Environmental Assessment, Finding of No Significant Impact, and Draft Decision Notice

Supplemental Watershed Plan-Environmental Assessment (EA) No. 9
For
Papillion Creek Watershed
Washington, Douglas and Sarpy Counties, Nebraska

AGENCY ROLE AND RESPONSIBILITY – United States Department of Agriculture (USDA) – Natural Resources Conservation Service (NRCS)

In accordance with the NRCS regulations (7 CFR Part 622, 650 and 40 CFR 1500-1508) implementing the National Environmental Policy Act (NEPA), NRCS in conjunction with the Papio-Missouri Natural Resources District has completed an environmental review of the proposed action. The proposed action is federally assisted, authorized under Public Law 83-566, the Watershed Protection and Flood Prevention Act.

The proposed action includes the construction of two (2) sediment basins; one (1) wet dam; six grade stabilization structures consisting of 34 loose rock structures and four (4) rigid rock structures, and the restoration of one stream channel within the Papillion Creek watershed in Washington, Douglas, and Sarpy Counties, Nebraska. Benefits of the proposed action include flood risk reduction, recreation, watershed protection, damage reduction, land voiding, depreciation, crop stand damage, improve property values, and protection of roads, bridges, and houses.

NRCS DECISION TO BE MADE

As the delegated responsible Federal official for compliance with NEPA, I must make the following decision:

I must determine if the agency's proposed action (preferred alternative 2) will or will not be a major Federal action significantly affecting the quality of the human environment. The Supplemental Plan-EA accompanying this finding has provided the analysis needed to assess the significance of the potential

impacts from the selected alternative. The decision on which alternative is to be implemented and the significance of that alternative's impacts are under part VII of this finding.

PURPOSE AND NEED FOR ACTION

The purpose of this proposed action is to provide watershed protection through grade stabilization, sediment reduction, and improved safety as well as flood damage reduction within the Papillion Creek Watershed.

The need is due to channel degradation, flooding damage, and water quality issues are problems in the Papillion Creek watershed, A full project description and conceptual design plans are included in the completed Supplemental Plan-EA (October 2023)

ALTERNATIVES CONSIDERED IN THE EA

The NRCS National Watershed Manual (501.12) requires that all reasonable alternatives that address the purpose and need for action must be presented in the watershed project plan, including those not within the program authorities of the NRCS and those not preferred by sponsors. For watershed project plans involving flood protection, consideration must be given to alternative measures to prevent or reduce flood damage, including but not limited to floodproofing of structures; floodplain regulation; acquisition of floodplain lands for recreational, fish and wildlife, and other public purposes; moving buildings and facilities; and conversion of land use to forest. Five alternatives were analyzed in the EA and are characterized as follows:

Alternative 1: No Action – The No Action Alternative considers the most likely future condition if no federal action or federal were provided for the project. Streambanks in the watershed would continue to degrade, increasing sedimentation downstream and decreasing water quality. Annual erosion losses due would continue at a rate of 896,940 tons of soil/year. Sedimentation in the watershed would continue at a rate of 249,420 tons of sediment per year. Streambank instability would continue to threaten roads and homes through headcut erosion. Flood damages to cropland, urban areas, and infrastructure would continue at a rate of $94,500 per year. There would be no change to the 100-year floodplain.

Alternative 2: Proposed Action - This alternative would consist of installing measures at seven sites within the watershed to decrease sedimentation, improve water quality, stabilize stream channels, and reduce flood damages. The proposed measures include 34 loose rock structures, four (4) rigid rock structures, two (2) sediment basins, one (1) wet dam, and channel restoration. Construction of this alternative would result in over $100,000 of annual flood reduction benefits. This alternative reduces they annual sedimentation rate by 4,660 tons per year. There will be a net gain of 37 acres of wetlands if this alternative is constructed. This alternative would reduce the 100-year event flood plain by 131 acres.

Alternative 3: Alternative 3 includes all aspects of Alternative 2 except for the sediment basin proposed at Site S-1. Instead of installing a sediment basin at Site S-1 to reduce sedimentation of a downstream reservoir, the sponsor would dredge reservoir DS-19 to remove sediment as needed. This alternative reduces the annual sedimentation rate by 3,270 tons per year and provides $100,000 in annual flood reduction benefits. There will be a net gain of 28-acres of wetland if this alternative is constructed. This alternative would reduce the 100-year event flood plain by 131 acres.

Alternative 4: Alternative 4 includes all aspects of Alternative 2 except the dam installed at Site WP-1 would be a dry dam instead of a wet dam. Construction of this alternative would result in over $100,000 of annual flood reduction benefits. This alternative reduces the annual sedimentation rate by 4,660 tons per year. There will be a net gain of 9.1 acres of wetlands if this alternative is constructed. This alternative would reduce the 100-year event flood plain by 131 acres.

NRCS'S DECISION AND FACTORS CONSIDERED IN THE DECISIONS

Based on the evaluation in the Final Supplemental Plan-EA, I have chosen to select Alternative 2 as the agency's proposed action. I have taken into consideration all the potential impacts of the proposed action, incorporated herein by reference from the supplemental EA and balanced those impacts with considerations of the agency's purpose and need for action.

In accordance with the Council on Environmental Quality's (CEQ) "40 Most Asked Questions" guidance on NEPA, Question 37(a), NRCS has considered "which factors were weighed most heavily in the determination" when choosing the agency preferred alternative (Alternative 2) to implement. Specifically,

I acknowledge that based on the Final Supplemental Plan-EA, potential impacts to soil, water, air, plants, fish and wildlife, and human resources were heavily considered in the decision. As a result, the agency's preferred alternative (Alternative 2) would result short- and long-term beneficial impacts to the environmental resources potentially impacted by the preferred alternative.

FINDING OF NO SIGNIFICANT IMPACT

To determine the significance of the action analyzed in the Final Supplemental Plan-EA, NRCS implemented the NEPA regulations at 40 CFR Section 1508.27 and 7 CFR Part 650 to consider the context and intensity of the proposed action.

Based on the detailed analysis in the Final Supplemental Plan-EA and the review of the NEPA criteria for significant effects, I have determined that Alternative 2, which consists of constructing 34 loose rock structures, four (4) rigid rock structures, one (1) sediment basin, one (1) wet dam regional detention basin, and channel restoration, would not have a significant effect upon the quality of the human environment. Therefore, preparation of an environmental impact statement (EIS) on the final action is not required under section 102(2)(c) of the NEPA, Council on Environmental Quality (CEQ) implementing regulations (40 CFR Part 1500-1508, Section 1508.13), or NRCS environmental review procedures (7 CFR Part 650).

The Papio-Missouri Natural Resources District concurs with this determination and supports the proposed project and channel restoration to meet the current NRCS requirements for a design life expectancy of 100 years.

This finding is based on the following factors from CEQ's implementing regulations at 40 CFR Section 1508.27 and from NRCS regulations at 7 CFR Part 650:

1) The Final Supplemental Plan-EA evaluated both beneficial and adverse impacts of the proposed action. It is anticipated the proposed action will result in long-term beneficial impacts for environmental resources such as flood risk reduction, recreation, damage reduction, land voiding and depreciation, crop damage, improve property values, and

protection of infrastructure within the watershed. As a result of the analysis (discussed in detail in Chapter 7.0 and incorporated by reference), the preferred alternative does not result in significant impacts to the human environment, particularly when focusing on the significant adverse impacts which NEPA is intended to help decisionmakers avoid, minimize, or mitigate.

2) The proposed action does not significantly affect public health or safety. The indirect effects associated with the implementation of the maintenance actions are in fact anticipated to provide long term beneficial impacts to improve natural ecosystem functions. Specifically, soil, water, air, fish and wildlife, plants, and cultural issues will be improved and protected through selection of preferred alternative.
3) As analyzed in chapter 5.0 of the Final Supplemental Plan-EA, there are no anticipated significant effects to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas from selection of preferred alternative. NRCS regulations (7 CFR Part 650) and policy (Title 420, General Manual, Part 401), require that NRCS identify, assess, and avoid effects to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. In accordance with these requirements, it is not anticipated that implementing preferred alternative would have adverse effects on these resources.
4) The effects on the human environment are not considered controversial for the preferred alternative. There are no impacts associated with the proposed action that would be considered controversial.
5) The preferred alternative is not considered highly uncertain and does not involve unique or unknown risks.
6) The preferred alternative will not establish a precedent for future actions with significant effects, nor does it represent a decision in principle about future considerations.

7) Particularly when focusing on the significant adverse impacts which NEPA is intended to help decisionmakers avoid, minimize, or mitigate, preferred alternative does not result in significant adverse cumulative impacts to the human environment as discussed in chapter 5.0 of the Final Supplemental Plan-EA. The preferred alternative is, however, anticipated to result in beneficial long-term impacts as a result of implementation of the proposed measures.

8) The preferred alternative will not cause the loss or destruction of significant scientific, cultural, or historical resources as addressed in Chapter 5.0 of the Final Supplemental Plan-EA. A cultural resource inventory of the areas where measures will be installed did not identify any significant cultural or historical resources where the proposed measures will be installed. In accordance with 36 CFR 800.4(d)(1), NRCS determined that no historic properties will be affected by this undertaking and consulted on the project with the State Historic Preservation Office and Tribes with ancestral ties to the project area. The Nebraska State Historic Preservation Office, the Pawnee Nation of Oklahoma, and the Otoe-Missouria Tribe of Indians concurred with this determination of effect.

9) 1) The preferred alternative is unlikely to significantly impact any endangered, threatened, proposed, or candidate species or critical habitat as discussed in Chapter 3.0 and 5.0 of the Final Supplemental Plan-EA. NRCS has initially determined that the proposed measures have no effect on threatened and endangered species or will not likely adversely affect threatened and endangered species. The United States Fish and Wildlife Service (USFWS) and Nebraska Game and Parks Commission (NGPC), which have jurisdiction over these species, have reviewed our conclusions and have concurred with our initial findings. The concurrence letters provided by USFWS and NGPC are included in the Final Supplemental Plan-EA In Appendix A – Comments and Responses.

10) The preferred alternative does not violate Federal, State, or local law requirements imposed for protection of the environment as noted in Chapter 7.0 of the Final Supplemental Plan-EA. The major laws identified with the selection of the Preferred Alternative include the Clean

Water Act, Endangered Species Act, National Historic Preservation Act, the Executive order on Environmental Justice, and Migratory Bird Treaty Act. The Preferred Alternative is consistent with the requirements of these laws.

For information regarding this finding, contact: Robert Lawson, State Conservationist, U.S. Department of Agriculture, Natural Resources Conservation Service, Federal Building, Room 152, 100 Centennial Mall North, Lincoln Nebraska 68508-3866; telephone (402) 437-5300.

Conclusion

Based on the information presented in the attached Final Supplemental Plan-EA, I find in accordance with 40 CFR Section 1508.13 that the selection of the agency preferred alternative is not a major Federal action significantly affecting the quality of the human environment requiring preparation of an EIS. Thus, a Finding of No Significant Impact has been made.

Signed

Robert D. Lawson

Digitally signed by ROBERT LAWSON
Date: 2023.11.30 07:51:03 -06'00'

Robert Lawson
State Conservationist

Date

FINAL

Supplemental Watershed Plan-Environmental Assessment No. 9

Papillion Creek Watershed
Washington, Douglas, and Sarpy
Counties, Nebraska

NRCS

PAPIO-MISSOURI RIVER
NATURAL RESOURCES DISTRICT
Finding Solutions Today for a Secure Tomorrow.

December 2023

THIS PAGE INTENTIONALLY LEFT BLANK

Final
Supplemental Watershed Plan Supplement No. 9 & Environmental Assessment
For
Papillion Creek Watershed
Washington, Douglas, and Sarpy Counties, NE

AUTHORITY

The original watershed work plan was prepared, and works of improvement have been installed, under the authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law 83-566) as amended. The construction of the six grade stabilization sites is authorized under Public Law 83-566 (as amended), as further amended by section 313 of Public Law 106-472, and in accordance with Section 102 (2)(c) of the National Environmental Policy Act of 1969, Public Law 91-190, as amended (42 U.S.C. 43221 et seq).

ABSTRACT

This Draft Supplemental Plan-EA was developed in response to the varied concerns of the Sponsoring Local Organization, Papio-Missouri River Natural Resources District, and includes the remaining viable locations originally identified in the 1966 Watershed Work Plan. Project benefits include flood risk reduction, recreation, and watershed protection damage reduction including land voiding and depreciation, crop stand damage, property values, and protection of infrastructure. Proposed actions include four sites (W-5, D-78, D-2, and S-15) with a series of grade stabilization structures, one stream restoration location (S-5), one sediment control basin (S-1) with grade stabilization, and one high hazard flood damage reduction dam with a permanent pool (WP-1, previously known as D-31). Total project costs are $27,004,500, of which $8,367,300 is proposed to be paid by Public Law 83-566 funds and $18,637,200 will be paid by the Sponsor. This document is intended to fulfill requirements of the National Environmental Policy Act and to be considered for authorization of Public Law 83-566 funding.

Responsible Agency: U.S. Department of Agriculture, Natural Resources Conservation Service

Sponsor: Papio-Missouri River Natural Resources District

Cooperating Agency: United States Corps of Engineers

COMMENTS AND INQUIRIES

Comments and inquiries must be received by January 20, 2024. Submit comments and inquiries to:

Melissa Baier, Watershed Planning Coordinator
Natural Resources Conservation Service
Federal Building, Room 152
100 Centennial Mall North
Lincoln, NE 68508

Non-Discrimination Statement

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 https://www.usda.gov/oascr/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.

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

Papillion Creek Watershed Supplemental Watershed Agreement No. 9

Between the
Papio-Missouri River Natural Resources District
(Referred to herein as Sponsor)
State of Nebraska
and the
Natural Resources Conservation Service,
United States Department of Agriculture
(Referred to herein as NRCS)

Whereas, the watershed plan for Papillion Creek Watershed, State of Nebraska, executed by the sponsor named therein and NRCS, became effective on the twenty-second day of March, 1967; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the eighteenth day of November, 1969, to remove the Papio Watershed Board as the contracting agency and to provide that contracting be entered into on an ad hoc basis with the local governing body as contracting officer for those improvements within its boundaries; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the twelfth day of March, 1970, to provide that the Soil Conservation Service administer all construction contracts; and

Whereas, a supplemental agreement for said watershed executed by the Sponsor named therein and NRCS became effective on the first day of October, 1971, to provide assistance and funds as needed to comply with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 – Public Law 91-646 (34 Stat. 1894); and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the twenty-third day of January, 1973, to name the Papio Natural Resources District as Sponsor; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the twelfth day of November, 1991, to move Grade Stabilization Structure W-42 approximately 400-feet upstream onto the road; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the sixth day of April, 1995, to delete grade stabilization structures D-15, D-23, D-49, D-50, D-65, S-9, S-15, S-16, and W-20 from the plan; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the tenth day of June, 2005, to rehabilitate grade stabilization structures S-27, S-31, and S-32; and

Whereas, a supplemental agreement for said watershed, executed by the Sponsor named therein and NRCS became effective on the fifteenth day of July, 2008, to rehabilitate grade stabilization structure W-3 to current NRCS high hazard class requirements and extend its life for 90 years; and

Whereas, in order to carry out the watershed plan for said watershed, it has become necessary to modify said watershed agreement; and

Whereas, the responsibility for administration of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. 1001 to 1008, 1010, and 1012), has been assigned by the Secretary of Agriculture to NRCS; and

Whereas, a Supplemental Watershed Plan which modifies the watershed plan dated March 22nd, 1967 for said watershed has been developed through the cooperative efforts of the Sponsors and the NRCS;

Now, therefore, the Secretary of Agriculture, through the NRCS and the sponsors hereby agree upon the following modifications of the terms, conditions, and stipulations of said watershed agreement as supplemented;

(1) Flood risk reduction, sediment reduction, and improved safety are hereby added as project purposes.

(2) Grade stabilization structure S-15 is hereby reintroduced to the plan.

(3) Grade stabilization structure D-31 (herein referred to as WP-1) is hereby modified to provide flood damage reduction.

(4) Grade stabilization S-1 is hereby modified to provide sediment reduction.

(5) Modifications to the design of W-5, D-78, D-2, S-15, and S-5 grade stabilization structures.

(6) Paragraph numbered 2 is modified to read as follows: The term of this agreement is for the installation period and evaluated life of the project (102 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.

(7) Paragraph numbered 3 is modified to read as follows: The sponsors 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 sponsors and NRCS are as shown in the cost-share table in section 8 hereof.

(8) Paragraph numbered 5 is modified to read as follows: The following table will be used to show cost-share percentages and amounts for watershed project plan implementation.

Project Costs	PL 83-566 Funds		Other Funds		Total
	Dollars	Percent	Dollars	Percent	Dollars
Construction[1]	8,727,900	51%	8,401,700	49%	17,129,600
Engineering[2,3]	3,875,100	91%	378,600	9%	4,253,700
Real Property Rights[4]	0	0%	5,394,000	100%	5,394,000
Project Administration	354,300	31%	793,900	69%	1,148,200
Total Project	12,957,300	46%	14,968,200	54%	27,925,500

[1]Includes mitigation
[2]Includes construction observation
[3]Includes permit acquisition
[4]Includes cost of legal fees and land appraisals

(9) Paragraph numbered 6 is modified to read as follows: 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.

(10) Paragraph numbered 9 is modified to read as follows:

Floodplain Management. Before construction of any project for flood prevention, the sponsors must agree to participate in and comply with applicable Federal floodplain management and flood insurance programs. For plans approved as of the date of this revised manual 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.

(11) Paragraph numbered 14 is modified to read as follows:

Operation and Maintenance (O&M). The sponsors 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 (100 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 sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.

(12) Paragraph numbered 15 is modified to read as follows:

Emergency Action Plan. Prior to construction, the sponsors 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 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 sponsors annually.

(13) Paragraph numbered 16 is modified to read as follows:

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 https://www.usda.gov/oascr/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.

USDA is an equal opportunity provider, employer, and lender

(14) Paragraphs numbered 15, 16, and 17 are hereby added as follows:

(15) **Land Treatment Agreements**. The sponsors will ensure that 50 percent of the land upstream of any retention reservoir site is adequately protected before construction of the dam. The sponsors will provide assistance to landowners and operators to ensure the installation of the land treatment measures shown in the watershed project plan. The sponsors 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.

(16) **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.

(17) **Examination of Records.**

The sponsors 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.

The Sponsor and NRCS further agree to all other terms, conditions, and stipulations of said watershed agreement not modified herein.

22. Signatures

The signing of this plan was authorized by a resolution by the Papio-Missouri River Natural Resources District governing body and adopted at an official meeting held on 12-14-23 (date).

Papio-Missouri River Natural Resources District.

By: _____
John Winkler
General Manager

Date: 12-15-23

The signing of this Watershed Agreement as supplemented was authorized by a resolution of governing body of the Papio-Missouri River Natural Resources District adopted at a meeting held on 12-14-23 (date).

_____
Secretary

8901 S. 154th St. Omaha NE 68138
Address Zip Code

Date 12-14-23

Natural Resources Conservation Service
United States Department of Agriculture

Approved By: _____
State Conservationist

12/19/2023
Date

Table of Contents

List of Tables

List of Figures

List of Appendices

THIS PAGE INTENTIONALLY LEFT BLANK

Summary of Supplemental Watershed Plan-Environmental Assessment No. 9

OFFICE OF MANAGEMENT AND BUDGET FACT SHEET

for the

Papillion Creek Watershed

Washington, Douglas, and Sarpy Counties, Nebraska
Papio-Missouri River Natural Resources District
1st and 2nd CONGRESSIONAL DISTRICT

Authorization: Watershed Protection and Flood Prevention Act, Public Law (PL) 83-566, as amended (16 U.SC. Section 1001, et. seq.)

Sponsor: Papio-Missouri River Natural Resources District (P-MRNRD)

Lead Federal Agency: USDA – Natural Resources Conservation Service (NRCS)

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

Reason for Preparing a Supplement: This Supplemental Watershed Plan-EA is intended to update the 1966 Work Plan and subsequent Supplements to satisfy National Environmental Policy Act (NEPA) requirements, to comply with USACE Clean Water Act 404(b)(1) guidelines, and to provide an analysis that complies with Principles, Requirements, and Guidelines for Water and Land Related Resources (PR&G).

Proposed Action: The proposed action is the construction of 34 loose rock structures, four (4) rigid rock structures, one (1) sediment basin, one (1) wet dam regional detention basin, and channel restoration.

Purpose and Need for the Action: The purpose of the proposed action varies by site, shown in Table S-1. The purposes include watershed protection through grade stabilization, sediment reduction, and improved safety as well as flood damage reduction within the Papillion Creek Watershed.

