation) will facilitate a more sustainable basin long

into the future. The project will, in conjunction with other flood mitigation projects throughout the Red River Basin, help address water quantity and water quality concerns throughout the Red River Basin.

5.6 OVERALL CUMULATIVE IMPACTS

The assessment of cumulative environmental impacts in the National Environmental Policy Act (NEPA) documents is required by the Council of Environmental Quality (CEQ) regulation (1987). This section assesses if any of the alternatives have the potential to result in cumulative impacts to relevant environmental resources when considered in combination with past, present, and reasonably foreseeable projects or conditions in the vicinity of the study area. Cumulative impacts result when the effects of an action are added to or interact with other effects in a particular place and within a particular time. It is the combination of these effects and any resulting environmental degradation that is the focus of this cumulative impact analysis.

Ongoing dam rehabilitation projects, currently in the planning stage for Senator Young Dam and Olson Dam upstream of the project reach, could impact the project reach if a “no action” alternative is selected, and the dams are not brought into conformance with current federal and state dam safety standards to reduce their risk of failure. Installation of Alternatives 1 or 2, however, would provide some mitigation for erosion within the river channel in the event of a catastrophic dam breach. Selection and implementation of a decommissioning alternative through the rehabilitation planning process would be unlikely to affect the project under either Alternative 1 or Alternative 2 in the long term. Long term positive cumulative effects on environmental conditions, as the result of this project in combination with others, are documented in Sections 5.1.3, 5.2.5, 5.3.4, 5.4.7, and 5.5.6. While the project is consistent with regional objectives related to flood damage reduction and water quality improvements, these objectives are assigned to assist the local sponsor in ensuring consideration of reasonable measures to attain such objectives. Alternative 1 and Alternative 2 provide opportunities for implementation of reasonable measures consistent with regional objectives that are developed with a multipurpose project to achieve locally desired conditions.

5.7 COMPLIANCE WITH FEDERAL, STATE, AND LOCAL LAWS

The local, state, and federal permits possibly required to implement the Preferred Alternative are summarized in Table 5-6. Additional cultural and historic properties reviews and endangered species consultation will be required before project installation. An interagency team has been involved throughout the planning process, and state and federal fish and wildlife agencies will continue to be involved in final design decisions such as how and who will conduct aquatic species netting and relocation during construction. Agency biologists may complete this work personally. The USACE has confirmed that NWP-27 will be applicable for this project. The USACE was consulted in December 2022; they recommend continued consultation on permit needs and applicability following the completed design phase. Hydraulic modeling has shown no-rise in 100-year water surface elevations upstream, including CR6 and residence on west side of road. A Floodplain Development Permit will be completed with no-rise demonstrated at locations with floodplain development. Pembina County has been a participant in the watershed planning process and has not indicated any likely issues.

Table 5-5: Compliance and Permitting Requirements

Agency	Program	Permit to be applied for
Federal		

Agency	Program	Permit to be applied for
U.S. Army Corps of Engineers	Clean Water Act, Section 404	NWP-27 notification
State		
North Dakota Department of Environmental Quality	National Pollutant Discharge Elimination System (NPDES)	North Dakota Pollutant Discharge Elimination System (NDPDES), Stormwater Construction General Permit and Stormwater Pollution Prevention Plan (SWPPP)
Local	Floodplain Permit	Floodplain Development Permit

6 CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

6.1 AGENCY CONSULTATION

Both the USACE and USFWS agreed to be Cooperating Federal Agencies for this PL-566 Planning Process. They have been active participants with both the project team and interagency team, including providing a review of the Draft Plan/EA document. The USACE provided comments requesting clarification on the erosion processes, water quality and permitting – their comments were addressed formally and incorporated into this final version of the Plan/EA to their satisfaction. The USFWS also provided written comments regarding NLEB, eagles and migratory birds. Their comments were addressed formally and incorporated into the final Plan/EA to their satisfaction. All correspondence is included in Appendix A as well as summarized in the Comment/Disposition section of Appendix A.

In compliance with federal law (54USC§3061) regulation (36CFR§800), and NRCS policy (Title 401 Part 601) the NRCS consulted with the State of North Dakota and federally recognized American Indian tribes with ancestral ties to the APE throughout the planning process so as to actively seek, discuss, and consider the views of the stakeholders. The undertaking is located within land ceded by the Red Lake and Pembina Banks of Chippewa Indians, ancestors of the Turtle Mountain Band of Chippewa Indians, and Red Lake Nations. Tribal Leaders, Tribal Historic Preservation Officers and the ND State Historic Preservation Officer were consulted throughout the process. Initially 30 tribes were invited to participate in 2016. These entities were also invited to a virtual public meeting held on 4/7/2021. Tribal leaders for 23 tribes were mailed a copy of the Draft Plan EA; these were all received by 10/27/2022. Throughout this process, one tribe (Confederated Salish and Kootenai) declined participation, and one tribe (Three Affiliated) requested to be kept informed of any discoveries made during the final phases of the project. No other responses were received by tribal governments. The ND SHPO provided comments on the Class III Cultural Resource Survey (Appendix D-9). Their comments were addressed to their satisfaction, and they concurred with NRCS's finding of "No Historic Properties Affected" (Appendix A). The ND Geological Survey office was consulted regarding the potential to impact paleontological resources, they responded with concurrence that the likely impact on these resources is low. They recommended an inadvertent discovery plan be implemented for the construction phase. NRCS will work with NDGS to develop that plan during the final design phase of this project, in 2023-24.

Many other state and local agencies have participated in the planning process, as well, and the Sponsor has secured construction funding from the North Dakota Department of Water Resources and the North Dakota Outdoor Heritage Fund for the project. See Appendix A for a full list of the agencies who participated in the planning process, their comments and comment disposition.

6.2 PROJECT TEAM COORDINATION

A project team, including Pembina County Water Resource District, NRCS, USACE, and USFWS, was established to solicit input from agencies, area residents, and local/state/federal entities. The Project Team met on two occasions—November 21, 2017, and February 27, 2018, to assist in scoping the Watershed Plan-EA. Multiple meetings of the Pembina County Water Resource District board have addressed the project since 2018. A lengthy presentation on the channel stabilization background analysis and alternative design was held on November 19, 2019, in Cavalier, ND.

6.3 PUBLIC PARTICIPATION

Two public meetings were held by the Pembina County Water Resource District to solicit input on concerns within the watershed to advance development of the purpose and need for the project (Appendix A). The first of these meetings was held on April 5, 2017, in Cavalier, ND. The meeting was hosted through a state- and locally financed planning effort prior to federal participation through NRCS. The meeting focused on soliciting input from attendees to identify resource concerns, including flood damages (agricultural and structural), water quality, soil health, wildlife and habitat, recreation, and societal concerns. Questions from the audience were addressed during the meeting, and comment forms were provided to enable additional input on observed locations of these concerns in the watershed. In total, three comment forms were returned. Comments received as a result of this meeting generally indicated a high level of concern with damages related to channel incision and flood flows within the Tongue River Watershed.

The second public meeting was held virtually on April 7, 2021. The meeting focused on the Preferred Alternative and how it would address current issues within the watershed. Input from the attendees was solicited and feedback on the Preferred Alternative was encouraged. The meeting was recorded and a link to the recording was made available online to local landowners. Various letters of support for the project were provided after the April 7th meeting. Those letters are provided in Appendix A. A final public/agency meeting was held October 18, 2022 in conjunction with the final comment period on the Watershed Plan-EA.

A final public meeting and site tour was held on October 18, 2022. This meeting was also available virtually. The meeting was advertised on the NRCS and GovDelivery websites as well as the local papers (3 times). Fifty stakeholders were invited with email or mailed invitations. Twelve stakeholders attended the meeting including landowners and representatives from local, state and federal government. Comments and responses are included in the summary in Appendix A. No comments were found to be substantive.

7 THE PREFERRED ALTERNATIVE

7.1 RATIONALE FOR SELECTION OF THE PREFERRED ALTERNATIVE

The Tongue River Watershed Plan was initiated in 2016, and therefore falls under alternative analysis procedures outlined in the *Economic and Environmental Principles and Guidelines for Water and Land Resources Implementation Studies* (P&G, 1983) and the *National Watershed Program Manual* (NWPM, 2014). In accordance with NWPM 500.42D guidance, watershed protection cost-share funds are being used in the absence of other available conservation programs "ability to reduce severe problems and meet the major land treatment needs within a reasonable timeframe". One of the landowners on the severely incising river reach did put in an application for the Environmental Quality Incentives Program in 2016, however payment limitations made that program infeasible for a project of this magnitude. The Wetland Reserve Easement Program was also investigated for potential at that time, however existing USFWS conservation easements along the north side river would preclude it's use at the site. Therefore, it was determined that either RCPP or PL-566 Watershed Planning were the only feasible alternatives; the Red River Retention Authority successfully procured funds for watershed planning in the RRB, the Pembina WRD requested funds out of that project for Tongue River.

According to P&G (Chapter 1, Section 2), federal investments in water resources should strive to maximize public benefits, with appropriate consideration of costs. NWPM 500.4(D) outlines that the recommended plan alternative for watershed protection components of water resource plans will be "the least costly, environmentally acceptable method of achieving the agreed-on level of resource protection." For projects primarily providing watershed protection benefits the economic analysis of the plan does not require the development, identification, or selection of the National Economic Development (NED) plan.

Table 4-1 of this document outlines annual monetized costs and benefits for the three alternatives under consideration, with supporting analysis documented in Appendix D-5. Appendix D-8 provides detailed valuation of environmental benefits. From a flood damage reduction standpoint alone, although Alternative 1 provides greater flood damage reduction benefits, due to the larger excavations, Alternative 2 has a higher benefit-cost ratio at 1.2 to 1.0 versus 0.04 to 1.0 for Alternative 1. In short, the cost to excavate and end haul material from the larger floodplain excavations on Alternative 1 is not warranted. Because the majority of benefits and cost for this plan result from watershed protection, a NED plan is not identified, however Alternative 2 does show an overall benefit-cost ratio of 4.0 to 1.0. Alternative 2 provides identical benefits, in both economic and environmental benefits, to Alternative 1 at a much lower cost, therefore it is the Preferred Alternative.