Table S-1. Project Purposes

Site	Purpose
W-5	Watershed protection through grade stabilization
D-78	Watershed protection through grade stabilization
D-2	Watershed protection through grade stabilization
S-15	Watershed protection through grade stabilization
S-5	Watershed protection through grade stabilization and improved safety
S-1	Watershed protection through sediment reduction and grade stabilization
WP-1	Flood Damage Reduction

Description of the Preferred Alternative Plan: All locations were previously identified in the 1966 Work Plan. The preferred alternative would include installation of 34 loose rock structures and four rigid rock structures to provide grade control to upstream reaches and allow for stream crossing. Channel restoration is included to stabilize the stream and improve safety along the reach at Site S-5. A sediment basin will be

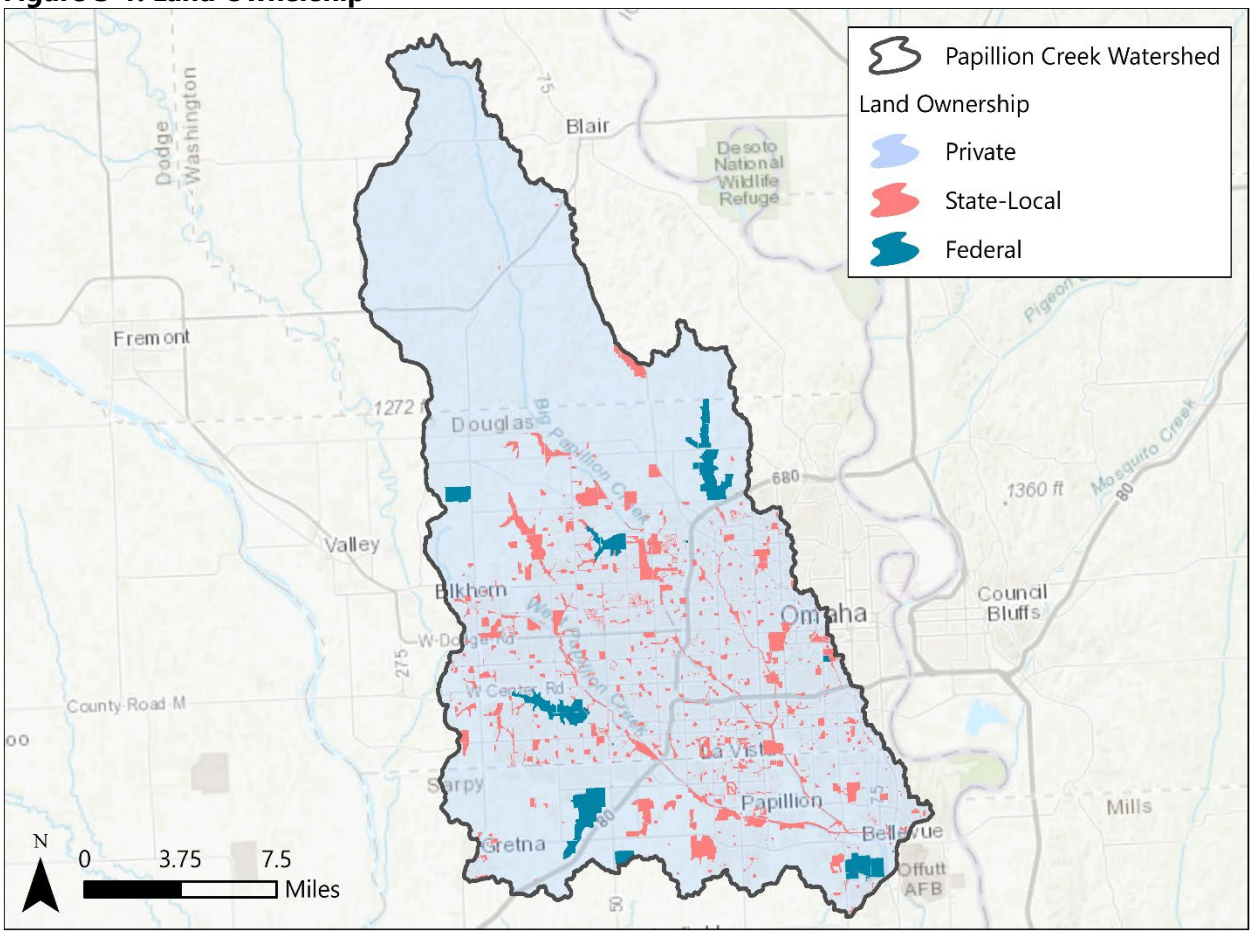
constructed at Site S-1 upstream of a planned flood control structure to reduce the influx of sediment to the downstream structure. A regional detention basin will be constructed at Site WP-1 to reduce the flood risk within the watershed.

Resource Information. Information is included below to describe the watershed conditions.

Table S-2. Papillion Creek Watershed

Eight-Digit Hydrologic Unit Number	10230006
Latitude, Longitude (decimal degrees)	41.3, -96.1
Papillion Creek Watershed (acres)	245,800 acres
Developed	111,400
Cropland	102,040
Grassland	22,670
Forest	5,760
Water	2,150
Wetlands	1,770
Land Ownership	Private 91%, State-Local 6%, Federal 2%
Prime Farmland and Farmland of Statewide Importance (acres)	123,700

Figure S-1. Land Ownership



Climate: Continental and temperate, characterized by mild, wet springs; mild, dry autumns; hot summers; and cold winters. Mean summer and winter temperatures are about 75°F and 26°F, respectively. Average annual precipitation is approximately 31.1 inches.

Topography: Watershed has rolling hills with steep, incised channel banks.

Table S-3. Population (2020 Census)

	Douglas County	Sarpy County	Washington County
Total Population[1]	584,526	190,604	20,865
Male[2,3]	281,580	93,546	10,058
Female[2,3]	289,747	93,650	10,303
Under 18[2,3]	145,688	51,072	5,003
65 years and over[2,3]	76,854	22,739	3,631

[1]2020 US Census
[2]2019 ACS 1-Year Estimates Subject Tables
[3]2019 ACS 5-Year Estimates Subject Tables (Washington County only)

Table S-4. Demographics (2020 Census)

	Douglas County	Sarpy County	Washington County
White[1]	68.16%	80.02%	93.54%
Black or African American[1]	11.07%	3.91%	0.35%
American Indian or Alaska Native	0.99%	0.53%	0.18%
Asian	4.76%	2.52%	0.48%
Native Hawaiian or other Pacific Islander	0.09%	0.13%	0.02%
Two or More Races	8.60%	9.19%	4.25%
Hispanic or Latino	13.83%	10.52%	2.97%
Total Households[2,4]	222,819	68,947	8,185
Percent of population below poverty level[3]	9.80%	4.90%	5.30%
Percent of children below poverty level[3]	10.20%	5.10%	6.30%

[1]2020 US Census
[2]2019 ACS 1-Year Estimates Subject Tables
[3]United States Census Bureau. 2020 SAIPE data.

Threatened and Endangered Species: There are 11 existing and proposed threatened and endangered species with known ranges within the Papillion Creek Watershed. The determinations in this Plan-EA reflect the presence of "significant impacts" on any listed species that would prevent the creation and signing of a FONSI. Prior to implementation, consultation with both USFWS and NGPC will be required, using a Biological Assessment to analyze and document impacts to listed species.

Historic Properties and Cultural Resources (within area of potential effect): There are no eligible National Register of Historic Places (NRHP) archaeological resources present and, therefore, no historic properties will be affected.

Wetlands: There is a total of 9 acres of wetlands delineated within the project sites' areas of potential effect. Of these wetlands, 8 acres are palustrine emergent wetlands.

Alternative Plans Considered: Additional alternatives were considered to address the project purposes. The alternative plans considered are shown in Table S-5 below. See Chapter 4.0 for explanations for why alternatives did not meet the purpose or were not carried forward for detailed study.

Table S-5. Alternative Plans Considered

Purpose	Sites	Alternative	Meets Purpose	Carried forward for Detailed Study
All	All	No Action/Future Without Project	No	Yes
Watershed Protection through Grade Stabilization	W-5, D-78, D-2, S-5, S-15	Standard NRCS Grade Stabilization Structures	Yes	No
		High Hazard Dam Alternative	Yes	No
		Nonstructural Alternatives	No	No
	W-5, D-78, D-2, S-15	Stream Restoration	Yes	No
		Loose Rock and Rigid Drop Structures	Yes	Yes
Watershed Protection through Grade Stabilization & Improved Safety	S-5	Loose Rock and Rigid Drop Structures	No	No
		Loose Rock Structures with Channel Bank Stability	No	No
		Stream Restoration	Yes	Yes
Watershed Protection through Sediment Reduction & Grade Stabilization	S-1	Conservation Measures	No	No
		Small Detention Basins	No	No
		Loose Rock Structures/Rigid Drop Structures	No	No
		Dredging of DS-19 with Grade Stabilization	Yes	Yes
		Sediment Basin and Rigid Drop Structure	Yes	Yes
Flood Risk Reduction	WP-1	Zoning Alternative	No	No
		Floodplain Acquisition	Yes	No
		Current Conservation Measures	No	No
		Low Impact Development (LID)	Yes	No
		Created and Restored Wetlands	No	No
		Stream Restoration	No	No
		Conveyance Alternative	Yes	No
		Raise Existing Levees and Bridges	No	No
		Small Detention Dams	No	No
		Regional Detention Site (Dry Dam)	Yes	Yes
		Regional Detention Site (Wet Dam)	Yes	Yes

Mitigation: There will be over 1/10-acre of impacts to wetlands at Sites S-1 and WP-1 and these sites will therefore require mitigation. There will be approximately 38 acres of lacustrine fringe wetlands created around the proposed permanent pools at Sites S-1 and WP-1, which can be used to mitigate for wetlands and will result in a net gain of wetlands for all sites.

Compensatory stream mitigation will be based on the existing stream conditions and calculated by the loss of stream functional units attributable to project implementation. A stream assessment based on the Nebraska Stream Condition Assessment Procedure (NeSCAP) will be performed to determine the existing stream functional units. The streams within the watershed are severely incised and projects will improve stream function. Compensatory stream mitigation is only anticipated for earthen fill due to embankments at Sites S-1 and WP-1.

Project Costs: Table S-6 summarizes the distribution of project costs between the Sponsor and NRCS for the installation of the project.

Table S-6. Project Costs

Project Costs	PL 83-566 Funds	Other Funds	Total
Construction[1]	$ 8,727,900	$ 8,401,700	$ 17,129,600
	51%	49%	100%
Engineering[2,3]	$ 3,875,100	$ 378,600	$ 4,253,700
	91%	9%	100%
Real Property Rights[4]	$ -	$ 5,394,000	$ 5,394,000
	0%	100%	100%
Project Administration	$ 354,300	$ 793,900	$ 1,148,200
	31%	69%	100%
Total Project	$ 12,957,300	$ 14,968,200	$ 27,925,500
	46%	54%	100%

[1]*Includes mitigation*

[2]*Includes construction observation*

[3]*Includes permit acquisition*

[4]*Includes cost of legal fees and land appraisals*

Project Benefits: Project benefits include flood risk reduction, recreation, and watershed protection damage reduction including land voiding and depreciation, crop stand damage, property values, and protection of infrastructure.

Table S-7. Economic Benefits (dollars)[1]

Average Annual Benefits							
Works of Improvement	**Agriculture related Flood Damage Reduction** 2/	**Non-Agriculture related Flood Damage Reduction**	**Agriculture related Watershed Protection** 2/	**Non-Agriculture related Watershed Protection**	**Total**	**Average Annual Cost** 3/	**Benefit: Cost Ratio**
1 Floodwater Retarding Structure (WP-1)	0	94,500	326,700	0	421,200	382,700	1.1

1/Price base: 2022, amortized over 105 years at a discount rate of 2.25% Prepared: 02/2022

2/ Includes rural benefits, as defined by the NWPM

Period of Analysis: 105 years

Project Life: 100 years

Environmental Considerations and Effects: Table S-8 summarizes resource elements that were identified during scoping and summarizes potential impacts related to the installment of the Project.

Table S-8. Summary of Resource Concerns and Impacts

Item or Concern	Alternative 2. (Preferred, Recommended)
Soils	
Erosion and Sedimentation	Will help stabilize degrading stream banks and provide grade control. Will reduce annual sedimentation rate by approximately 4,660 tons per year.
Prime and Unique Farmland	Will directly and indirectly impact approximately 160-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.
Water	
Water Quality	Enhanced water quality.
Water Quantity	Will provide flood risk reduction.
Regional Water Management Plans	Will implement projects included in and works towards goals of regional water management plans.
Floodplain Management	Increased flood risk reduction.
Wetlands and Waters of the U.S.	USACE 404 permit is anticipated.
Plants	
Threatened and Endangered Species	There is no suitable habitat for species.
Riparian Areas	Will stabilize streams and protect associated riparian areas.
Habitats	
Fish and Wildlife Habitat	There is no suitable habitat for other species.
Animals	
Migratory Birds/Bald and Golden Eagles	Habitat destructive activities will be avoided during the active nesting season for migratory birds. Because bald eagles are known to nest in the area, habitat destructive activities will be avoided from nest initiation through fledging timeframe., and surveys will be conducted prior to implementation.
Threatened and Endangered Species & Fish and Wildlife Coordination Act	No significant impacts are predicted for any of the listed species' suitable habitat that would prevent the creation of a FONSI based off of site investigation, feedback from agencies, and IPaC/CERT reports. However, because no definite determinations were made, additional consultation with both USFWS and NGPC will be required prior to implementation of any measure selected as the preferred alternative.
Humans	
Flood Damages	Reduced damages from flooding.
Historic and Cultural Properties	No historic properties would be affected.
Social and Demographic Data	Will not adversely impact any known minority groups or individuals living in poverty.
Public Health and Safety	Will stabilize stream banks to improve safety near streams and provide flood risk reduction.

Climate Change	Would increase climate change resiliency by reducing peak flows and protecting streams.
Land Use	Minor land use changes from agriculture to open water at sediment basin and wet dam.

Major Conclusions: The preferred alternative as presented in this Supplemental Plan most closely met the PR&G Guiding Principles, including the Federal Objectives, was the locally preferred alternative, and presented the most beneficial impacts to relevant ecosystem services. The regional detention structure will provide flood damage reduction within the watershed and the sediment basin will reduce the influx of sediment to downstream waterbodies. The combination of alternatives will provide grade stabilization and improved safety. The preferred alternative will also provide ancillary benefits of improved fish and wildlife habitat, recreation, infrastructure protection, and enhanced water quality.

Areas of Controversy: The planning process included public meetings, coordination with interested agencies and groups, and printed public information to raise issues, resolve conflicts, and recommend the most desirable plan features. No unresolved controversy remains.

Evidence of Unusual Congressional or Local Interest: None. This report is in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects.

Changes Requiring Preparation of a Supplement

The Watershed Protection Act (PL 83-566) of 1954 authorizes the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) to cooperate with State and local agencies in planning and carrying out works of improvement for soil conservation and other purposes. The Papillion Creek Watershed Work Plan Supplement No. 9 and Environmental Assessment are combined into this single document (Supplemental Plan-EA).

In March 1966, a Watershed Work Plan (1966 Work Plan) was authorized for the Papillion Creek Watershed (watershed) in Nebraska with the purpose of grade stabilization. It included 52 grade stabilization structures and land treatment measures. The grade stabilization structures included sheet piling drop structures, concrete weir drop structures, and drop inlet structures (dams). Primary benefits consisted of land damage and land depreciation prevention, grade stabilization of the channel beds, and a reduction in sediment. Indirect benefits included reduction to infrastructure damage. Thirty (30) of the original work plan structures have been constructed with the last one of the original sites completed in 2007 (Site S-30). There have been eight supplements to the 1966 Work Plan over the last 54 years which have involved updates to economics, changes to structure locations, removal of structures, and rehabilitation.

The seven remaining viable sites from the 1966 Work Plan are included in this document. One of the proposed structure locations, referred to herein as S-15, was removed from the 1966 Work Plan in a 1995 Supplemental Plan due to interference with a planned urban development. The planned development did not come to fruition due to insufficient funding and grade stabilization remains a problem at this site. Therefore, it is proposed that Site S-15 be reintroduced within this Supplemental Plan-EA. The other remaining viable sites include W-5, D-78, D-2, D-31 (herein referred to as WP-1), S-1, S-5, and S-15. The program funding source for WP-1 is the Regional Conservation Partnership Program (RCPP) and the funding for planning the other six sites is through the Watershed and Flood Prevention Operations Program (WFPO).

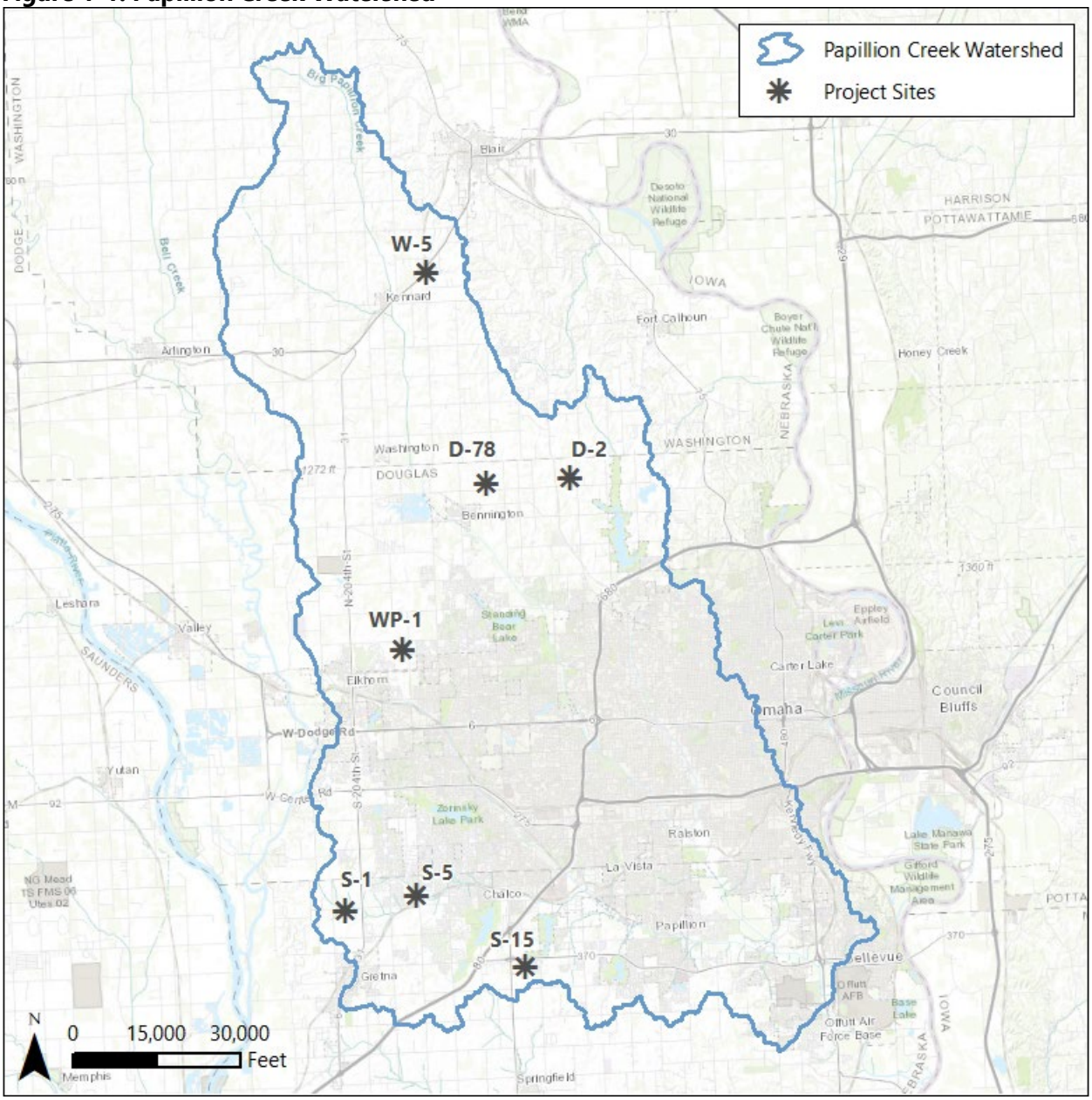
Natural and anthropogenic changes in the watershed have led to changes within the streams and additional watershed needs. Site S-5 is deeply incised and continued channel degradation and widening threaten infrastructure and homes which lends this site to require channel restoration in addition to grade stabilization. Site WP-1 has been identified in the Papillion Creek Watershed Management Plan as a high priority location for a flood damage reduction dam and therefore that purpose is being added in this Plan-EA. Site S-1 is located upstream of another high priority flood damage reduction dam site identified within the Papillion Creek Watershed Management Plan (DS-19) and therefore the purpose of Site S-1 is watershed protection through sediment reduction and grade stabilization more efficiently meet the needs of the watershed. The remaining four sites are proposed as grade stabilization sites. Implementation of these seven sites will complete the 1966 Work Plan. The intent of this Supplemental Plan-EA is to evaluate alternatives associated with the aforementioned locations under guidelines outlined in the NRCS Title 390 – National Watershed Program Review (NWPM), 4th edition (NRCS, 2015) and to satisfy National Environmental Policy Act (NEPA) requirements. A copy of the 1966 Work Plan and subsequent supplements can be acquired at the NRCS Nebraska State Office or through the Sponsor, the Papio-Missouri River Natural Resources District (P-MRNRD).