7.1.1 WATER QUALITY AND HABITAT ENHANCEMENTS

Implementation of the Preferred Alternative will reduce the level of erosion in the project reach, and prevent future erosion in upstream reaches, thereby reducing turbidity and phosphorus concentrations in the Tongue River upstream of Renwick Dam. Overall delivery of sediment to Renwick Dam will be reduced by the current average rate of 55,000 tons/year to the pre-incision rate of 7,500 tons/year. Maintenance of an adequately deep permanent pool at the dam will help in maintaining temperatures and dissolved oxygen concentrations at a level that can continue to support both a fishery and recreation. Phosphorus loads delivered to Renwick Dam are projected to drop from 84,000 lbs/year to 14,000 lbs per year. This may help to alleviate water turbidity and algal blooms at Renwick dam caused by excess nutrients in contributing

waters, dependent on current internal loading. This may also benefit the recreation resources of the reservoir by reducing the potential for spring fish kills and the potential for toxic algae in swimming waters.

Fish and wildlife are expected to benefit from natural aquatic and terrestrial improvements. Elements that should see major improvements over time include channel condition, bank condition, riparian area quantity and quality, canopy cover, water appearance, pools, fish habitat complexity, and aquatic invertebrate habitat and complexity. Some of these elements will improve immediately, while others will take time for riparian vegetation to mature. Most critically, existing high-quality habitat upstream of the project reach will not become impaired due to incision moving up the river channel. Specific wildlife that will benefit from the implementation of the Preferred Alternative include the northern pearl dace and beaver. For additional discussion on habitat enhancements, refer to Appendix D-8.

7.1.2 CONSISTENCY WITH REGIONAL AND INTERNATIONAL WATER MANAGEMENT PLANS

The Preferred Alternative provides an opportunity to further water quality and water quantity objectives defined for the Red River Basin. The Red River Basin is an international, multijurisdictional watershed with complex issues related to water management. This has resulted in regional water management planning efforts to better synchronize solutions within the Red River Basin. While the Preferred Alternative may provide only minor contributions towards regional and international goals, at the scale of the overall Red River Basin, it nonetheless demonstrates the commitment of the federal, state, and local entities involved in the project.

7.1.2.1 REGIONAL PLANS – WATER QUANTITY

The overall Red River Basin RCPP planning effort, of which this PL-566 watershed plan was a part of, was initiated by the Red River Retention Authority to provide contributions to the Red River Basin Commission's (RRBC) Long Term Flood Solutions (LTFS). One component of the LTFS is the Basin-Wide Flow Reduction Strategy (BFRS), which provides for peak flow and volume reduction goals within each tributary sub-watershed in the Red River Basin. Reduction goals are based on coincident peak flood timing between the tributary and the Red River. The overall goal of the BFRS is to provide for enough tributary volume reduction to reduce Red River mainstem peak flow rates by 20% on an event of similar magnitude as the 1997 flood event. The LTFS Report estimates that approximately 1.5 million acre-feet of volume reduction is still required to attain the BFRS (Red River Basin Commission, 2011). The Tongue River is a tributary to the Pembina River, which has a goal of 92,500 acre-feet of additional flood storage to attain the BRFS, as specified in the LTFS document. The Preferred Alternative provides flood storage towards the Pembina River Watershed tributary goal to attain the BFRS.

7.1.2.2 INTERNATIONAL TREATY – WATER QUALITY

Article IV of the Boundary Waters Treaty, between the United States and Canada, includes the provision that "boundary waters or waters flowing across the boundary shall not be polluted to the injury of health and property of the other". The International Joint Commission is the international board tasked to be an impartial watchdog over the boundary waters when formally requested by both governments, which took place on the Red River following a devastating flood in 1997. Phosphorus pollution at the border crossing of the Red River is of high concern, due to its contributions to eutrophication of Lake Winnipeg, and a concentration objective of 0.15 mg/L has recently been established at the international border crossing. Meeting that goal will be a significant challenge, however projects such as this one will demonstrate U.S. commitment to phosphorus reduction.

7.2 MEASURES TO BE INSTALLED

7.2.1 SITE LOCATION

The proposed channel stabilization project involves restoring natural pattern, profile, and dimension to 1.8 miles of the Tongue River starting at a location approximately 1.3 river miles downstream of the Tongue River crossing with North Dakota State Highway 89 in Section 28 of Beaulieu Township, Cavalier County, ND. In addition to channel restoration, two flood pools are to be excavated north of the Tongue River both east and west of North Dakota State Highway 89. The flood pools are used to provide storage during large flood events and to provide fill material for the channel restoration. Refer to Appendix D-4 for conceptual design drawings of the proposed construction project, for the Preferred Alternative.