1.0 PURPOSE AND NEED FOR ACTION

1.1 Introduction

The intent of this document is to identify and evaluate alternatives at locations previously identified in the 1966 Work Plan under guidelines outlined in the NRCS Title 390 – National Watershed Program Manual (NWPM), 4th edition (NRCS, 2015) and to satisfy National Environmental Policy Act (NEPA) and Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G) requirements. Locations analyzed in this Supplemental Plan-EA are shown in Figure 1-1 below.

Figure 1-1. Papillion Creek Watershed



1.2 Watershed History

A Watershed Work Plan for the Papillion Creek Watershed was prepared in August 1966 (1966 Work Plan) under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566, 83d Congress, 68 Stat. 666) as amended. The 1966 Work Plan was prepared by a combination of conservation districts, county commissioners, county supervisors and the Papio Watershed Board with assistance by the U.S. Department of Agriculture (USDA) Soil Conservation Service, USDA Forest Service, and the State of Nebraska Soil and Water Conservation Commission. The 1966 Work Plan identified flooding, grade stabilization, and sediment and erosion damages within the watershed. The 1966 Work Plan proposed a combination of land treatment measures and 52 grade stabilization structures. Eight Supplements have been completed since this 1966 Work Plan and 30 of the 52 grade stabilization structures have been constructed.

The U.S. Army Corps of Engineers (USACE), Omaha District issued a report in 1967 entitled *Review Report for Papillion Creek and Tributaries, Nebraska* (USACE, 1967), which was being written when the 1966 Work Plan was issued. The proposed 1967 USACE Report was referenced in the 1966 Work Plan as the means to address the flooding problems within the watershed. This 1967 USACE Report proposed a system of 21 dams for the purposes of flood control, recreation, and water quality. Of the 21 structures, nine have been constructed and one structure is no longer viable due to a proposed roadway (DS 14).

The Papillion Creek Watershed Partnership (PCWP) was formed in 2001 through an inter-local agreement between nine local governments to analyze and address the issues of water quality and water quantity throughout the watershed. Many studies have been completed since the creation of the PCWP. Three of these studies that addressed the issue of water quantity include the *Multi-Reservoir Analysis* (HDR, 2004), the *Papillion Creek Watershed Management Plan* (Management Plan) (HDR, 2009), and the *Papillion Creek Watershed Management Plan March 2014 Update* (HDR, 2014).

The *Multi-Reservoir Analysis* (HDR, 2004) evaluated fourteen of the remaining dam sites as identified in the 1967 USACE Report in various dam combination alternatives. The Management Plan (HDR, 2009) evaluated water quantity and water quality improvement strategies and policy controls, including an analysis of 19 dam sites and other potential solutions to water quantity issues such as using low impact development (LID) strategies to address both existing (2004) conditions and full build-out (future) conditions. The 19 dam sites included eight sites from the 2004 analysis (HDR, 2004) and 11 additional sites. The Management Plan recommended a combination of 15 dam sites in conjunction with LID strategies to provide the watershed with flood risk reduction.

1.3 Purpose and Need

Channel degradation continues to be a problem in the Papillion Creek Watershed where the planned grade stabilization structures in the original Papillion Creek Watershed plan were not implemented. The sponsors have also identified flooding damages and water quality issues due to sedimentation as problems the public wants to be addressed. Representative photographs of existing conditions at each site are included in Appendix D.

The purpose of **Sites W-5, D-78, D-2, and S-15** is to provide watershed protection through grade stabilization along their respective creeks, as identified in the original 1966 Work Plan. Site S-15 was

removed from the 1966 Work Plan in a 1995 Supplemental Plan due to interference with a planned urban development. The planned development did not come to fruition due to insufficient funding and grade stabilization remains a problem at this site. Therefore, Site S-15 is being reintroduced within this Supplemental Plan-EA.

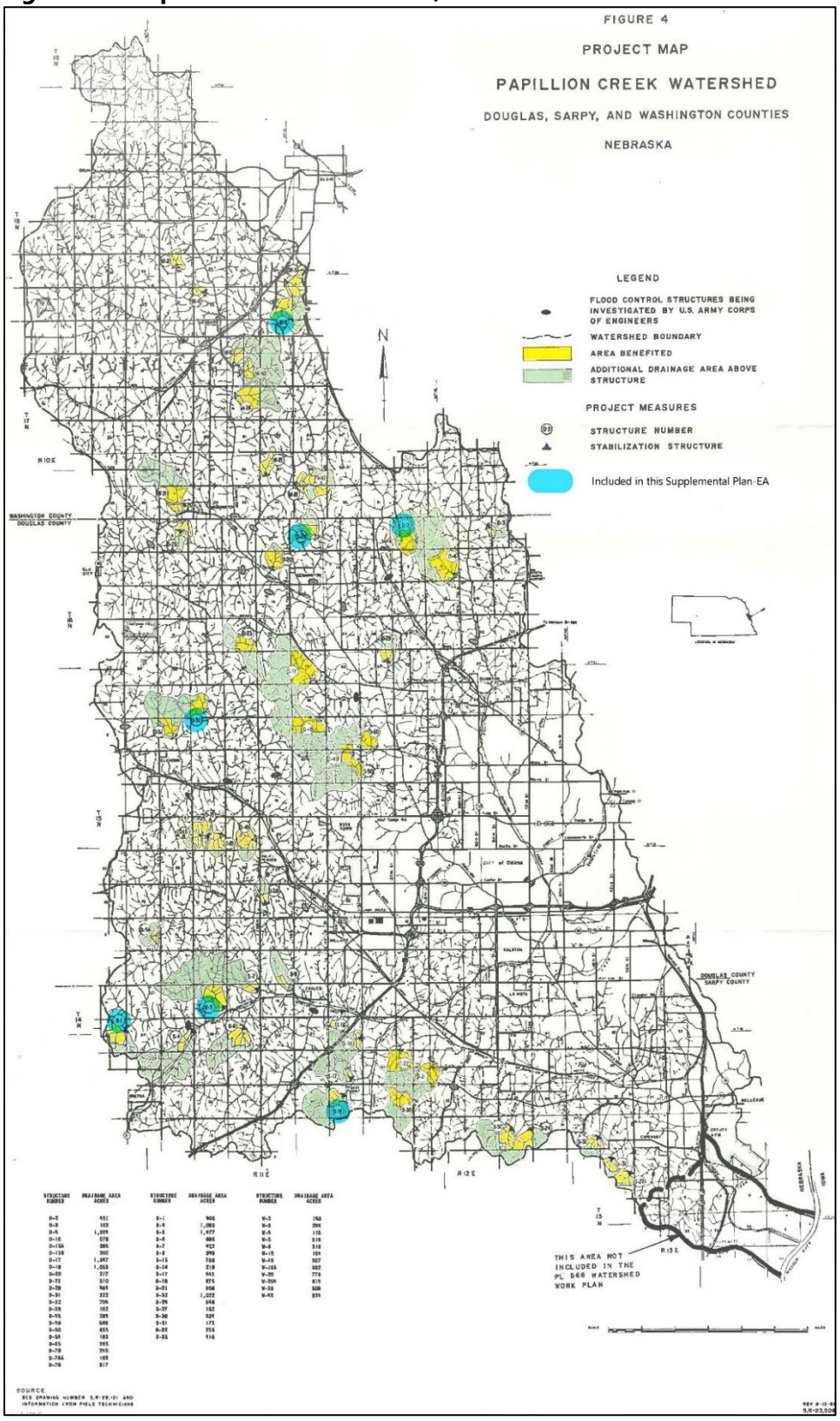
The purpose of **Site S-5** is to provide watershed protection through grade stabilization and improved safety along the Beadle Creek stream corridor between Lillian Street and the confluence of South Papillion Creek.

The purpose of **Site S-1** is to provide watershed protection through sediment capture on South Papillion Creek and grade stabilization along South Papillion Creek and an unnamed tributary between South 204th Street and South 216th Street.

The purpose of Site D-31 (referred to herein as **Site WP-1**) is to provide long term flood damage reduction within the West Papillion Creek subwatershed so that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA.

The hazard classification of all structures evaluated in the original work plan was low hazard (shown in Figure 1-2, below). A low hazard classification is for dams in predominantly rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and county roads. Since the work plan was approved, additional residential development has occurred in the watershed downstream of the structures, and additional development is in the planning stage. Approximately 2,000 acres of agricultural land is developed each year in the Omaha metro area. Structure WP-1 is now classified as high hazard due to the proximity to the city limits and potential loss of life if the structure would fail. The NRCS State Conservation Engineer has concurred with the high hazard designation.

Figure 1-2. Papillion Creek Watershed, 1966 Work Plan



1.4 Federal Objective and Guiding Principles

As set forth in the Water Resources Development Act of 2007 and as stated in the PR&G, the Federal Objective specifies the fundamental goal of Federal investments in water resources and is as follows:

> Federal water resources investments shall reflect national priorities, encourage economic development, and protect the environment by:
>
> (1) seeking to maximize sustainable economic development;
>
> (2) seeking to avoid the unwise use of floodplains and flood-prone areas and minimizing adverse impacts and vulnerabilities in any case in which a floodplain or flood-prone area must be used; and
>
> (3) protecting and restoring the functions of natural systems and mitigating any unavoidable damage to natural systems.

The Guiding Principles are overarching concepts that the Federal government seeks to achieve through the Federal Objective and are listed below. It is important to note that they do not have a hierarchal relationship and are therefore not listed in order of rank or importance.

A. Healthy and Resilient Ecosystems
B. Sustainable Economic Development
C. Floodplains
D. Public Safety
E. Environmental Justice
F. Watershed Approach

In addition to the Federal Objective and Guiding Principles, Step 2 of the NRCS Planning Process was conducted as outlined in the National Planning Procedures Handbook as well as guidelines presented in the NWPM, the NWPH, and PR&G were consulted during project scoping.

1.5 Problems and Opportunities

1.5.1 Problems

Most major channels within the Papillion Creek Watershed were straightened in the early 1900s, increasing velocities and accelerating channel degradation. Channel degradation and widening within the watershed was identified in the 1966 Work Plan and continues to be a common problem due to the deep deposits of loess soil. This results in incised channels, high banks, and loss of land. Vertical channel banks of greater than 20-feet are commonplace and pose a risk to the public. Infrastructure is often placed along the channel corridor and channel degradation and widening cause costly and dangerous infrastructure damage. Channel bed and bank erosion also results in sedimentation that decreases water quality downstream. All sites within this Supplemental Plan-EA were identified in the 1966 Work Plan and continue to show signs of degradation.

Flooding is another significant problem within the watershed that results in damage to urban, agricultural, and rural lands. Many studies have been completed within the watershed to identify flood damages and potential flood damage reduction measures, as discussed in Section 1.2. Sites WP-1 and DS-19 were included in the PCWP 2009 Management Plan and the PCWP 2014 Plan Update (HDR, 2014) as part of the overall watershed approach to reduce flood damages.

1.5.2 Opportunities

There are many opportunities to improve the quality of life and environmental conditions within this watershed. Protecting streams from degradation, restoring streams, capturing sediment to improve water quality and farming, and reducing flooding will improve economic conditions and decrease the threat to human safety.

2.0 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

The scope of the Environmental Assessment (EA) is based on resources identified in previous studies as well as current site investigations and scoping meetings with the NRCS, the Sponsor, and interested agencies and individuals. The following section identifies the resources of concern that were deemed relevant to decision making as well as resources that were considered but not studied in detail.

A scoping meeting was held with the Sponsor, State NRCS staff, and the National Water Management Center (NWMC) in March 2019 to discuss problems and opportunities within the watershed and to identify potential resource concerns. Additional scoping meetings were held between the Sponsor and State NRCS staff.

Public and agency scoping meetings were held in July 2019 for the seven project sites included in this Supplemental Plan-EA. Background on the project, preliminary design alternatives, project extents, and other relevant information about the project were discussed. Agencies and the public were given opportunities to express concerns in person at the meeting, by email, and through comment cards and resources of concern questionnaires provided at the meeting. A link to a website with project information was also shared for additional and updated information. Provided feedback was used to assist in scoping the resources of concern for this EA. Additional information on public and agency involvement is included in Chapter 6.0.

Tribal consultation was conducted in accordance with the National Historic Preservation Act (NHPA) of 1966 and Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments*, to maintain NRCS' government-to-government relationship with Tribes. NRCS sent letters to the Iowa Tribe of Kansas and Nebraska, the Iowa Tribe of Oklahoma, the Omaha Tribe of Nebraska, the Otoe-Missouria Tribe of Indians in Oklahoma, the Pawnee Nation of Oklahoma, the Ponca Tribe of Nebraska, the Ponca Tribe of Indians of Oklahoma, the Sac and Fox Nation of Missouri in Kansas and Nebraska, the Sac and Fox Tribe of the Mississippi in Iowa, and the Sac and Fox Nation of Oklahoma notifying them of the scoping process and requesting input on resource concerns.

A summary of scoping is provided in Table 2-1, which identifies resources that are relevant to the project and those that are not studied further within this EA. Resources marked relevant are studied in further detail throughout this document. Impacts of alternatives carried forward for detailed analysis are included in Chapter 5.0, Environmental Consequences.

Table 2-1. Summary of Scoping

Item / Concern	Relevant?	Rationale
Erosion and Sedimentation	Yes	Erosion contributes to land damage and depreciation and water quality impairments. Aggradations of eroded sediment contributes to sedimentation in streams and reservoirs and reduces water quality.
Prime and Unique Farmland	Yes	Stream bank erosion threatens prime and unique farmland, alternatives could impact prime and unique farmland.
Soil Quality	Yes	There may be minor impacts on soil quality. Soil impacts due to erosion and sedimentation are

Item / Concern	Relevant?	Rationale
		discussed under the Soil Erosion and Sedimentation sections.
Water Quality	Yes	Water quality within the streams of the watershed is reduced due to sedimentation and the influx of nutrients.
Water Quantity	Yes	There is a need to reduce peak flows to reduce flood damages. Water quantity is discussed and analyzed with Flood Damages.
Regional Water Management Plans	Yes	Regional Water Management plans exist within the Watershed.
Floodplain Management	Yes	Alternatives could impact the 100-year floodplain.
Wetlands and Waters of the U.S.	Yes	USACE Section 404 permits are anticipated.
Wild and Scenic Rivers	No	No designated rivers within the watershed.
Air Quality	No	Potential alternatives will not impact the emission rate of any regulated air pollutant and is not subject to any other federal, state, or local air quality regulation.
Threatened and Endangered Species & Fish and Wildlife Coordination Act	Yes	Species have known ranges within the watershed.
Invasive Species	No	Alternatives will not cause or promote the introduction and/or spread of invasive species.
Natural Areas	No	No Natural Areas will be impacted.
Riparian Areas	Yes	Sporadic, degraded riparian areas can be found in the watershed and may be impacted by alternatives.
Fish and Wildlife Habitat	Yes	Grasslands, woodlands, and fish and wildlife habitat are present.
Coastal Zone Management	No	Designated coastal zone management areas are not present within the watershed.
Coral Reefs	No	Coral reefs and associated waterbodies are not present within the watershed.
Essential Fish Habitat	No	Essential fish habitat is not present within the watershed.
Threatened and Endangered Species & Fish and Wildlife Coordination Act	Yes	Species have known ranges within the watershed.
Invasive Species	No	Invasive species will not be introduced or spread.
Migratory Birds/Bald and Golden Eagles	Yes	Migratory birds and bald eagles may be present.

Item / Concern	Relevant?	Rationale
Flood Damages	Yes	Flood damages are a concern within the watershed.
Cost	Yes	Required by the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G)
Historic Properties and Cultural Resources	Yes	Potential impact to cultural resources, studies to determine impact included as part of this Supplemental Plan-EA.
Social and Demographic Data	Yes	Potential to impact subject populations, studies to determine impact included as part of this Supplemental Plan-EA.
Potable Water Supply	No	Sufficient potable water
Public Health and Safety	Yes	Degrading and widening streams and flooding create a risk to the public's safety.
Scenic Beauty and Parklands	No	The proposed project does not occur within an area specifically designated unique or valuable scenic landscape.
Climate Change	Yes	Required for PR&G analysis
Land Use	Yes	Required by PR&G analysis
Adaptive Management	Yes	Required by PR&G analysis

In addition to the resources identified as relevant, alternatives carried forward for detailed analysis will also be evaluated with respect to the Federal Objective and Guiding Principles, as required under the PR&G.

3.0 AFFECTED ENVIRONMENT

The following chapter describes the existing conditions of resources identified as relevant during scoping (see Table 2-1). Due to watershed changes that have occurred since the 1966 Work Plan, the resources are described for the entire watershed except where noted below.

3.1 Soil Erosion and Sedimentation

Approximately 896,940 tons of soil erode annually, resulting in resource problems within the Papillion Creek Watershed. Erosion losses are shown in Table 3-1 and calculation details are provided in Appendix D.

Table 3-1. Annual Erosion within Papillion Creek Watershed

Erosion Source	Amount of Erosion (tons/year)
Sheet and Rill	857,470[1]
Ephemeral and Gully	1,880[2]
Channel/Streambank	37,590[2]
Total	**896,940**

[1]*See Table D6-1*
[2]*See Table D6-3*
Note: Values rounded to the nearest 10 tons/year

Sediment is produced from all parts of the watershed from all land uses. Sheet and rill erosion is the dominant erosion process in the watershed, accounting for over ninety percent of total erosion. The largest single contributor to this is untreated cropland. Sheet and rill erosion reduces crop yields and lowers long-term productivity of cropland due to depletion of topsoil. Crops are destroyed or damaged as sediment is redistributed on fields, especially where sediment laden runoff moves across areas of reduced slope or encounters roads and fence lines. Farm machinery is also subjected to additional wear and tear during farming operations in these areas. The second largest contributor of erosion is channel/streambank erosion and the watershed contains many continually eroding streams. Stream degradation and widening results in loss of agricultural and urban land and poses a public health and safety concern as the stream banks become vertical and can reach heights of over 30 feet tall.

Sedimentation is the portion of total erosion that is transported from its point of origin and delivered to a specific location such as the stream system or the watershed outlet. Sediment transport occurs primarily by water, either as overland runoff or channelized flow in this watershed.

The largest erosion process contributing to delivered sediment is sheet and rill erosion and the largest contributing land use is cropland. Sheet and rill erosion, however, has a low sediment delivery efficiency because overland runoff leaves material behind as depositions on fields, at field boundaries, in road ditches, and other obstacles. An estimated 25 percent of sheet and rill erosion produced annually moves through the stream system. Ephemeral and gully erosion is somewhat more efficient at sediment delivery, due to the proximity to flow channels with an estimated 65 percent delivery rate. Streambank erosion is much more efficiently delivered, due to the greater carrying capacity of channelized flow with an estimated 90 percent delivery rate. Based on the estimated sediment delivery rates, the total sediment produced annually within the Papillion Creek Watershed is 249,420 tons of sediment per year (Table 3-2).

Table 3-2. Sediment Produced Annually within Papillion Creek Watershed

Erosion Source	Sediment Transported Downstream (tons/year)
Sheet and Rill	214,370
Ephemeral and Gully	1,220
Channel/Streambank	33,830
Total	**249,420**

Note: Values rounded to the nearest 10 tons/year

3.2 Prime and Unique Farmland

The Farmland Protection Policy Act (FPPA) was established to avoid significant, irreversible losses of farmland. Prime farmland (defined under the FPPA) and farmland of statewide importance are lands that exhibit the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses (SSM 2017). These lands have the soil quality, growing season, and moisture supply needed to produce economically sustainable high yields of crops. The use of acceptable farming methods, including water management, can be used to attain sustainable yields. Prime farmlands generally have an adequate and dependable water supply (from precipitation or irrigation), are not excessively erodible or saturated for long periods of time, and do not flood frequently (SSM 2017). Prime farmland is land that is available for farming, but could currently be cropland, pastureland, rangeland, forestland, or other land, but not urban built-up land or water. More information about the criteria for prime farmland and farmland of statewide importance is available at the local office of the NRCS.