7.2.2 CHANNEL MODIFICATIONS

NRCS Conservation Practices applicable to the channel modification include 582 Open Channel and 410 Grade Stabilization Structure. The conceptual design drawings and associated report are provided in Appendix D-4. The proposed 1.8-mile project will raise the elevation of the riverbed to within 3.0 feet of the natural floodplain, at the low point of the riffles, to just the capacity of the bankfull channel flow. Approximately 336,000 cubic yards (210 ac-ft) of material will be excavated from the floodplain, of which approximately 65,000 cubic yards will be placed and compacted within the river channel. Excess excavation material would be hauled to an offsite location procured by the contractor, likely to be placed as fill in one of many old gravel pits in the local area. An additional 3,000 cubic yards of fill material for the channel will come from excavation of old levees. Approximately 14,400 tons of a custom gravel mix will be imported and placed to a 2 ft thickness underlying riffles, runs, glides, and point bars to mitigate the extent to which the Pierre Shale derived gravel particles in the riverbed will degrade under construction activities. Riverbanks of the new channel will be temporarily stabilized by approximately 7,000 feet of Type 1 treatment, consisting of a ballasted large wood debris toe with overlying encapsulated soil lifts, and 9,300 feet of Type 2 treatment consisting of a brush and cobble toe with coir erosion control fabric. Long term bank protection will be provided from the over 55,000 stems of live willow and dogwood cuttings, 30 mature willow clump transplants and 500 prairie cordgrass plugs to be planted on or immediately adjacent to riverbanks.

A fish passable rock arch rapids structure on the downstream end of the project will raise the channel nearly 8 feet over a length of 180 feet. Rock arch rapids are a commonly used grade control structure in natural channel design work. The rock arch rapid design consists of a rock ramp and boulder weirs imbedded into the ramp in a parabolic pattern. The parabolic shape of the weirs helps to direct flows to the middle of the channel (which helps direct high-velocity flows away from the banks and forces flow into a hydraulic jump downstream of the rock). A buried sheet pile wall, driven down into the existing riverbed at the top of the structure, will provide an emergency scour countermeasure in the event some catastrophic event (such as an upstream dam failure) re-initiated incision. A buried rock sill constructed across the lower elevation floodplain on the north side of the river will provide flanking protection to the rock arch rapids and sheet pile wall. Additional grade control measures just downstream of the Highway 89 bridge and midway from that to the end of the project include two rock cross vanes installed below the constructed channel, with buried sheet pile walls driven into the existing riverbed. Cobble patches will be placed on the upstream end of riffles as 12 scattered locations in the channel as well, to act as minor grade control features. Upstream of the channel restoration section, two rock cross vanes and two debris collectors will be placed to elevations to encourage 1-2 foot of aggradation in 740 feet of slightly incised channel upstream. The debris collectors include driven posts, to encourage beavers to form dams, and ballasted full trees to encourage formation

of natural log jams. Sediment fence would be installed along the edges of the bankfull channel, behind bank protection treatments, and removed after the floodplain is fully revegetated.

7.2.3 OTHER MODIFICATIONS

NRCS Conservation Practices applicable to the other modifications include 378 Pond, 391 Riparian Forest Buffer, 390 Riparian Herbaceous Cover, 512 Pasture and Hayland Planting, 342 Critical Area Seeding and 484 Mulching. Excavation of existing levees and two large floodplain retention features are also included in the Preferred Alternative as outlined in Appendix D-4. Removal of levees will restore natural floodplain relief to the river and allow historic meanders cutoff by the levees to be added to the channel length, thereby restoring natural sinuosity to the reach. Topsoil from levees and floodplain excavations will be stockpiled and spread over disturbed areas at completion of the project to aid with revegetation. Both natural floodplain retention and the floodplain excavations provide flood damage reduction benefits downstream of the project reach.

Following construction completion, revegetation of the floodplain and disturbed areas will consist of 54.8 acres of a temporary cover of oats or rye applied with hydro-mulch. In the following spring the 16.6 acres to be planted as a riparian forest buffer will be drill seeded to a non-competitive grass mix, after which 5,770 bare root trees (with tree protectors) and 2,885 shrubs will be hand planted. The remaining floodplain areas, surrounded the excavations on USFWS conservation easements, will be drill seeded to native grasses including the 6:1 slopes on the excavations as far down as water elevations will allow. Disturbed areas due to construction on the downstream end of the project, currently enrolled in the CRP program, will be drill seeded to a CRP mix.

7.2.3.1 PERFORMANCE AT, AND UPSTREAM OF THE PROJECT REACH

Implementation of the Preferred Alternative will stabilize the actively eroding channel bed and riverbanks by restoring natural channel conditions and floodplain access during peak flow events. Riverbank erosion within the project reach will be reduced from an average of 6.4 cubic yards per foot per year to 0.4 cubic yards per foot per year or less. High quality instream aquatic habitat upstream of the incised reach, over approximately 5.5 miles, will be protected from loss due to incision and public investment in the two upstream bridges that would be impacted by channel incision would be avoided. Upland forest resources on 16-25 acres will not be at risk of that would be impact ed Restoring natural water elevations through the restored reach will benefit production of 21 acres of adjacent hayfields and 35 acres of floodplain managed for wildlife habitat, as well as adjacent floodplain hardwood forests.

7.2.3.2 PERFORMANCE DOWNSTREAM OF THE PROJECT REACH AND UPSTREAM OF RENWICK DAM

To analyze the flood damage reduction performance of the river channel restoration alternative from North Dakota State Highway 89 to the Renwick Dam, synthetic rainfall events were simulated and routed through the hydraulic model. Synthetic rainfall events for the Tongue River Watershed Plan are defined in the *Tongue River Watershed Plan – Existing Conditions Hydrology and Hydraulics Report* in Appendix D-2. The events include 2-year through 100-year return periods based on NOAA Atlas 14 rainfall depths with a 4-day duration. Runoff Curve Numbers were adjusted from a 24-hour Curve Number to a 4-day Curve Number based on guidance from *NEH, Part 630, Chapter 21* and were set to an average antecedent moisture condition (AMC II). The rainfall distribution used for the synthetic events was developed using a “nesting” technique described in *NEH, Part 630, Chapter 4* (NRCS, 2015).

Multiple reporting locations at geographically significant locations were used to evaluate the existing peak flows within the Tongue River Watershed and compare them to the peak flows with the Preferred Alternative in place. These locations include North Dakota state highways, township roads, and the inlet and outlet of the reservoir at Renwick Dam. The peak discharges for both the existing conditions and the Preferred Alternative at the reporting locations are shown in Appendix D-8, Table 4 for the different recurrence intervals analyzed. The inundation for the Tongue River Watershed between Senator Young Dam and Renwick Dam for both existing and proposed conditions during the 2- through 100-year events is shown in Appendix D-8, Table 5.

The proposed channel restoration reduces total inundated acres for the 2-year through the 100-year events by as much as 8 %, and cropland inundated acres are reduced by 3 % to 15 %. The highest reductions to cropland inundation occur during the 50-year event, where the cropland inundation is reduced by 15 % with the Preferred Alternative in-place. Significant reductions to cropland inundation also occur during the 10- and 25-year events. There is a slight increase in total inundation with the channel restoration alternative during the 5-year event. This is caused by the increased inundation in the floodplain adjacent to the Tongue River, where the restoration would occur. That same event shows a slight decrease in cropland inundation with the channel restoration in-place.

7.2.3.3 PERFORMANCE AT, AND DOWNSTREAM OF, RENWICK DAM

The designed sediment pool for the Renwick Dam Rehabilitation Project was planned to have capacity through 2113. That pool filled 72 % between 2003 and 2020. If channel incision and widening continue to occur, the sediment pool is projected to be full by approximately 2027, and the permanent pool will conceivably be full by 2086, at which point the flood volume storage would begin to be impacted. By the end of the design life of Renwick Dam (2113), flood control benefits downstream of the dam would be reduced by an estimated 33 %. If the Preferred Alternative were to be implemented, the reservoir would continue to fill, and the sediment pool would likely be 100 % full by 2043. However, the permanent pool would not be impacted through the design life of Renwick Dam, and the projected flood control benefits of the dam would remain unchanged. Recreation benefits at Renwick Dam have already been reduced, due to accelerated sediment and phosphorus inflow, but further degradation would be avoided. Additional information on the benefits provided by the Preferred Alternative is provided in Appendix D-8.

7.3 AVOIDANCE, MINIMIZATION, AND MITIGATION FEATURES

Impacts to existing wetlands were considered during the development of the Preferred Alternative. NRCS seeks to first avoid, then minimize, and only if needed mitigate for adverse impacts to wetlands. The bottoms of the floodplain excavations will provide 6.1 acres of new wetland habitat. The only negative impact to a wetland is a 0.03-acre wetland labeled as ID9 in Appendix 5 Figure 3, which is a slight depression at the base of the Highway 89 road fill. The wetland falls within the lateral effect distance of the planned excavation on the east side of the road. USFWS requested that the excavations be planned to not overlap their easement boundaries, if possible, which forces the excavation to be located in the middle of the old field encircled by the easement. As detailed in Appendix D-8, the project will generate a net overall increase of 6.6 acres of wetlands with functional improvement of 4.9 FCUs, as determined from the applicable riverine HGM model. One existing oxbow wetland will be expanded and an additional five restored via restoration of natural hydrologic conditions. Agency requests to avoid disturbances will be incorporated into construction specifications including the USFWS request for a migratory bird avoidance/minimization strategy and the North Dakota Geological Survey request for an inadvertent discovery plan for paleontological resources. Disturbance to mature trees on the floodplain will be

minimized as much as possible during construction. The construction contract will specify cleaning requirements for heavy equipment, including trucks hauling materials to the site, to avoid spread of invasive species. Likewise, materials sources will be required to be pre-approved to minimize potential for pests and invasive species to be imported to the site.

Design of a dewatering plan on this project was challenging, due to the high fill of Highway 89 across the valley. Consideration was given to boring a culvert below the highway fill, to allow construction of a temporary bypass channel, however the culvert cost alone would approach $500,000. The highly erodible floodplain materials generate concern that any type of flood flow would cause a massive gully to form, effectively causing the channel to braid upstream of the highway. The proposed dewatering plan therefore relies on 8 temporary in-channel dams and bypass pumps, with portable pipeline to be placed on the south side of the river, as shown on the preliminary design drawings for the project, Appendix D-4-59, drawing sheets 2, 23, and 24. Upstream of each temporary dam, a fish screen will be placed across the channel, and aquatic species will be hand collected with dip nets and seine nets and relocated prior to dewatering. Depending on decisions by agency biologists onsite during dewatering, electroshocking may also be utilized to ensure full relocation. Preliminary design computations for the dewatering system are provided in Appendix D-4-54, which is sized for the 25% probability flow between August and November, when the project would take place. Adequate fuel for a pump run time of at least 5 days will be maintained onsite, stored in double walled fuel tanks located outside of the bankfull channel. Pumps would have float activated start/stop controls given that flows during the planned construction window are typically very low; so that if a sudden rainstorm occurs in off hours the secondary pump will start up. The project would start with construction of the rock arch rapids, and then proceed upstream as described on page 24.