There are approximately 117,400-acres of prime farmland and farmland of statewide importance within the watershed, or approximately 48 percent of the land. Figure 3-1 shows the extents of the prime farmland and farmland of statewide importance within the watershed. The soil types and areas of NRCS soil map units within the watershed that are prime farmland and farmland of statewide importance are listed in Table 3-3 below.

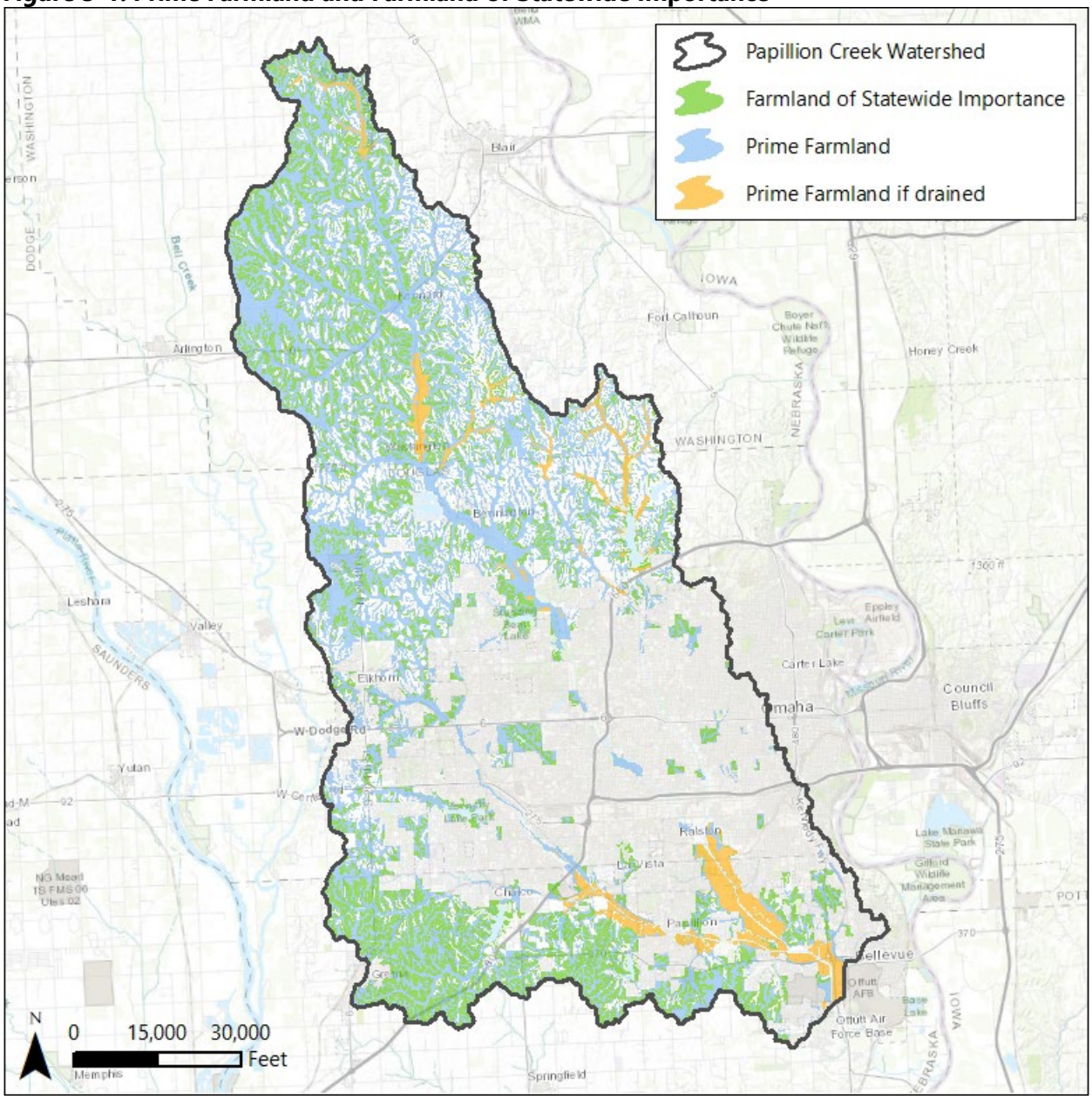
Table 3-3. Prime Farmland and Farmland of Statewide Importance within the Watershed

Map Unit Symbol	Map Unit Name	Rating	Area (acres)
3643	Kezan-Kennebec silt loams, drained, occasionally flooded	Prime farmland if drained	2,515
6452	Clamo-Zook-Kezan silty clay loams, occasionally flooded	Prime farmland if drained	717
6756	Nora silt loam, 6 to 11 percent slopes, eroded	Farmland of statewide importance	37
7050	Kennebec silt loam, occasionally flooded	All areas are prime farmland	14,238
7228	Burchard clay loam, 6 to 11 percent slopes, eroded	Farmland of statewide importance	112
7234	Judson silty clay loam, 2 to 6 percent slopes	All areas are prime farmland	19,949
7812	Smithland-Kenridge silty clay loams, occasionally flooded	Prime farmland if drained	4,584

Map Unit Symbol	Map Unit Name	Rating	Area (acres)
8010	Ida silt loam, 6 to 11 percent slopes, eroded	Farmland of statewide importance	405
8016	Marshall silty clay loam, dry, 0 to 2 percent slopes	All areas are prime farmland	6,909
8019	Marshall silty clay loam, 2 to 6 percent slopes	All areas are prime farmland	6,938
8032	Marshall-Pohocco silty clay loams, 6 to 11 percent slopes, eroded	Farmland of statewide importance	15,225
8035	Marshall-Contrary silty clay loams, 2 to 7 percent slopes	All areas are prime farmland	16,664
8041	Melia silty clay loam, 0 to 2 percent slopes	All areas are prime farmland	2,240
8076	Monona silt loam, 1 to 6 percent slopes, eroded	All areas are prime farmland	802
8097	Monona-Pohocco complex, 6 to 11 percent slopes, eroded	Farmland of statewide importance	1,129
8153	Contrary-Marshall silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	22,328
8155	Contrary-Monona silty clay loams, 6 to 11 percent slopes	Farmland of statewide importance	2,654

Source: United States Department of Agriculture (USDA). Web Soil Survey. Accessed 2019.

Figure 3-1. Prime Farmland and Farmland of Statewide Importance



Source: United States Department of Agriculture (USDA). Web Soil Survey. Accessed 2019.

3.3 Water Quality

The 2018 Nebraska Water Quality Integrated Report (IR) is used to establish a priority ranking of perennial streams based on water quality and beneficial uses. The IR defines multiple categories of waterbodies to help present information in a complete, descriptive manner.

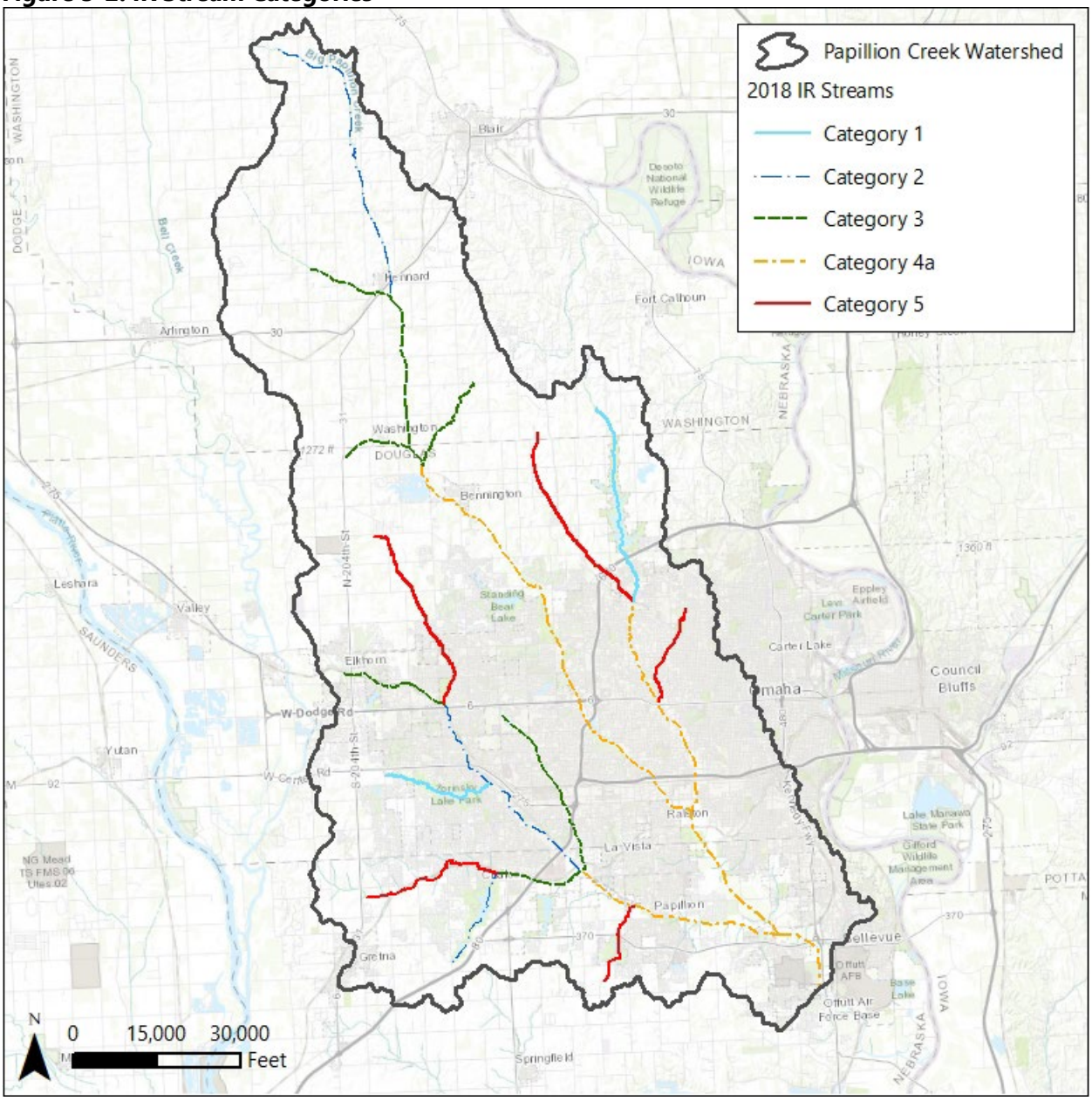
These categories include the following:

- Category 1. Waterbodies where all designated uses are met.

- Category 2. Waterbodies where some of the designated uses are met but there is insufficient information to determine if all uses are being met.
- Category 3. Waterbody where there is insufficient data to determine if any beneficial uses are being met.
- Category 4. Waterbody is impaired, but a total maximum daily loads (TMDL) is not needed.
- Category 5. Waterbody where one or more beneficial uses are determined to be impaired by one or more pollutants and all the TMDLs have not been developed. Category 5 waters constitute the Section 303(d) list subject to EPA approval/disapproval.

There are five stream segments within the Papillion Creek Watershed listed as Category 5 waterbodies. All five of these streams are listed on the State's 303(d) list due to impaired aquatic life. Four of the streams have impaired aquatic communities and one has impaired dissolved oxygen for aquatic life. Additionally, one stream segment is listed for impaired stream aesthetics due to trash located within the stream. There are five stream segments listed as Category 4 waterbodies due to recreational E. coli impairments and an E. coli TMDL was approved in September 2009. See Figure 3-2 for a map of the IR Stream Categories.

Figure 3-2. IR Stream Categories



Nebraska Department of Environmental Quality. 2018 Water Quality Integrated Report. April 2018.

Beneficial uses are assigned to surface waters within or bordering the State of Nebraska according to the Nebraska Department of Environment and Energy (NDEE). All uses are not assigned to all waters and use attainability analyses are utilized on a waterbody by waterbody basis to determine whether the use(s) are applicable. These beneficial uses defined by the NDEE include Primary Contact Recreation, Aquatic Life (Coldwater A, Coldwater B, Warmwater A, and Warmwater B), Water Supply (Public Drinking Water, Agricultural, and Industrial), and Aesthetics. The beneficial uses within the Papillion Creek Watershed are described below.

Primary Contact Recreation. Primary contact recreation applies to surface waters which are used, or have a high potential to be used, for primary contact recreation activities. Primary contact recreation includes activities where the body may come into prolonged or intimate contact with the water, such that water may be accidentally ingested and sensitive body organs (e.g., eyes, ears, nose, etc.) may be exposed. These waters shall be free from toxic substances, alone or in combination with other substances, in concentrations that result in adverse health impacts to humans participating in primary contact recreation and *E. coli* bacteria shall not exceed a geometric mean of 126/100 ml. Six streams and nine lakes within the watershed are listed for Primary Contact Recreation.

Aquatic Life. Aquatic life for each waterbody is ranked as being either Coldwater (Class A or B) or Warmwater (Class A or B). The most downstream reaches of Papillion Creek and Big Papillion Creek and all reservoirs in the 2018 IR Report within the Watershed are listed as Warmwater Class A. Classification for Class A Warmwater Aquatic Life means that these waters provide, or could provide, a habitat suitable for maintaining one or more identified key species (channel catfish) on a year-round basis. These waters can maintain year-round populations of a variety of other warmwater fish and associated vertebrate and invertebrate organisms and plants. The upstream tributaries within the watershed are listed as Class B Warmwater, which means these are waters where the variety of warmwater biota is presently limited by water volume or flow, water quality (natural or irretrievable human-induced conditions), substrate composition, or other habitat conditions. These waters are only capable of maintaining year-round populations of tolerant warmwater fish and associated vertebrate and invertebrate organisms and plants. Key species may be supported on a seasonal or intermittent basis but year-round populations cannot be maintained.

Water Supply. All waters within Papillion Creek Watershed are classified for Class A Agriculture Water Supply. Designation for Water Supply means that Class A Agriculture waters can be used for general agriculture purposes such as irrigation and livestock watering without treatment. Nitrate and nitrite as nitrogen cannot exceed 100 mg/l, selenium cannot exceed 0.02 mg/l, and conductivity cannot exceed 2,000 umhos/cm between April 1 and September 30.

Aesthetics. These waters are also protected for an Aesthetic Beneficial Use, meaning they must be free from human induced pollution that causes noxious odors; floating, suspended, colloidal, or settleable materials that produce objectionable film, colors, turbidity, or deposits; and the occurrence of undesirable or nuisance aquatic life such as algal blooms.

3.4 Regional Watershed Management Plans

This Supplemental Plan-EA includes locations covered under the following regional water resource plans that were considered during the scoping process.

Multi-Reservoir Analysis, Papillion Creek Watershed (2004). This analysis was released in September 2004 by the Sponsor to analyze flooding problems in the watershed as a continuation of the 1967 Report. The analysis assesses the feasibility of the unbuilt dams from the 1967 Report and includes two locations near sites that were identified in the 1966 Work Plan (S-1 and WP-1).

Papillion Creek Watershed Management Plan (2009). The Papillion Creek Watershed Management Plan (Management Plan) was released in April of 2009 by the Papillion Creek Watershed Partnership (PCWP) as

a part of their on-going objective for improved stormwater management within the watershed. The Sponsor is a member of the PCWP. The watershed management plan includes updated stormwater management policies, enabling bonding and a stormwater utility fee system authority for the Sponsor, recommended project and financing, and potential long-term capital improvement projects. This analysis also included two locations near sites that were identified in the 1966 Work Plan (S-1 and WP-1).

Papillion Creek Watershed Management Plan – March 2014 Update. The plan update was released in March of 2014 as part of the PCWP's mission for improved stormwater management. This plan provides progress updates on various management practices, including financial needs for remaining structural projects.

Papio-Missouri River Basin Water Quality Management Plan (2018). This plan was released in June of 2018 by the Sponsor to provide a concise summary of water resource conditions to provide direction and a coordinated approach for addressing nonpoint source pollution. This plan received Section 319 funding through the Nebraska Nonpoint Source Management Program administered by the Nebraska Department of Environment and Energy (NDEE), formerly the Nebraska Department of Environmental Quality (NDEQ), to facilitate the management of nonpoint source pollution.

P-MRNRD Groundwater Management Plan (2018). This groundwater management plan was adopted in February of 2018 for the P-MRNRD boundary, which encompasses the entire watershed. The purpose of the plan is to describe the groundwater resources available, current demands and contamination levels of the resources, and define the methods that the NRD will use to oversee the sustainable use of the groundwater resources.

Papillion Creek and Tributaries Lakes, Nebraska Final Feasibility Report and Environmental Assessment (2021). The USACE developed a final feasibility report, environmental assessment, and Finding of No Significant Impact (FONSI) as part of a General Reevaluation Study of the Papillion Creek to reduce flood risks for the Papillion Creek Watershed. The study identifies opportunities, develops alternatives, and selects a proposed plan to reduce flood risk within the watershed. The Recommended Plan was also the National Economic Development (NED) plan for flood risk management and included Site DS-19. NEPA considerations were analyzed for the site, it was recommended for implementation funding, and the Sponsor has begun purchasing land for construction.

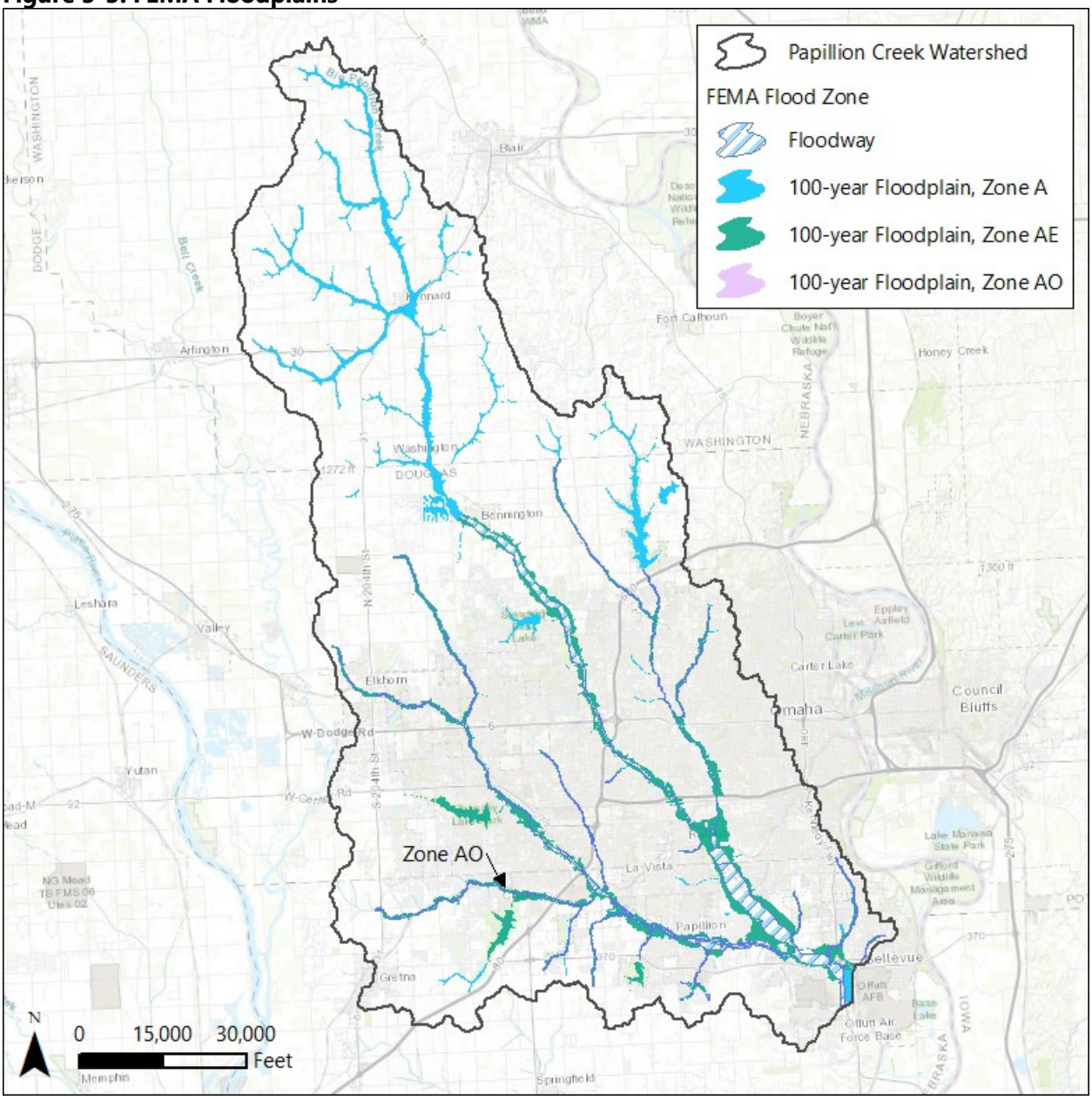
3.5 Floodplains

The Federal Emergency Management Agency (FEMA) 100-year floodplains and floodways are mapped by FEMA along major streams within the watershed and encompass areas with a 1 percent chance of being inundated by a flood event in any given year. The 100-year floodplain is broken down into five types of zones, three of which are included within the watershed. Zone A does not include base flood elevations, Zone AE includes base flood elevations, and Zone AO includes sheet flow, ponding, or shallow flooding and also includes base flood depths above ground elevation. In the Papillion Creek Watershed, Zone A is generally mapped within Washington County, Zone AE within Douglas and Sarpy County, and there is one small area of Zone AO (see Figure 3-3). All areas outside of the 100-year floodplain have less than a 1 percent chance of inundation in any given year.