Construction and design of the project is following the U.S. Army Corps of Engineers Nationwide Permit 27: Aquatic Habitat Restoration Enhancement and Establishment Activities and NRCS Conservation Practice Standard 580: Open Channel. Anticipated channel construction time period is August to November, to meet the CICP for Northern Long Eared Bats. Pollution control during construction is of concern, particularly since northern pearl dace are reportedly sensitive to fine sediment. The initial flow of water into each newly constructed channel segment will generate sediment, however the fact that most of the channel will have imported gravel bed material, large woody debris, or cobble at its surface will minimize that concern. In addition, the bank protection elements will also help to minimize sediment delivery. To minimize potential for stormwater runoff to transport fine sediment to the channel, from access roads, stockpile sites, and other disturbed areas, silt fence will be placed at the bankfull elevation adjacent to the channel on both sides, prior to turning water into each segment. In the fall of 2023, as construction work is completed, all disturbed areas will be seeded with a temporary cover of oats. In the spring of 2024, final grass seeding, and tree/shrub planting will be completed as outlined in Appendix D-4 by the planting zones shown in Appendix D-4-59, drawing sheets 23 and 24.

7.4 PERMITS AND COMPLIANCE REQUIREMENTS

7.4.1 STATE PERMITS

A National Pollutant Discharge Elimination System (NPDES) Stormwater Construction General Permit will need to be obtained for the project, which will require filing of a Stormwater Pollution Prevention Plan with the ND Department of Environmental Quality. There is no charge for this permit in North Dakota.

7.4.2 FEDERAL PERMITS

The USACE regulates the deposition of fill into Waters of the US under Section 404 of the Clean Water Act. Input from the USACE North Dakota Regulatory Program manager through the planning effort indicates that the proposed project will not require an individual permit under Section 404; Nationwide Permit 27-Aquatic Habitat Restoration, Enhancement, and Establishment Activities The final design will be accountable to USACE permitting requirements. There is no charge for Section 404 Permits.

7.4.3 OTHER CONSIDERATIONS

The proposed project will involve the placement of fill and excavation activities within a FEMA-mapped floodplain. A permit may be required in these situations from the local floodplain administrator, and additional coordination with FEMA may also be required. Hydraulic analysis indicates that the restoration project will restore the extents of current mapping upstream of the project; therefore, a permit is not anticipated. Even so, these entities will be engaged during final design as they have in the planning process.

7.5 INSTALLATION SEQUENCE

The preliminary design drawings for the project in Appendix D-4 outline construction access routes, stockpile areas, and details of temporary diversion installation. Construction will progress from downstream to upstream and be completed between August 1 and November 20. The rock arch rapids, sheet pile wall, and buried rock sill will be the first items constructed, after which channel construction will proceed upstream. All channel construction, grade control structures, and bank protection will be installed in the reach prior to releasing water into it and moving upstream. NRCS will maintain a construction engineer onsite at all times during the project, to provide quality assurance oversight. Design of the dewatering system is covered in Appendix D-4.

7.6 OPERATION AND MAINTENANCE RESPONSIBILITIES

A natural river channel is expected to be in a state of dynamic equilibrium with natural levels of erosion and lateral migration, therefore no “operation and maintenance” will be conducted on the river channel. Floodplains adjacent to the project are either enrolled in conservation easements with USFWS or USDA, or are in a forested condition, therefore management of vegetation on the floodplain will occur through the terms of those easements which are compatible with the needs of a naturally functioning floodplain. Through annual joint Operation and Maintenance Inspections USDA-NRCS personnel and Sponsor will complete channel morphology and vegetation monitoring to assess project performance. Development of the detailed monitoring plan will occur during the final design phase of the project in 2022. Vegetation management of the majority of the floodplain areas, outside of the floodplain excavations which will be quickly overtaken with dense wetland vegetation, occurs under the terms of USFWS and CRP easements. USFWS is a federal cooperating agency for this planning effort and is in agreement with the proposed revegetation plan outline in Appendix D-4.

As the PL-566 Sponsor, the Pembina County Water Resource District will acquire an access and maintenance easement for the rock arch ramp grade control structure, which is . Although the buried sheet pile wall is incorporated into the fishway as a fail-safe measure to maintain grade control in the upstream river should the rock arch rapids scour or become dislodged, it should never remain exposed in a manner that blocks fish passage. Pembina WRD would be responsible, over the 50-year O&M Agreement period, to maintain the rock arch rapids in a fish passable condition. It will be designed by NRCS to remain stable at a 50-year recurrence flood event, so it would be eligible for PL-566 cost share to reconstruct if it were to

fail due to a design flaw at that flow level or lower. Maintenance or reconstruction that was not the result of a design flaw (vandalism or flood event in excess of the 50-year) would be the responsibility of the local sponsor, although funding sources such as the NRCS EWP program are available to address imminent failures caused by major flood events.

7.7 ECONOMIC AND STRUCTURAL TABLES

Overall costs are presented in Table 7-1. The Preferred Alternative involves extensive channel work along with some floodplain excavation and land acquisition.

Table 7-1: Economic Table 1 - Estimated Installation Costs[1]

Works of Improvement	Unit	Number	Public Law 83-566	Other Funds	Total
Tongue River Restoration	No.	1	$3,673,900	$1,103,700	$4,777,600
Total Project			**$3,673,900**	**$1,103,700**	**$4,777,600**

[1] Price Base 2020

Table 7-2 provides costs broken down by category. Construction costs were estimated through conceptual engineering design of the Preferred Alternative. Engineering costs for design and construction were estimated based on a combination of NRCS engineering staff supported by a Sponsor hired firm that would provide surveying and drafting support for the project. Real property rights were estimated by reviewing recent land sales local to the area and applying the appropriate per acre rate for land acquisition. Project administration costs are primarily associated with formation of local financing sources and legal fees associated with acquiring land rights. All costs presented are for planning purposes and may vary in future phases.

Table 7-2: Economic Table 2 – Estimated Cost Distribution, Water Resource Project Measures (Dollars)[1]

Works of Improvement		Installation Cost Distribution		
		Federal Funds[2]	Other Funds	Total
Flood Reduction	Construction	$ 250,000	$ 0	$ 250,000
	Engineering Services	$ 0	$ -	$ 0
	Real Property Rights[3]	$ -	$ 0	$ 0
	Require Permits	$ -	$ 0	$ 0
	Project Administration	$ -	$ 0	$ 0
	Subtotals	$ 250,000	$ 0	$ 250,000
Watershed Protection	Construction	$ 2,933,700	$ 977,900	$ 3,911,600
	Engineering Services	$ 490,200	$ -	$ 490,200
	Real Property Rights[3]	$ -	$ 1,000	$ 1,000
	Required Permits	$ -	$ 0	$ 0
	Project Administration	$ -	$ 124,800	$ 124,800
	Subtotals	$ 3,423,900	$ 1,103,700	$ 4,527,600
Total	Construction	$ 3,183,700	$ 977,900	$ 4,161,600
	Engineering Services	$ 490,200	$ -	$ 490,200

Works of Improvement		Installation Cost Distribution		
		Federal Funds[2]	Other Funds	Total
	Real Property Rights[3]	$ -	$ 1,000	$ 1,000
	Required Permits	$ -	$ 0	$ 0
	Project Administration	$ -	$ 124,800	$ 124,800
	Total	**$ 3,673,900**	**$ 1,103,700**	**$ 4,777,600**

[1] Price Base 2020.

[2] Federal cost share is 100% of flood reduction-related construction costs, and 75% of watershed protection-related construction costs. Federal engineering services costs, as well as real property acquisition, sponsor administration costs and permit costs, are not included when calculating eligible federal cost share. Therefore, federal cost share for construction is based on total eligible project cost of $4,161,600.

[3] Consists of permanent easement acquisition for O&M access.

Structural information for the channel work associated with the Tongue River channel restoration is provided in Table 7-3.

Table 7-3: Structural Table 3 – Structural Data for Channel Stabilization in the Tongue River

Item	Unit	River Restoration
General Statistics		
Channel Name	--	Tongue River
Station	ft	4+25 – 98+50
Drainage Area	Sq. Mi.	63
25-year Frequency Design Discharge	CFS	1,270
Water Surface Elevation	NAVD 1988	1106.04 - 1131.44
Hydraulic Gradient	ft/ft	0.0027 ft/ft
Channel Dimensions[1]		
Gradient	ft/ft	0.0027 ft/ft
Bottom Width	ft	20
Bankfull Width	ft	29
Bankfull Depth	ft	2.2
Side Slope	Horizontal: Vertical	1.5:1
N Value		
Existing n Value	--	0.035
Proposed n Value	--	0.035
Velocities		
Existing Velocity	ft/s	3.2[5]
Proposed Velocity	ft/s	3.3[5]
Other Channel Data		
Excavation Volume	Cubic Yards	73,100
Channel Volume	Cubic Yards	68,000
Type of Work[2]	--	V
Existing Channel Type[3]	--	N
Present Flow Condition[4]	--	Pr

[1] Prepared Month/Year

[2] I = Establishment of new channel including necessary stabilization measures.
II = Enlargement or realignment of existing channel or stream.

III = Cleaning out natural or manmade channel (including bar removal and major clearing and snagging operations).
IV = Clearing and removal of loose debris within channel section.
V = Stabilization as primary purpose (by continuous treatment or localized problem areas – present capacity adequate).
[3] N = An unmodified, well-defined natural channel or stream.
M = Manmade ditch or previously modified channel or stream (Date of Original Construction Shown Here)
O = None or practically no defined channel.
[4] Pr = Perennial – Flows at all times except during extreme drought.
I = Intermittent – Continuous flow through some seasons of the year.
E = Ephemeral – Flows only during periods of surface runoff, otherwise dry.
S = Ponded water with no noticeable flow – caused by lack of outlet or high groundwater table.
[5] Velocities based on bankfull discharge.

Total project costs were annualized assuming a 53-year period of analysis, which includes a 3-year design and installation period and 50 years of useful life. Total annual costs for installation and operation and maintenance are provided in Table 7-4.