The delineated FEMA Floodway includes areas with restrictions on cumulatively raising the water surface elevation above a designated height. Development in the FEMA Floodways are regulated to ensure that

there are no increases in upstream flood elevations and are mapped along streams in Douglas and Sarpy Counties, as shown in Figure 3-3 below.

Figure 3-3. FEMA Floodplains



Source: United States Department of Homeland Security. FEMA Flood Map Service Center. NFHL Data. September 2019.

3.6 Wetlands

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) provides detailed information on the abundance, characteristics, and distribution of wetlands within the United States. There are approximately 2,700-acres of NWI areas within the watershed. Approximately half of these NWI areas are riverine wetlands within and along the streams and tributaries. Freshwater emergent wetlands in this

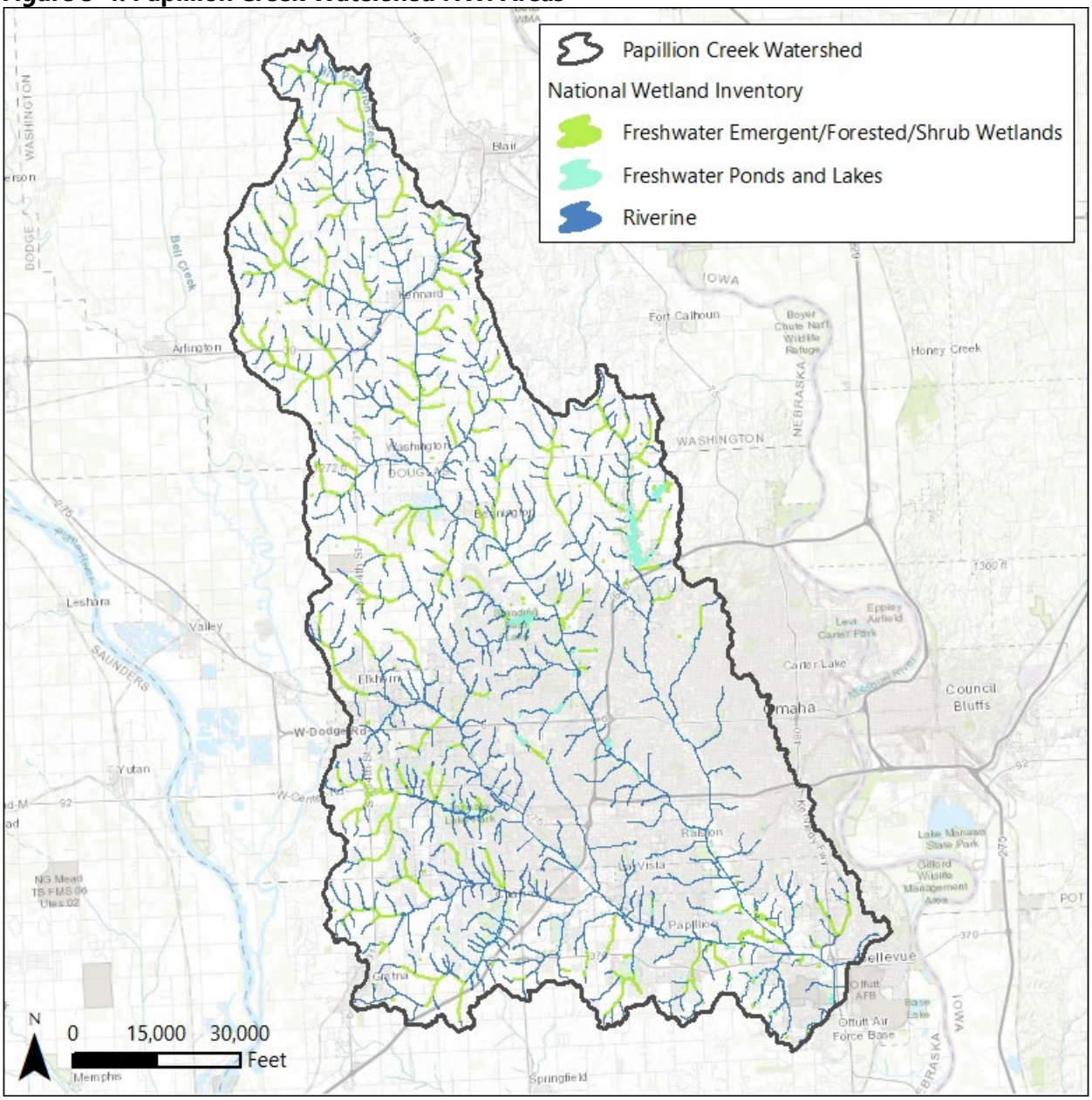
area are typically represented by *Phalaris arundinacea* and freshwater forested/shrub wetlands are typically dominated by *Salix species* and *Populus deltoides*. The acreage within the subwatershed of each type of wetland and the Cowardin classification (as classified by the NWI) are included in Table 3-4 below and shown in Figure 3-4.

Table 3-4. NWI Areas within the Papillion Creek Watershed

Wetland Type	Cowardin Classification	Area (ac)
Freshwater Emergent Wetland	Palustrine emergent, temporarily flooded	21
	Palustrine emergent, seasonally flooded	219
	Palustrine emergent, semi-permanently flooded	1
	Subtotal	241
Freshwater Forested/Shrub Wetland	Palustrine forested, temporarily flooded	200
	Palustrine scrub-shrub, temporarily flooded	23
	Subtotal	224
Freshwater Pond	Palustrine aquatic bed, semi-permanently flooded	17
	Palustrine unconsolidated bottom, semi-permanently flooded	174
	Palustrine unconsolidated bottom, intermittently exposed	23
	Palustrine unconsolidated shore, temporarily flooded	2
	Palustrine unconsolidated shore, seasonally flooded	8
	Subtotal	225
Lake	Lacustrine limnetic unconsolidated bottom, permanently flooded	576
	Lacustrine littoral aquatic bed, intermittently exposed	23
	Lacustrine littoral unconsolidated shore, seasonally flooded	28
	Subtotal	627
Riverine	Riverine lower perennial unconsolidated bottom, intermittently exposed	50
	Riverine intermittent streambed, temporarily flooded	2
	Riverine intermittent streambed, seasonally flooded	1235
	Riverine unknown perennial unconsolidated bottom, permanently flooded	102
	Subtotal	1,388
	Total	**2,704**

Source: United States Fish and Wildlife Service (USFWS). National Wetlands Inventory. NE Wetlands East. Last updated October 2018.

Figure 3-4. Papillion Creek Watershed NWI Areas



Source: United States Fish and Wildlife Service (USFWS). National Wetlands Inventory. NE Wetlands East. Last updated October 2018.

3.7 Streams and Riparian Habitat

Papillion Creek, Big Papillion Creek, Little Papillion Creek, and West Papillion Creek are the four main perennial streams within the Papillion Creek Watershed and flow in a southeasterly direction. These four creeks are perennial except for the headwaters of the Big Papillion Creek and Little Papillion Creek, which are intermittent. The creek lengths and drainage areas of these major streams are included in Table 3-5 and shown in Figure 3-5.

Table 3-5. Stream Lengths with Papillion Creek Watershed

Stream	Drainage Area (mi^2)	Length (mi)
Papillion Creek	384	10.2
Big Papillion Creek	233	39.3
West Papillion Creek	69	16.4
Little Papillion Creek	59	18.4

Source: United States Geological Survey (USGS), National Hydrography Dataset (NHD). Updated: 2020.

Figure 3-5. Watershed Streams

Source: United States Geological Survey (USGS), National Hydrography Dataset (NHD). Updated: 2020.

3.8 Threatened and Endangered Species & Fish and Wildlife Coordination Act

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

On September 27, 2023, both the US Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) Tool and the Nebraska Game and Park Commission's (NGPC) Conservation and Environmental Review Tool (CERT) were run to determine the initial list of species with habitat ranges that intersect the boundaries of the watershed. In total, 11 species were identified including: Northern Long-eared Bat, Piping Plover, Pallid Sturgeon, Monarch Butterfly, Western Prairie-Fringed Orchid, Lake Sturgeon, Sturgeon Chub, American Ginseng, Interior Least Tern, Eastern Black Rail, and the Rufa Red Knot.

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

- Little Brown Bat (*Myotis lucifugus)*- Currently a non-listed proposed species.
- Tricolored Bat (*Perimyotis subflavus*)- Currently a proposed endangered species that is subject to re-classification in Fall of 2023.
- Plains Spotted Skunk (*Spilogale subflavus*)- Currently a non-listed proposed species that is subject to re-classification in Fall of 2023.

Below are the suitable habitat descriptions for each of the 11 species listed in the opening section paragraph based off of information gathered from the IPaC and CERT reports.

Northern Long-eared Bat *(Myotis septentrionalis)* – Federally and State Endangered (as of March 31st, 2023)
This medium-sized bat is approximately 3- to 3.7-inches in length with a wingspan of 9- to 10-inches and is distinguished by its long ears, particularly as compared to other bats in its genus. Their fur color can be medium to dark brown on the back and tawny to pale-brown on its underside. These bats spend winters hibernating in caves and mines (called hibernacula) with constant temperatures, high humidity, and no air currents. During the summer, they roost either singly or in colonies underneath bark, in cavities or in crevices in both live and dead trees, and within structures like barns, sheds, and culverts.

Pregnant females spend summer months roosting in small colonies generally composed of 30 to 60 bats at the beginning of summer. Most of these females will give birth at the same time, which may occur from late May to late July. The predominant and most immediate threat to the Northern long-eared bat is white-nose syndrome, a fungal disease that affects hibernating bats. This fungus causes changes in bats that make them more active than usual and in turn they burn up fat stores needed to survive the winter.

Western Prairie Fringed Orchid *(Platanthera praeclara)* – Federally and State Threatened
This orchid is a native perennial forb distinguished by large, white flowers on a single stem that grows up to 3-feet high. Each flower stalk has up to 40 flowers that have fringed margins and are approximately one inch long. It was historically found throughout the tallgrass regions of North America and now occurs in 30

counties in Nebraska, including the majority of Sarpy County. Habitat includes wet to moist soils with full sunlight in wet unplowed tallgrass prairies and meadows as well as bogs, fens, and sedge meadows.

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

Eastern Black Rail (Laterallus jamaicensis ssp. Jamaicensis) – Federally and State Threatened

The eastern black rail is a sparrow-sized marsh bird, and the smallest rail in North America. Adults have an average length of 4 – 6 inches and a wingspan of 8.7 – 11 inches. The birds are gray-black in coloration, with white speckled upperparts, and has a grayish crown, chestnut-colored nape of the neck, and a short tail. The birds are secretive and difficult to detect. In some locations, males will sing throughout the day and night, while in others they only sing at night. During breeding and wintering seasons, eastern black rails fly very little and will flush for only a short distance when pursued, mostly remaining on the ground and running quickly through dense vegetation.

Rufa Red Knot (Calidris canutus rufa) – Federally and State Threatened

The rufa red knot is a stocky, robin-sized shorebird with relatively short bill and legs, and a wingspan of approximately 20 inches. The birds have a proportionately small head, small eyes, and short neck, and a black bill that tapers from a stout base to a relatively fine length. The rufa red knot is easily recognized during the breeding season by its distinctive red plumage. Nonbreeding season plumage is dusky or pale ashy gray above, with feathers on back narrowly edged in white. The birds prefer coastal marine and estuarine habitats with large areas of exposed intertidal sediments. The birds annually migrate between the far north of the central Canadian Arctic to the extreme south of Tierra del Fuego, making them one of the longest-distance migrants in the animal kingdom.

Piping Plover (Charadrius melodus) – Federally and State Threatened

Piping plover are small shorebirds with a sand-colored upper body, white underside, and orange legs. During breeding season, adults have a black forehead, black breast band, and orange bill. They are migratory birds, breeding in the Northern Great Plains, Atlantic Coast, and shorelines of the Great Lakes in the spring and summer, and wintering in the Gulf of Mexico. The birds prefer wide, flat, sandy beaches with little vegetation. Nesting territories often include small creeks or wetlands.

Interior Least Tern (Sternula antillarum athalassos) – State Endangered

The interior least tern is the smallest North American tern. Adults average 8-10 inches in length, with a 20-inch wingspan. Adults are gray above and white below, with a black cap, black nape and eye stripe, white forehead, yellow bill with a black or grown trip, and yellow to orange legs. They have narrow, pointed wings, and a forked tail. Nesting habitat is typically bare or sparsely vegetated sand, sandbars, and islands. The birds prefer open habitat and tend to avoid thick vegetation.

Pallid Sturgeon (Scaphirhynchus albus) – Federally and State Endangered

Pallid sturgeons are bottom dwelling, slow growing fish that feed primarily on small fish and immature aquatic insects. They have a flattened snout, long slender tail, and are armored with rows of bony plates. While seldom seen, the fish can reach lengths of 6 feet and weights of 80 pounds. Pallid sturgeons are

adapted to the bottoms of large, silty rivers, and prefer a diversity of depths and velocities provided by braided channels and sandbars. The fish are long-lived and slow growing, with females reaching reproductive age around 7-15 years, and up to 10-year intervals between spawning.

Lake Sturgeon (Acipenser fulvescens) – State Threatened

Lake Sturgeon are benthic fish that occupy bottom habitats of large freshwater lakes and rivers. The fish have a long lifespan with males living around 55 years and females living from 80-150 years. They can grow to be over six feet in length and weigh nearly 200 lbs. They spend the majority of their lives in lake and coastal systems, but migrate into large rivers to reproduce, laying their eggs in rocky, swift flowing portions of the river. Larval Lake Sturgeon are often found in riverine habitats with fine sediments and slightly slower water velocities.

Sturgeon Chub (Macrhybopsis gelida) – State Endangered

The sturgeon chub is a small minnow species reaching up to four inches in length. It is recognized by its long, flat snout with a barbell at the corner of its mouth. The fish are brown to olive colored on their back and white or silver on their belly with relatively large and clear fins. The sturgeon chub is found in fast, free flowing rivers with high turbidity and low visibility. It is believed that reproduction occurs in late spring to early summer. Spawning takes place by broadcast in fast-moving water.

American Ginseng (*Panax quinquefolius) – State Threatened*

American Ginseng prefer the understories of wooded areas that contain rich soils and a lot of shade. preferring moist over wet soils. It is most often found on hillsides or wooded ravines. American Ginseng reproduces only through propagation, dispersal and germination of seeds. They bloom from May through July, and contain flowers consist of a cluster of small flowers. Flowers can be self-pollinated or pollinated via a pollinator. Fruits are present from July through August and consist of a striking cluster of bright red berries.

Monarch Butterfly (Danaus plexippus) – Candidate Federally Threatened

Monarch butterflies are large and have bright orange wings with a black outline and black veins. Monarchs lay their eggs on milkweed host plants during the breeding season and the larvae feed on the milkweed plants. Adult monarch butterflies pollinate many flowering plants. Monarchs migrate to warmer areas for the winter. The loss of milkweed and habitat has been the biggest threat to this species. The cutting of fir forests is an additional threat to monarchs' wintering sites. Use of insecticides and herbicides have been linked to the declining monarch butterfly population.

3.9 Fish and Wildlife Habitat

The available wildlife habitat within the watershed is largely disturbed by agriculture and developments. Almost half of the watershed is developed with urban and suburban areas. Rabbits, coyotes, opossums, raccoons, skunks, and squirrels are some of the main types of mammals typically found in the developed areas. Agricultural land is another primary wildlife habitat and is typically home to species that feed on crops such as white-tailed deer, rabbits, mice, squirrels, striped skunks, raccoons, and pheasants. Grassland and pastureland provide habitat for similar species and are scattered throughout the watershed, predominantly as small, discontinuous areas in agricultural areas or adjacent to streams. Grasslands in this part of Nebraska were often historically tallgrass prairies that have since been plowed for agriculture or

development. Small artificial wetland areas have been established in some of the agricultural fields or riverine areas and make up a small percentage of the watershed. These wetlands provide habitat for wildlife species that vary by season and wetland hydrologic condition.

Woodland habitats are commonly located adjacent to streams and make up approximately two percent of the watershed. In eastern Nebraska, woodland community types are considered relatively rare. The woodlands found within the Papillion Creek Watershed pre-settlement would probably have been classified as either the Eastern Dry-Mesic Bur Oak Forest and Woodland ecological system or the Eastern Upland Oak Bluff Forest ecological system (NGPC 2010). The trees that are typical of the watershed include *Fraxinus pennsylvanica* (green ash), *Populus deltoides* (eastern cottonwood), *Morus alba* (white mulberry), *Acer saccharinum* (silver maple), *Ulmus pumila* (siberian elm), *Ulmus americana* (american elm), *Celtis occidentalis* (hackberry), *Gleditsia triacanthos* (honey locust), and *Salix nigra* (black willow). The watershed is most closely represented by the Eastern Riparian Forest within the Eastern Upland Oak Bluff Forest ecological system. Underlined species represent species that are listed as 'most abundant' within the Eastern Riparian Forest community by Rolfsmeier and Steinauer (NGPC 2010). The woodland areas may provide habitat for nesting of migratory birds, which occurs primarily between April 1st and July 15.

In-stream habitat for fish is generally lacking throughout the watershed due to poor substrate conditions and lack of vegetation and cover. Fish habitat is predominantly limited to small impoundments and major streams. Numerous ponds and lakes throughout the watershed provide habitat for fish, many of which are open to the public for fishing. Bluegill, channel catfish, largemouth bass, and walleye are some of the most prevalent fish within these waterbodies. There are four public waterbodies within the watershed that are known to contain trout.

3.10 Migratory Birds and Eagles

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), and the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended, require NRCS to consider impacts on migratory bird and bald and golden eagle populations and habitats. Migratory birds are essentially all wild birds found in the United States with the exception of the house sparrow, starling, feral pigeon, and resident game birds. The protections under MBTA and BGEPA cover the birds and their parts (including eggs, nests, and feathers) and therefore it is unlawful for private individuals or Federal agencies to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The BGEPA includes protections for any disturbance to bald and golden eagles and their nests.

Although the MBTA and BGEPA are applicable year-round, it is accepted that most migratory bird nesting activity occurs in Nebraska during the period of April 1 to July 15. Some migratory birds nest outside of this range. For example, raptors generally nest in woodland habitats during the period of February 1 to July 15, whereas sedge wrens, which occur in some wetland habitat, normally nest from July 15 to September 10.

Many species of migratory birds could be present and could nest within the watershed. Bird species of conservation concern can be found within and near the watershed and those with priority concern are included with habitat descriptions in Table 3-6 below (USFWS). The woodlands surrounding tributaries provide ample habitat for birds protected under the MBTA to nest. Golden eagles breed in western

Nebraska, outside the range of the watershed, and are only found within the watershed during winter months. Bald eagles can be found within the watershed year-round and areas of high and moderate density of bald eagles are near the watershed.

Table 3-6. Birds of Conservation Concern

Species	Potential to Breed in Area	Description
Black-billed Cuckoo* *Coccyzus erythropthalmus*	Yes	This species typically occupies dense, wooded habitats that have strong associations with water. They are often found in environments such as deciduous woods, bogs and marshes, lakeshores, or abandoned farmlands or pastures.
American Golden-plover *Pluvialis dominica*	No	This species breeds in the Arctic tundra during the spring. During winter, the species can be seen in prairies, fields and pastures, mudflats, shorelines, and beaches.
Bobolink *Dolichonyx oryzirorus*	Yes	This bird is often found in hayfields and meadows, but during migration they are usually found in marshes.
Cerulean Warbler *Dendroica cerulea*	Yes	This bird is often found in forested areas with large, tall trees and limited undergrowth.
Chimney Swift *Chaetura pelagica*	Yes	This bird prefers dark spaces such as caves or tree hollows but has also been found in anthropogenic structures such as chimneys and other vertical surfaces that lack light.
Eastern Whip-poor-will *Antrostomus vociferus*	Yes	For most of the year, this species prefers wooded areas, primarily deciduous forests, and will use old leaf litter as nests. Then the species migrates South for the Winter.
Henslow's Sparrow *Ammodramus henslowii*	Yes	Though research is still ongoing to determine preferred habitats, this species often prefers fields and meadows to breed in. They are known to inhabit wet meadows, weedy pastures and lowland prairies.
Hudsonian Godwit *Limosa haemastica*	No	The Hudsonian Godwit is typically found occupying marshes, prairie pools, and mudflats. In the summer they can be found on the edge of the tundra. Their nesting habitat is in the far north where ponds, open woods, and patches of tundra are mixed.
Kentucky Warbler *Oporornis formosus*	Yes	In the summer these birds are often found in deep shaded woods with dense, humid thickets, bottomlands near streams, ravines in upland deciduous woods, and edges of swamps. In the winter the Kentucky Warbler prefers the dense lowland forests and second growth.
Lesser Yellowlegs *Tringa flavipes*	No	These birds often occupy marshes, mudflats, shores, and ponds, and in the summer they favor open boreal woods. They occur widely in migration, including coastal estuaries, salt and fresh marshes, and edges of lakes and ponds, typically more common on freshwater habitats.
Prothonotary Warbler *Protonotaria citrea*	Yes	The Prothonotary Warbler can typically be found near wooded swamps. They nest near lakes, rivers, and ponds.

Species	Potential to Breed in Area	Description
Red-headed Woodpecker *Melanerpes erythrocephalus*	Yes	This bird can be found in groves, farm country, orchards, shade trees, and large scattered trees.
Ruddy Turnstone *Arenaria interpres morinella*	No	These are stout shorebirds that breed in the high arctic tundra's and winter along the Atlantic Coast. They may be seen in the area, passing over during migration, but will only stay for a short period of time.
Rusty Blackbird *Euphagus carolinus*	No	The Rusty Blackbird can be found in river groves and wooded swamps. During migration and winter, these birds favor areas with trees near water such as wooded swamps and riverside forest. They have also been known to forage in open fields and cattle feedlots.
Short-billed Dowitcher *Limnodromus griseus*	No	These birds are usually found in mudflats, tidal marshes, and pond edges. They favor freshwater ponds with muddy margins when they are inland.
Upper Sandpiper *Bartramia longicauda*	Yes	Prefer open densely grassed areas, and breed in small, loose nesting colonies. The breeding season lasts from early-to-late summer.
Wood Thrush* *Hylocichla mustelina*	Yes	This bird occupies mainly deciduous woodlands. During migration they are found in various kinds of woodland.

3.11 Flood Damages

Flood damage is a major concern within the watershed, which has a history of damaging floods. Approximately 40 percent of annual precipitation occurs during the summer thunderstorm season and floods or threats of floods occur almost every year during this season. The most damaging flood event occurred in June of 1964 and resulted in the loss of seven lives. Several recent flood events (1994, 1997, 1999, 2004, 2008, 2014, and 2019), three of which resulted in loss of life, highlight the severe flood risks that remain within the watershed despite flood-control measures implemented since the 1964 flood event (USACE 2019). Papillion Creek consistently results in damage from flood events due to the convergence of several major streams on the Papillion Creek. Significant urban development is progressing within the watershed, predominantly located in the upper portions of the watershed, and will continue to increase the damage potential from flooding. Despite construction of flood control, substantial potential for flood damages remains due to development and agriculture adjacent to streams and rapid development within the watershed.

Existing urban, road, and bridge flooding is extensive along West Papillion Creek (shown within the area of benefit downstream of Site WP-1 in Appendix B). Existing flood damages for various storm events are shown below in Table 3-7.

Table 3-7. Existing Flooding Damages Downstream of Site WP-1

Flood Event	Road and Bridge Damages	Structure and Content Damages
50 year	$730,400	$1,417,800
100 year	$935,000	$6,138,500
500 year	$3,029,400	$55,973,800

3.12 Historic and Cultural Resources

Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. § 306108) and its implementing regulations (36 CFR Part 800) require federal agencies to take into account the effect of undertakings on historic properties. Historic properties are defined as cultural resources that are listed on or are eligible for listing on the National Register of Historic Places (NRHP). The Section 106 compliance process includes the following:

- Identify consulting parties.
- Identify cultural resources located within the Area of Potential Effect (APE) and evaluate their eligibility for inclusion on the National Register of Historic Places (NRHP).
- Assess the effects of the undertaking on historic properties within the APE.
- Consult with the State Historic Preservation Officer, federally recognized Indian tribes, the Advisory Council on Historic Preservation (as appropriate), and other interested parties to resolve adverse effects.

Cultural resources are physical or other expressions of human activity or occupation and include archeological sites, buildings, bridges, business districts, culturally significant landscapes, isolated artifacts or features, culturally sacred places, and objects of cultural and historic significance. In order for a cultural resource to be eligible for the NRHP, it must be associated with events significant to the broad patterns of history; associated with the lives of persons significant in the past; embody distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity; and/or must yield or be likely to yield, information important to history or prehistory. If an undertaking will alter, damage, or destroy a historic property, the agency has a responsibility to avoid, minimize, or mitigate the adverse effect.

Several formal archeological surveys have been completed in the general project area, and over 200 archeological sites representing all periods of human occupation have been recorded within the watershed. Only five previously recorded archeological sites are located within one mile of the Preferred Alternative. These resources consist of historic farmsteads, prehistoric artifact scatters, and an early 20th century railroad grade.

Several properties listed on the NRHP are located within the watershed, including Father Flanagan's Boy's Home, Fort Crook Historic District, Gold Coast Historic District, the South Omaha Main Street District, portions of the Lincoln Highway, and two Central Plains Tradition archeological sites. None of these properties are located within 0.5-miles of the proposed area of potential effects.

2019 Cultural Resource Inventory: A cultural resource inventory consisting of background research and field surveys of the APE of the Preferred Alternative was completed in October and November of 2019. Background research did not identify any properties listed on or eligible for the National Register of Historic Properties within the APE. The field surveys identified only one cultural resource site, a segment of an early 20th century railroad grade. The railroad grade was evaluated against the criteria of eligibility for listing on the National Register of Historic Places and was determined not eligible in consultation with the Nebraska State Historic Preservation Office in August 2021.

3.13 Social and Demographic Data

The watershed is rapidly developing and there are no anticipated major social, cultural, or political factors that may influence major changes in land use, speed of development, or management of resources. The watershed is located within Douglas, Sarpy, and Washington counites in Nebraska. There are over 170 census tracts located within the Papillion Creek Watershed. The watershed is part of the Omaha-Council Bluffs Metropolitan Statistical Area, which encompasses multiple population centers. The City of Omaha is the largest population center in the area. Populations of the counties and major population centers within the watershed are shown below in Table 3-8. As shown in Table 3-8, populations within the watershed have been increasing over the last 10 years.

Table 3-8. Social and Demographic Data

Population Centers	2010 Populations[1]	2017 Populations[2]	2020 Populations[3]
Douglas County	517,110	549,706	584,526
City of Omaha	408,958	463,081	486,051
City of Ralston	5,943	7,348	6,494
City of Bennington	1,458	1,611	2,026
Sarpy County	158,840	175,188	190,604
City of Papillion	18,894	19,478	24,159
City of La Vista	15,758	17,062	16,746
City of Bellevue	50,137	53,040	64,176
Offutt Air Force Base	4,644	5,142	5,363
City of Gretna	4,441	5,045	5,083
Washington County	20,234	20,414	20,865
City of Blair	7,990	8,011	7,790

[1]*Source: 2010 Census Data*

[2]*Source: 2017 American Community Survey (ACS) 5-Year Estimates*

[3]*Source: 2020 Census Data*

In accordance with the Environmental Justice Departmental Regulation, it is imperative that the project is compliant with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Although this project will provide many benefits, it is important to ensure any negative human health and/or environmental impacts are not disproportionately carried by minorities or low-income populations. Demographic and poverty data within the watershed are described below to ensure that the project will not disproportionally impact minority or low-income groups.

Table 3-9 shows the percentage of minorities within the three counties, the state of Nebraska, and the United States from 2020 Census data. A minority is a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. As shown in Table 3-9, the percentage of minorities within the three counties vary significantly, with Douglas County having a significantly larger percent minority population than Sarpy and Washington Counties. The percentage of minorities within Douglas County is higher than the percentage of Nebraska but lower than the United States. Sarpy and Washington Counties, however, have percent minority populations below both the state and the country percentages.

Table 3-9. 2020 Census Demographic Data

Category	Douglas County	Sarpy County	Washington County	Nebraska	United States
Percent Minority	31.8%	20.0%	6.5%	21.6%	38.4%

Source: United States Census Bureau. 2020 Census.

Table 3-10 shows the percentage of people of all ages and minors (people under 18-years of age) below the poverty line within the watershed's counties, the state of Nebraska, and the United States from 2017 Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program data. Low-Income populations are identified as the populations living below the poverty line. As shown in Table 3-10, the percentages of all people and minors living below the poverty line in Douglas County are greater than Nebraska percentages and lower than the United States. Sarpy and Washington County have lower percentages in poverty than the state and nationwide percentages.

Table 3-10. 2020 Poverty Data

Category	Douglas County	Sarpy County	Washington County	Nebraska	United States
Percent in Poverty (all ages)	9.8%	4.9%	5.3%	9.2%	11.9%
Percent in Poverty (under 18)	10.2%	5.1%	6.3%	10.1%	15.7%

Source: United States Census Bureau. 2020 SAIPE data.

The minority, low income, and demographic index were analyzed with the Environmental Protection Agency's (EPA) Environmental Justice Screening and Mapping Tool (EJ SCREEN). The 2019 EJ Screen results showed 541 census block groups within the watershed. These 541 census block groups have ranges between 0 to 95 percent minority and 0 to 93 percent low-income (defined as income less than two times the poverty level). The demographic index (a combination of percent minority and percent low-income) varies between 0 and 87 percent within the watershed, which is in the 0 to 99th percentile for the state of Nebraska. The average demographic index, percent minority, and percent low income are 24 percent, 23 percent, and 26 percent, respectively.

Environmental justice communities, specifically minorities, low income, and Indian Tribes (NWPH 600.30) are not located within the affected resources areas of the 7 project sites.

3.14 Public Health and Safety

The Papillion Creek Watershed is a mix of urban and rural and has been continually developing. There is a potential risk to loss of life, property, and essential public services due to flooding. Multiple studies have

analyzed flooding potential and developed a watershed approach to flood risk reduction (see Sections 1.2 and 3.4). Additionally, some streams are experiencing major degradation and widening and pose a risk to the public due to high and eroding banks. Neighborhoods are often developed near watershed streams and as degradation and widening occur, stream footprints encroach into yards and homes. Stream degradation and bank failures also lead to infrastructure damage and interruptions to essential services, particularly to sanitary sewer and power lines that are frequently located adjacent to and cross under stream corridors within the watershed.

3.15 Ecosystem Services

An ecosystem services framework is required by the PR&G and provides for an integrated approach that allows consideration and transparent evaluation of the benefits (both tangible and intangible) and trade-offs of potential alternatives. Four categories of ecosystem services are described in PR&G and are included below for ease of reference.

1. **Provisioning services** are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass.
2. **Regulating services** maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe – examples include flood and disease control, water filtration, climate stabilization, or crop pollination.
3. **Supporting services** refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.
4. **Cultural services** make the world a place in which people want to live – recreational use, spiritual, aesthetic viewsheds, or tribal values.

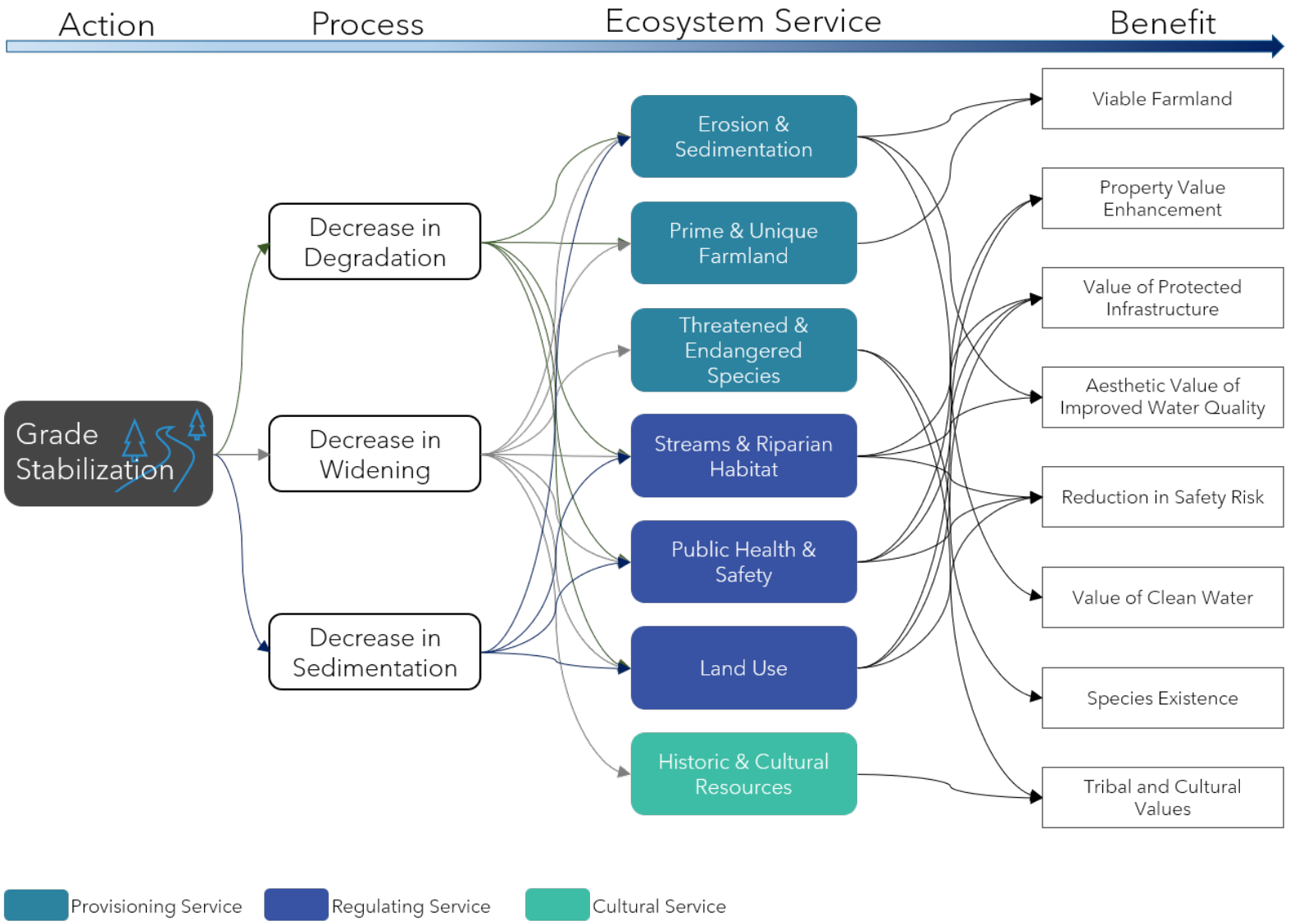
Project scoping (see Chapter 2) led to the determination of the number and variety of ecosystem services (or resources of concern) to be considered in the analysis and the existing conditions of these resources have been described in this chapter. Each resource of concern (or ecosystem service) is grouped into four service categories, shown below in Table 3-11. Ecosystem service flows are both monetary and non-monetary and appropriate metrics should be based on current methodology to quantify impacted services over time and project- and regional-specific information and values. A concept diagram included below as Figure 3-6 helps to provide a visual representation of the linkages between actions and social values.

Table 3-11. Categories of Ecosystem Services

Category	Resource
Provisioning Services	Erosion and Sedimentation
	Prime and Unique Farmland
	Threatened and Endangered Species
	Migratory Birds/Bald and Golden Eagles
Regulating Services	Water Quality
	Regional Water Management Plans
	Floodplain Management
	Streams and Riparian Habitat

Category	Resource
	Wetlands
	Flood Damages
	Public Health and Safety
	Climate Change
	Land Use
	Fish and Wildlife Habitat
Cultural Services	Historic and Cultural Properties
	Environmental Justice

Figure 3-6. Grade Stabilization Ecosystem Services Concept Diagram



4.0 ALTERNATIVES

Project formulation revolved around the project purpose and need at each previously identified site, existing resource conditions, originally identified preferred alternatives, and changes in design, technology, and environmental policies and requirements. Plans that could be implemented under the authorities of other Federal agencies, state and local entitles, and nongovernmental interests were also considered. Accordingly, local, state, regional, Federal, and nongovernmental interests participated in the formulation process. Measures considered in the formulation of alternative plans included those measures believed to be effective, efficient, and acceptable in achieving or satisfying the purpose at each previously identified site. Table 4-1 provides a summary of the recommended alternatives in the 1966 Work Plan.

Table 4-1. Recommended Alternative in 1966 Work Plan

Site	Drop (feet)	Type of Structure[1]	Hazard Classification[2]
W-5	25	Drop Inlet	b (Significant)
D-78	14	Drop Inlet	b (Significant)
D-2	20	Drop Inlet	b (Significant)
D-31 (WP-1)	19	Drop Inlet	b (Significant)
S-1	17.5	Drop Inlet	b (Significant)
S-5	24	Drop Inlet	b (Significant)
S-15	25	Drop Inlet	b (Significant)

[1]Drop inlet consists of earthen dam with riser, principal spillway pipe, and grassed emergency spillway. Typical structure detail included in Appendix D.
[2]Class b (Significant Hazard) classification based on projected build-out at time of 1966 Work Plan development.

4.1 Formulation Process

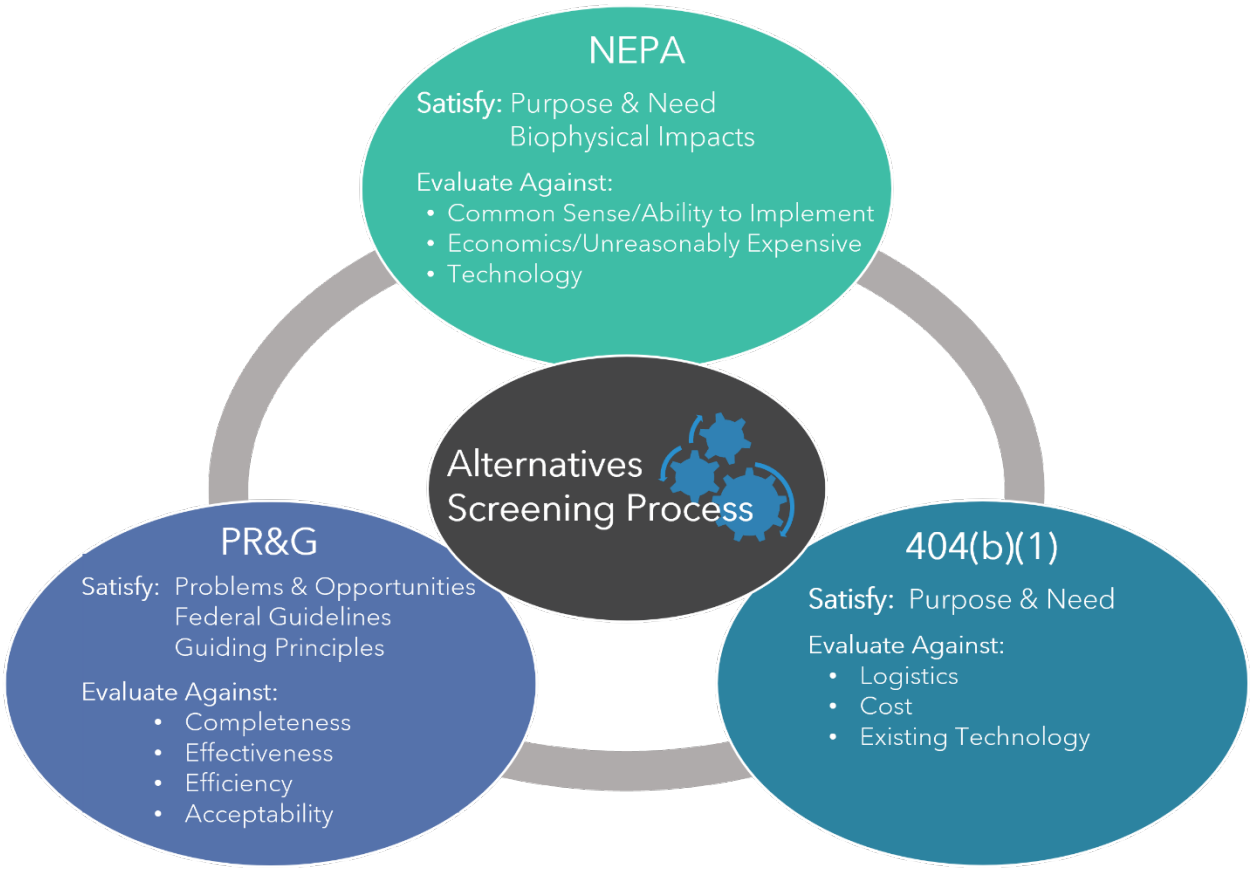
The formulation process is the basis for selecting combinations of measures to include as alternatives. The combination of alternatives developed are based on measures that could meet the project site purposes and take into consideration multiple Federal requirements to streamline the planning and decision-making process. This analysis is meant to satisfy the alternative development and screening criteria requirements of NEPA, Clean Water Act (CWA) Section 404(b)(1) guidelines, and Principles, Requirements, and Guidelines (PR&G) for Federal investments in water resources. This means that a wider range of alternatives and a varied screening process was used to satisfy all applicable Federal alternatives analysis requirements to reduce the time, cost, and cumbersome agency reviews that often come with multiple analysis documents. Table 4-2 below gives a description of when each of these regulations are required.