Table 7-4: Economic Table 4 – Estimated Average Annual Costs (Dollars)[1]

Works of Improvement		Amortization of Installation Costs[2]	Operation, Maintenance, and Replacement Cost[3]	Total
River Restoration	Flood Reduction	$ 8,500	$ 0	$ 8,500
	Watershed Protection	$ 154,700	$ 200	$ 154,900
Total Costs		**$ 163,200**	**$ 200**	**$ 163,400**

[1] Price Base 2020
[2] Amortized for 53 years at 2.75 percent
[3] Based on $5,700 spent every 20 years

A summary of flood damages under each alternative is shown in Table 7-5**.** Benefits have been converted to their average annual equivalents using the FY 2020 project discount rate. Implementation of the Preferred Alternative would reduce flood damages by an average of $10,900 annually, or $10,200 in annual average equivalents over the 50-year life of the project.

Table 7-5: Economic Table 5 – Estimated Average Annual Flood Damage Reduction Benefits (Dollars)[1]

Item	Estimated Average Annual Damage		Damage Reduction Benefit	Damage Reduction Benefit, Average Annual Equivalent Value[3]
	Without Project (Agriculture Related)	With Project (Agriculture Related)		
Floodwater[2]				
Crop and Pasture	$ 16,500	$ 15,000	$ 1,500	$ 1,400
Other Agricultural	$ 28,800	$ 24,300	$ 4,500	$ 4,200
Residential	$ 20,000	$ 15,200	$ 4,800	$ 4,500
Commercial	$ 2,300	$ 2,200	$ 100	$ 100
Total	**$ 67,600**	**$ 56,700**	**$ 10,900**	**$ 10,200**

[1] Price Base 2020; 2019 normalized prices for cropland.
[2] Because all floodwater damages occur within rural communities; all flood water damages are considered agriculture-related.
[3] Amortized for 53 years at 2.75 percent.

A summary of watershed protection benefits is shown in Table 7-6. Implementation of the Preferred Alternative would reduce erosion damage to infrastructure by $19,600 and sediment damage to recreation amenities by $616,100 in average annual equivalents, or a total of $635,700 in annual average equivalents over the 50-year life of the project.

Table 7-6: Economic Table 5a - Estimated Average Watershed Protection Damage Reduction Benefits (Dollars)[1]

Item		Damage Reduction Benefit, Average Annual Equivalent Value[3] (Non-agriculture Related)
Offsite/Public	Sediment Damages	$ 19,600
	Recreation	$ 616,100
Total		**$ 635,700**

[1] Price Base 2020.
[2] Amortized for 53 years at 2.75 percent.

Table 7-7 provides a comparison of annual costs and benefits for the Preferred Alternative. Benefits and costs of the No-Action Alternative are not presented. The No-Action Alternative was not selected as the Preferred Alternative because it does not meet the objectives of the SLO and does not provide watershed protection benefits. The Preferred Alternative, river corridor restoration, was selected based on its ability to provide flood damage reduction objectives as well as substantial benefits for watershed protection.

Table 7-7: Economic Table 6 – Comparison of NED Benefits and Costs[1]

Works of Improvement		Total Average Annual Equivalent Agricultural Related Benefits [2,3]	Average Annual Costs [4]	Benefit to Cost Ratio
Tongue River Restoration	Flood Reduction	$ 10,200	$ 8,500	1.2 to 1.0
	Floodplain Excavation and Land Acquisition	$ 635,700	$ 154,900	4.1 to 1.0
Total		**$ 645,900**	**$ 163,400**	**4.0 to 1.0**

[1] Price Base 2020; 2019 normalized prices for cropland.
[2] Because all floodwater damage occurs within rural communities, all damages are considered agricultural-related
[3] Benefits related to watershed protection are presented qualitatively in the Watershed Plan EA and consist of water quality improvements and wildlife habitat.
[4] From Economic Table 4.

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10 DISTRIBUTION LIST

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Cavalier County Soil Conservation District
Cavalier County Water Resource District
Federal Emergency Management Agency
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North Dakota Game and Fish
North Dakota Geological Survey - Paleontology
North Dakota Department of Transportation
North Dakota State Water Commission
Pembina County Commission
Pembina County Highway Department
Pembina County Soil Conservation District
Pembina County Water Resource District
State Historical Society of North Dakota
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Apache Tribe of Oklahoma
Cheyenne River Sioux Tribe
Chippewa Cree Tribe of the Rocky Boy's Reservation
Confederated Salish and Kootenai Tribes
Crow Creek Sioux Tribe
The Crow Tribe of Indians
Fort Belknap Indian Community
Fort Peck Assiniboine and Sioux Tribes
Flandreau Santee Sioux Tribe
Leech Lake Band of Ojibwe
Lower Sioux Indian Community
Mandan, Hidatsa & Arikara Nation
Oglala Sioux Tribe
Red Lake Band of Chippewa Indians
Rosebud Sioux Tribe of Indians
Shoshone Tribe of the Wind River Reservation
Sisseton-Wahpeton Oyate
Spirit Lake Tribe of Fort Totten
Standing Rock Sioux Tribe
Turtle Mountain Band of Chippewa Indians
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