Table 4-2. Federal Requirements for Alternatives Analyses

NEPA	404(b)(1)	PR&G
National Environmental Policy Act requires Federal agencies to assess the environmental effects of proposed major Federal actions prior to making decisions.	Clean Water Act guidelines for an alternative analysis when an Individual Permit for fill in jurisdictional wetlands and/or streams is required from the USACE.	Alternatives analysis requirements when Federal funds are used for water projects. Agencies have specific guidelines, including the USDA (who is funding this Supplemental Plan-EA).

Once an appropriate range of alternatives is selected, each alternative is screened to determine if it should be carried forward for a more detailed analysis. Detailed analysis includes a more refined preliminary design, analysis of environmental and social consequences (both beneficial and detrimental), and a detailed economic analysis. This pre-screening allows for a detailed look at a narrower range of alternatives, which allows for a more efficient decision-making process. Different Federal requirements and guidelines present different screening criteria based on the overarching goal of the policy. This screening criteria is shown in Figure 4-1 below.

Figure 4-1. Alternative Screening Process



Tables 4-3a, 4-3b, and 4-3c summarize the alternatives, the screening process summary, and whether each alternative was carried forward for detailed study. Alternatives not carried forward for detailed study are included in Section 4.2 and further information is provided in Appendix D. Costs included in the table include construction, project administration, engineering, construction observation, permitting, and mitigation.

Table 4-3a. Range of Alternatives and Determination for Detailed Study for Grade Stabilization Sites[1]

Site	Goal	FWOFI	Rigid Drop Structures			Loose Rock Structures	Channel Restoration	Loose Rock Structures with Channel Bank Stability
			Drop Spillways	Chute Spillways/ Channel Linings	Drop Inlet Spillways (High Hazard Dams)			
W-5	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$4,625,900 Economics/Cost/ Efficiency	$2,724,700 **Carried Forward**	$6,560,000 Economics/Cost/ Efficiency	N/A
D-78	Grade Stabilization	**Carried Forward**	Logistics	Logistics	$10,720,900 Economics/Cost/ Efficiency	$1,191,700 **Carried Forward**	$5,400,000 Economics/Cost /Efficiency	N/A
D-2	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$5,584,000 Economics/Cost/ Efficiency	$1,774,500 **Carried Forward**	$6,151,000 Economics/Cost/ Efficiency	N/A
S-15	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$8,506,900 Economics/Cost/ Efficiency	$1,226,700 **Carried Forward**	$6,450,000 Economics/Cost/ Efficiency	N/A
S-5	Grade Stabilization / Improved Safety	**Carried Forward**	Logistics	**Carried forward** with Channel Restoration Alternative	Logistics	Purpose and Need	$3,770,200 **Carried Forward**	$5,875,800 Economics/Cost/ Efficiency

[1]If an alternative is not carried forward for detailed study, the reason is listed in the table. Logistics includes inability to implement due to specific site conditions and not meeting the Federal objective. Information is provided in the following sections and Appendix D to support the rationale.

Table 4-3b. Range of Alternatives and Determination for Detailed Study for Site S-1[1]

Site	Goal	FWOFI	Sediment Basin	Maintenance Dredging of DS-19	Conservation Measures	Small Sediment Basins	Rigid Drop Structures	Drop Inlet Spillways (High Hazard Dams)	Loose Rock Structures
S-1	Sediment Reduction	**Carried Forward**	$3,491,300 **Carried Forward** in combination	$2,605,700 **Carried Forward** in combination	Purpose	Purpose	N/A	Logistics/ Ability to Implement/ Efficiency	N/A
S-1	Grade Stabilization	**Carried Forward**	N/A	N/A	N/A	N/A	**Carried Forward** in combination	Logistics/ Ability to Implement/ Efficiency	**Carried Forward** in combination

[1]*If an alternative is not carried forward for detailed study, the reason is listed in the table. Information is provided in the following sections and Appendix D to support the rationale.*

Table 4-3c. Range of Alternatives and Determination for Detailed Study for Site WP-1[1]

Site	Goal	FWOFI	Nonstructural	Floodplain Acquisition	Current Conservation Measures	Low Impact Development	Created and Restored Wetlands
WP-1	Flood Risk Reduction	**Carried Forward**	Purpose	$288,600,000 Economics/Cost/ Efficiency	Purpose	Logistics/ Ability to Implement/ Efficiency	Purpose
		Stream Restoration	**Conveyance**	**Raise Existing Levees & Bridges**	**Small Detention Dams**	**Regional Detention Site (Dry Dam)**	**Regional Detention Site (Wet Dam)**
		Purpose	Purpose	Purpose	Purpose	**Carried Forward** $15,390,800	**Carried Forward** $13,663,500

[1]*If an alternative is not carried forward for detailed study, the reason is listed in the table. Information is provided in the following sections and Appendix D to support the rationale.*

4.2 Alternatives Eliminated from Detailed Study

The alternatives eliminated from detailed study were analyzed on a site-by-site basis. The following alternatives either did not satisfy the project purpose and need (problems and opportunities) or were otherwise removed from detailed study due to the factors shown in Figure 4-1. To reduce redundancy and improve readability, these are first grouped by site goal and then by specific site where clarity is needed. Alternatives are also shown in Tables 4-3a, 4-3b, and 4-3c above.

4.2.1 Site Goal: Grade Stabilization

Applicable Sites: W-5, D-78, D-2, S-5, S-15

The following briefly describes alternatives that were eliminated from detailed study for sites that have an identified purpose of grade stabilization (sites W-5, D-78, D-2, S-15, and S-5).

4.2.1.1 Standard NRCS Grade Stabilization Structures

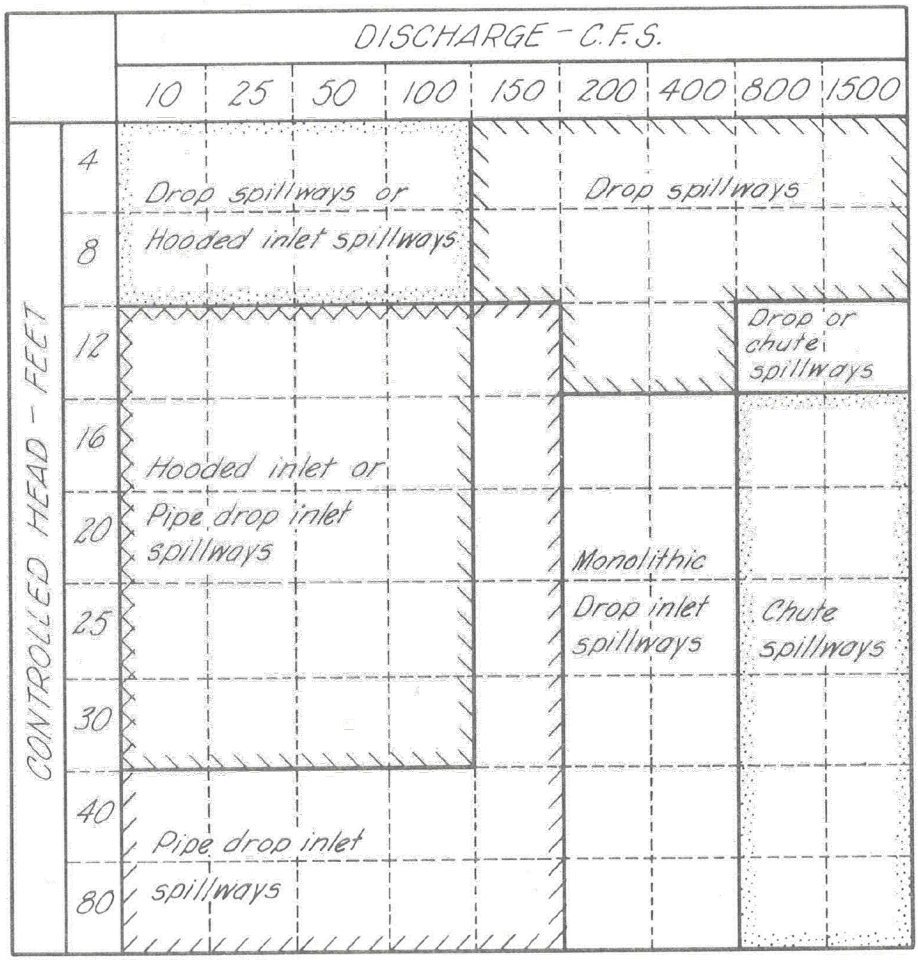
Applicable Sites: W-5, D-78, D-2, S-5, S-15

Standard grade stabilization structures as presented in the USDA NRCS National Engineering Handbook (NEH) Part 650 - Engineering Field Handbook were recommended for all sites in the 1966 Work Plan and, more specifically, drop inlet structures were recommended at all sites discussed in this Supplement (Table 4-1). Site visits and desktop surveys were used to determine if standard NRCS grade control structures could still be reasonable alternatives. Structure types, techniques, and design guidelines presented in Technical Supplement (TS)-14G, NEH Part 650, NEH Part 654, 584-CPS-1, NE-410-1, and others were referenced during the analysis. Many alternatives were considered and rejected due to site conditions. A brief description of some of these are included below.

Although all of sites in this Supplement are experiencing bed degradation, existing channel profile drops as identified in the 1966 Work Plan are no longer evident at Sites W-5, D-78, and D-2. This yields a portion of the structures identified in Figure 6-4 of NEH Part 650 (figure included below as Figure 4-2) unreasonable as they do not fit the site conditions. There is one large headcut progressing upstream toward HWY 370 at Site S-15, a large existing drop at the 180th Street culvert at Site S-5, and at an abandoned bridge crossing at Site W-5 and therefore these are considered further at specific locations within those sites, as discussed in the sections below.

Grade Stabilization Alternatives Eliminated from Detailed Study
Sites: W-5, D-78, D-2, S-5, S-15

Figure 4-2. General Guide to Structure Selection[1]



[1]*Source: NEH Part 650, Figure 6-4*

Drop inlet spillways (i.e. earthen embankment dams) were given further consideration due to the recommendation in the 1966 Work Plan and the potential additional benefits of flood risk reduction and water quality. Consultation with Nebraska Department of Natural Resources (NDNR) Dam Safety indicated that all structures at these locations would need to be designed to high hazard dam criteria due to development in the watershed and existing infrastructure. High hazard potential means that a failure or misoperation of the dam results in a probable loss of human life (NDNR, 2013). Further information on this alternative is provided below.

4.2.1.2 High Hazard Dam Alternative

Applicable Sites: W-5, D-78, D-2, S-5, S-15

This alternative involves the construction of an earthen embankment dam and was considered at Sites W-5, D-78, D-2, S-5, and S-15. The dams were designed as high hazard flood control structures due to existing development and predicted future build-out downstream of these structures that would result in a probable loss of human life in the case of the dam failure. Design specifications described in NRCS Technical Release 210-60 (TR 210-60) were followed to set the elevations for the dams using National Oceanic and Atmospheric Administration (NOAA) Atlas 14

Grade Stabilization Alternatives Eliminated from Detailed Study
Sites: W-5, D-78, D-2, S-5, S-15

precipitation values and the NRCS Water Resources Site Analysis Program (SITES) program. Wet and dry dams are sized to the same design criteria and therefore this preliminary analysis encompasses both types of dams. If the alternative were found to be reasonable, both wet and dry dams would be analyzed separately. Additional design information can be found in Appendix D, including figures that show the locations and extents of each high hazard dam alternative that was analyzed. Due to property constraints caused by existing and platted development there is no plausible location at Site S-5 and therefore it is not included in a figure.

Costs were determined at each site to assess if the alternatives were reasonable and were guided by the assumptions listed below. Unit costs, provided in Appendix D, were based on local knowledge and similar, recent projects in the local area. Total project costs for each site are included in Table 4-3a.

- Embankment volume and extents were determined with 3H:1V side slopes, a 10-foot wide access berm, a 10-foot wide buttress on the upstream face, and a 30-foot long stability berm on the downstream face.
- Rock riprap would be placed above and below the permanent pool elevation on the upstream face to protect from wind action.
- Land will be purchased for the embankment, auxiliary spillway, and top of dam extents. When land purchase area encompasses over ¾ of the parcel, the whole parcel will be purchased.
- Any homes within the top of dam elevation extents will be purchased.
- A 20 percent contingency was added to the construction costs to account for unforeseen expenses during construction.

This alternative meets the purpose and need and would provide additional benefits in the form of flood risk reduction, water quality, ecological improvements, and passive recreation. However, costs for this alternative are unreasonably expensive in comparison to other available alternatives for the purpose of grade stabilization. This alternative would also create significantly more impacts to waters of the United States (WOTUS). Therefore, this alternative is not reasonable and was not carried forward for detailed analysis at Sites W-5, D-78, D-2, S-5, and S-15.

4.2.1.3 Nonstructural Alternatives

Applicable Sites: W-5, D-78, D-2, S-5, S-15

Nonstructural alternatives include changes to policy, existing land use, infrastructure, and/or management practices to meet the project purpose and need and potentially minimize adverse changes and impacts to existing hydrologic, geomorphic, and ecological processes. To meet the grade stabilization purpose, a nonstructural alternative (or combination of nonstructural/structural alternatives) would need to halt and prevent future stream degradation including progressing headcuts.

Stream degradation is a known problem within the watershed due to the deep deposits of highly erosive Peoria Loess soil types. Existing policies for development have been established through the PCWP and include stream setbacks, maintaining peak flows on significant developments, and others (PCWP, 2014). Although policies can help to slow stream degradation or protect future developments from being built too close to a stream, public and regulatory policies cannot prevent

the headcut progression that is common in the area. Changes in land use are equally as ineffective. One potential nonstructural alternative is to buy the land that is expected to fall within the stream limits as the streams continue to degrade and widen and allow the channel banks to become higher and the stream footprint to continue to expand. However, this would remove the farmland and residential homes that this project is intending to protect and therefore does not meet the project purpose. This alternative also leaves risk to public health and safety as stream banks can frequently become over 30 feet tall, posing a significant safety risk to residents. Risks to infrastructure, including sewer lines and power poles, previously placed adjacent to and crossing under the streams also remain in this alternative. Relocating infrastructure in conjunction with buying property would also be exorbitantly expensive, would not be socially acceptable, and would be ecologically detrimental as streams would continue to degrade and widen thus leading to further habitat loss. No nonstructural alternatives for grade stabilization were brought forward for detailed analysis.

4.2.1.4 Stream Restoration Alternative

Applicable Sites: W-5, D-78, D-2, S-15

This alternative involves the implementation of a two-stage channel design to meet the project purpose of grade stabilization and to improve stream and ecological function. This alternative would include the grade stabilization structures as well as in-channel grading according to the NRCS Two-Stage Channel Design (NRCS 2007). The two-stage channel design involves grading the channel to create low channel benches that function as floodplains to restore natural alluvial channel processes. This alternative would reduce in-stream erosion due to the shallower flows during large events, which would stabilize streams, lower in-stream maintenance, and improve water quality and ecological function. The implementation of loose rock grade stabilization structures according to detailed methodology included in Appendix D (in conjunction with the two -stage channel design) would also be required to prevent future headcut progression. Assumptions and design criteria utilized to determine costs are listed below.

- Floodplain benches would be graded at the ordinary high water mark (OHWM) elevation to be at the elevation where benches are anticipated to form.
- Floodplain bench widths were determined using a 4:1 floodplain bench width to bankfull channel width ratio.
- Channel bank slopes were graded with 3H:1V side slopes.
- The Manning's equation was used to verify adequate floodplain widths to ensure a stable stream velocity of 3 feet per second at bankfull conditions.
- The stream slope was selected based on NEH stable channel design for Loess soils with plasticity index of less than 15.

A representative cross section and plan view of this alternative for Site D-2 is provided below in Figures 4-3 and 4-4, respectively.

Grade Stabilization Alternatives Eliminated from Detailed Study
Sites: W-5, D-78, D-2, S-15

Grade Stabilization Alternatives Eliminated from Detailed Study
Sites: W-5, D-78, D-2, S-15

Figure 4-3. Stream Restoration Alternative, Cross Section

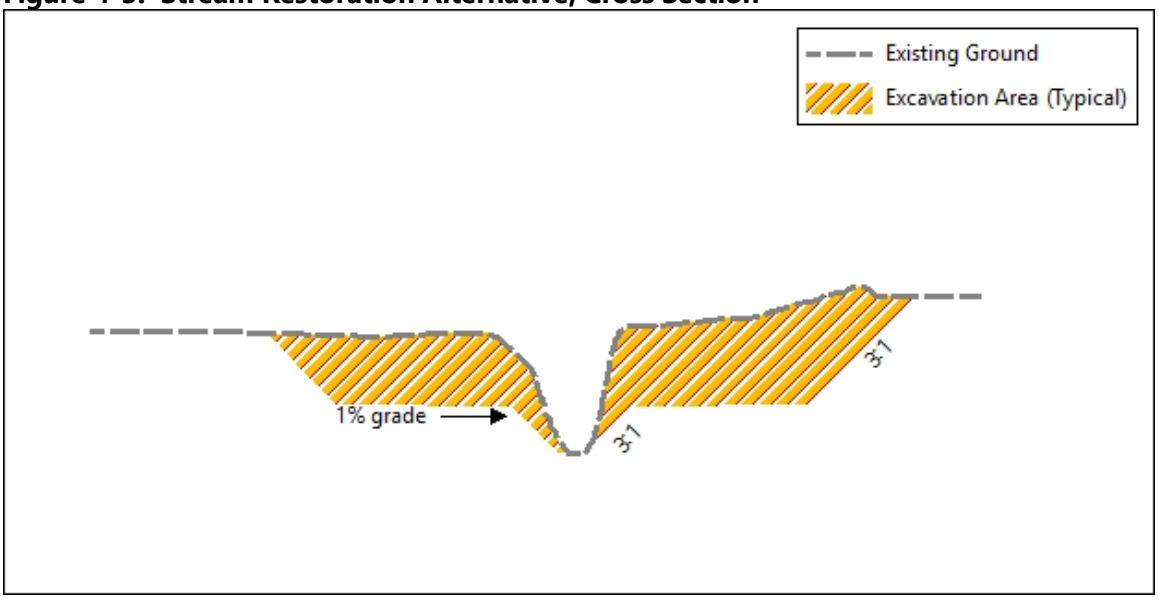
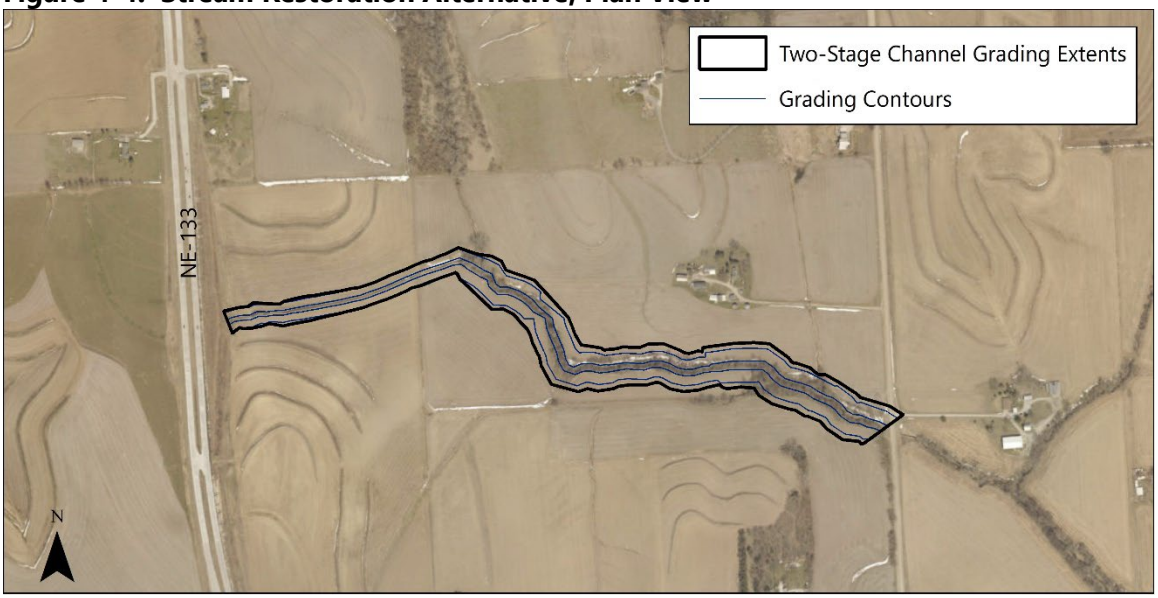


Figure 4-4. Stream Restoration Alternative, Plan View



Costs were determined to assess if the alternatives were reasonable and are included in Table 4-3a. Unit costs, provided in Appendix D, were based on local knowledge and similar, recent projects in the local area. Costs for each site were determined based on specific excavation quantities calculated at Sites D-2 and S-5 and then applied to the other sites. Although land acquisition/easements would be required, these costs were not determined due to the already exorbitant costs without these values included.

This alternative meets the Project's purpose and need and would provide grade control benefits. However, costs for this alternative are unreasonably expensive in comparison to other available alternatives. This alternative also removes much of the land that other alternatives would protect from future channel degradation and widening because of required grading extents. Therefore,

this alternative is not reasonable and was not carried forward for detailed analysis at Sites W-5, D-78, D-2, and S-15.

4.2.1.5 Loose Rock Structures

Applicable Sites: S-5

The loose rock structures alternative at Site S-5 involves the implementation of rock riprap grade stabilization structures within Beadle Creek that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream. Stream degradation occurs within the watershed due to highly erosive soil types and it is predicted that streams will continue to degrade until reaching a stable stream bed slope. Beadle Creek is nearly fully degraded, but rock structures could be used to prevent further degradation as the stream reaches the stable stream slope. Appendix D provides detailed information about the design and placement of loose rock structures.

As stated in Section 1.3, the purpose of Site S-5 is to provide grade stabilization AND to improve safety along the Beadle Creek stream corridor between Lillian Street and the confluence of South Papillion Creek. This alternative does not improve safety along the Beadle Creek stream corridor and was therefore not carried forward for detailed analysis.

4.2.1.6 Loose Rock Structures with Channel Bank Stability

Applicable Sites: S-5

The loose rock structures with channel stability alternative at Site S-5 involves the implementation of rock riprap grade stabilization structures within Beadle Creek that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream as well as laying the channel banks back to provide less steep and more stable bank slopes. Stream degradation occurs within the watershed due to highly erosive soil types and it is predicted that streams will continue to degrade until reaching a stable stream bed slope. Beadle Creek is nearly fully degraded, but rock structures could be used to prevent further degradation as the stream reaches the stable stream slope. Appendix D provides detailed information about the design and placement of loose rock structures.

Ideal channel bank slopes are 3:1 (horizontal:vertical) as they are inherently stable using area soils and would significantly reduce public safety concerns. Steeper slopes would likely lead to failure and increased risk to public safety. Due to the extremely high velocities and subsequent stream power, green armor matting would be required along the channel bed and up the channel slopes for the entire stretch of protected Beadle Creek. The existing sanitary sewer and power poles that are adjacent to Beadle Creek (shown in Figure 4-5, below) would require relocation and subsequent property easements (and potentially property buyouts) with this alternative. This alternative would improve public safety but would not decrease the over 20-foot-tall banks and therefore would not remove the public risk. This alternative also has an exorbitant cost (almost $5.9 million without including any property costs) and was therefore not carried forward for detailed analysis. Cost details are provided in Appendix D.

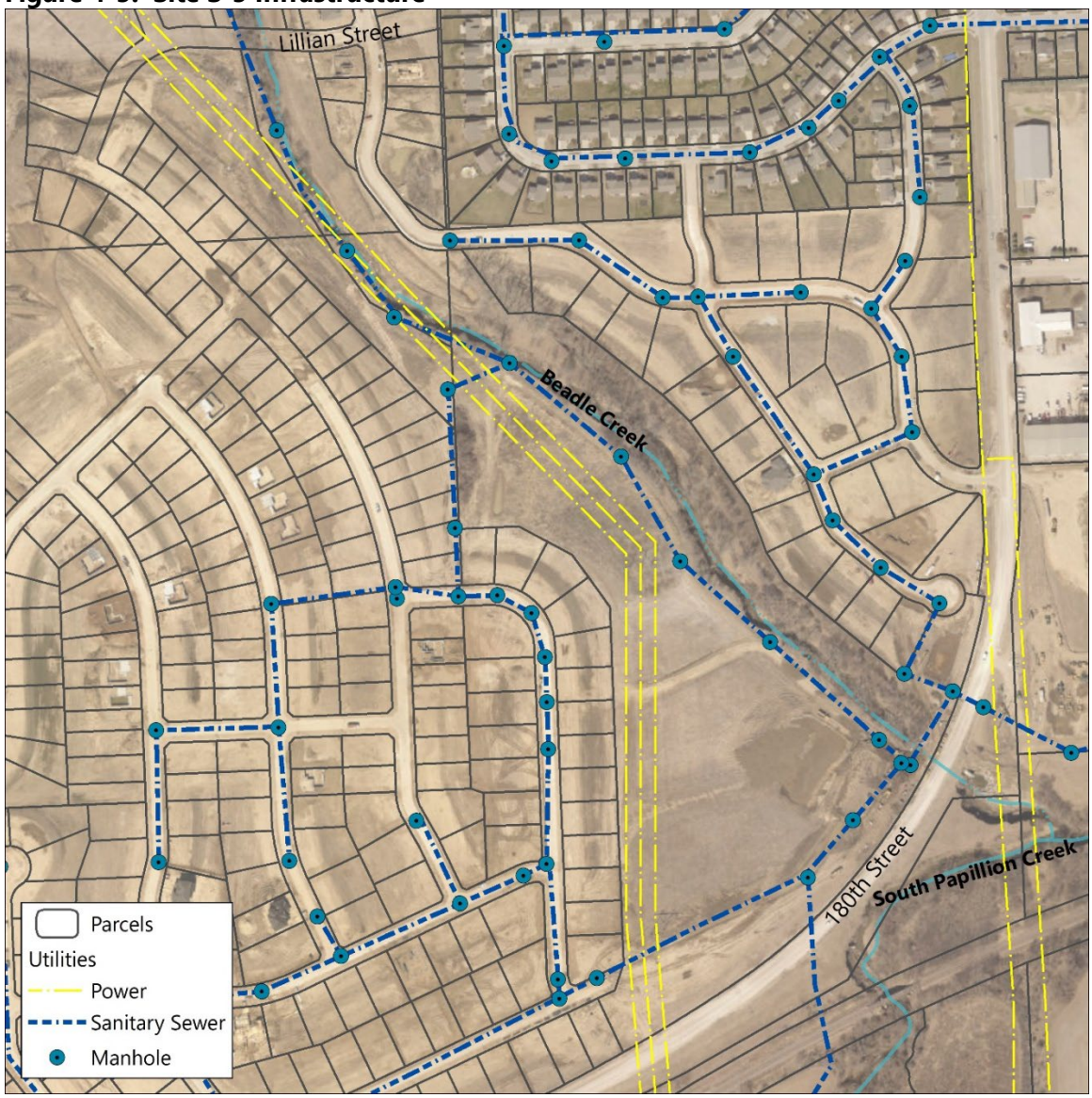
Other alternatives for stabilizing the channel banks were also considered to avoid the need for infrastructure relocation by stabilizing the banks in-place. These included sheet pile steps to allow

Grade Stabilization Alternatives Eliminated from Detailed Study
Site: S-5

Grade Stabilization Alternatives Eliminated from Detailed Study
Site: S-5

for vertical walls, concrete geowebs, and other alternatives that stabilize the vertical banks. These alternatives do not improve public safety along Beadle Creek and were therefore not carried forward for detailed analysis.

Figure 4-5. Site S-5 Infrastructure



4.2.2 Site Goal: Sediment Retention and Grade Stabilization

Applicable Site: S-1

The following briefly describes alternatives that were eliminated from detailed study for Site S-1. Combinations of alternatives were considered to meet the project purpose.

Sediment Retention & Grade Stabilization Alternatives Eliminated from Detailed Study

4.2.2.1 Conservation Measures

Applicable Site: S-1

The conservation measures alternative was analyzed at Site S-1 and uses policy to ensure current conservation methods are used on private agricultural land within the watershed as well as requiring increased conservation measures on private agricultural land within the watershed. Conservation measures maximize infiltration and reduce erosion. Agricultural land takes up approximately 82 percent of the S-1 watershed and 55 percent of those agricultural acres currently utilize conservation practices including grade terraces, ponds, and grassed waterways.

This leaves 45 percent of existing agricultural land available for full implementation of conservation measures. It is estimated that terraces can reduce sedimentation with an 85 percent efficiency. If terraces were applied to all existing agricultural land available for conservation measures, it would only provide a sediment load reduction of approximately 16.7 acre-feet. This alternative will not provide sufficient sediment load reductions to meet the project purpose.

The conservation measures alternative was also analyzed for the entire Site DS-19 watershed. Agricultural land makes up approximately 61 percent of the DS-19 watershed and approximately 60 percent of those agricultural acres currently utilize conservation practices including grade terraces, ponds, and grassed waterways.

This leaves 40 percent of existing agricultural land available for full implementation of conservation measures. It is estimated that terraces can reduce sedimentation with an 85 percent efficiency. If terraces were applied to all existing agricultural land available for conservation measures, it would provide a sediment load reduction of approximately 19 acre-feet over 50-years. This alternative would not provide sufficient sediment load reductions to meet the project purpose.

Additionally, the Sponsor does not have authority to force landowners to implement conservation measures on their land. This alternative is not practical to implement and does not meet the project purpose and was therefore eliminated from further study.

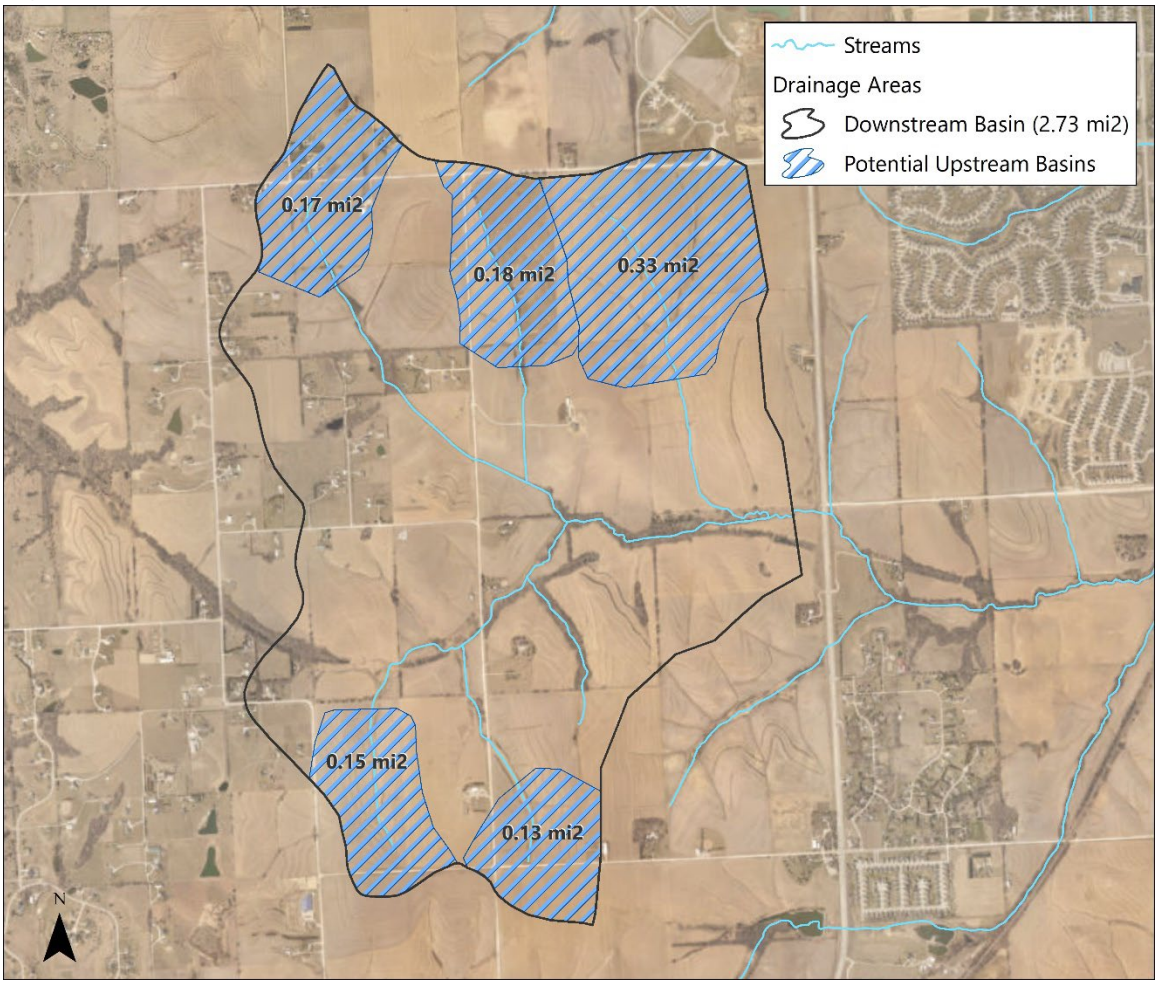
4.2.2.2 Small Detention Basins

Applicable Site: S-1

The small sediment basins alternative involves constructing combinations of small sediment basins to provide the same sediment detention benefits as a single, larger downstream structure at Site S-1 to potentially minimize impacts to stream length and other resources. The S-1 watershed was analyzed for potential locations based on existing streams, topography, and drainage basin areas. Five potential locations for small sediment basins were found with a cumulative watershed area of 0.95 square miles (Figure 4-6). If all five basins were constructed, it is predicted that they would capture approximately 16 acre-feet of sediment over 50 years. Therefore, this alternative does not meet the project purpose and was eliminated from detailed study.

Sediment Retention & Grade Stabilization Alternatives Eliminated from Detailed Study
Site: S-1

Figure 4-6. Site S-1 Small Detention Basin Alternative

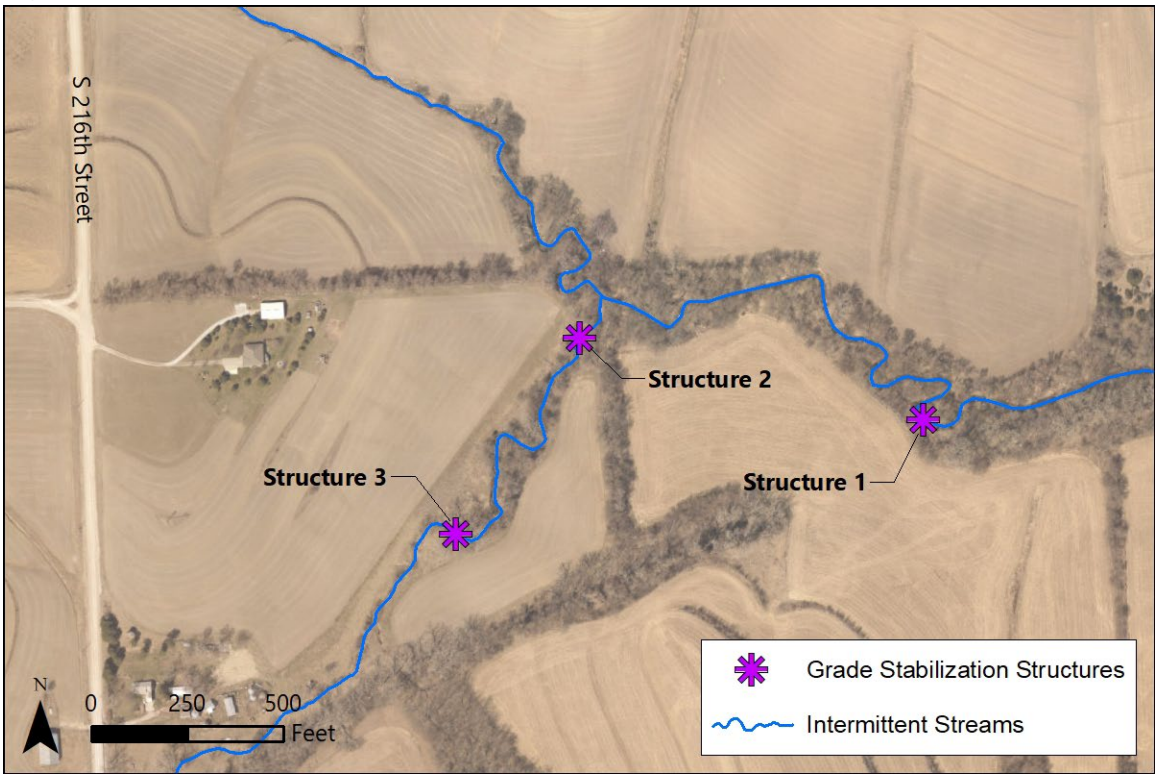


4.2.2.3 Loose Rock Structures and Rigid Structure

Applicable Site: S-1

The loose rock structures alternative at Site S-1 involves the implementation of two rock riprap grade stabilization structures and one rigid structure within South Papillion Creek and its tributary that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream and maintain existing grade. The location of the proposed structures is shown in Figure 4-7, with Structure 3 being the rigid structure that would allow for stream crossing. This location has an existing channel grade drop and water crossing that frequently washes out. Stream degradation is a problem within the watershed due to highly erosive soil types and it is predicted that the streams will continue to degrade until reaching a stable stream bed slope. The structures would stabilize the stream bed slope and protect approximately 4-acres of upstream land from degradation. See Appendix D for detailed information about the design and placement of the grade stabilization structures.

Figure 4-7. Site S-1 Grade Stabilization Structures



This alternative meets the Project's purpose to provide grade stabilization benefits; however, does not meet the purpose of sediment retention and therefore this alternative alone was not carried forward for detailed study at Site S-1. Loose rock structures were considered in combination with other alternatives to meet the project purpose and one of these combinations was carried forward for detailed analysis as discussed in Section 4.3.

4.2.3 Site Goal: Flood Risk Reduction

Applicable Site: WP-1

The following briefly describes alternatives that were eliminated from detailed study for site WP-1, which has an identified purpose of providing long term flood damage reduction within the West Papillion Creek subwatershed so that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. Where applicable, alternatives were analyzed using the same drainage area to compare them without bias. This drainage area is referred to simply as 'drainage basin' in the following sections for brevity.

4.2.3.1 Nonstructural Alternatives

Nonstructural alternatives include changes to policy, existing land use, infrastructure, and/or management practices to meet the Project purpose and need. To meet the flood damage reduction purpose, a nonstructural alternative (or combination of nonstructural/structural alternatives) would need to provide flood damage reduction and/or remove structures from the floodplain. Raising building elevations, filling basements, and dry floodproofing are potential nonstructural alternatives that were analyzed as potential solutions.

The Zoning Alternative involves administrative action to adopt zoning regulations that prevent new development within the projected full build-out 100-year floodplain for the affected reach downstream of the identified site, over 3,000 acres from West Papillion Creek to the confluence with Big Papillion Creek. This alternative includes all land within the floodplain, including agricultural, and could reduce flood risk to new construction but would not address flooding of existing structures. It is assumed that no land would be acquired. Adoption and enforcement of new zoning regulations does not reduce flood risk or limit the expansion of the future conditions floodplain and therefore this alternative does not meet the project purpose and was not carried forward for detailed analysis.

4.2.3.2 Floodplain Acquisition Alternative

The Floodplain Acquisition Alternative involves acquiring downstream developed properties along West Papillion Creek within the projected full build-out, 100-year floodplain for the affected reach downstream of the WP-1 project location. This alternative does not include zoning and considers all properties in the downstream 100-year floodplain along West Branch Papillion Creek.

The full build-out, 100-year floodplain contains more than 3,076 acres. The Sponsor would need to acquire land, purchase flooding easements, and use existing public lands. A cost estimate for this alternative includes the following:

- Removing 762 existing permanent structures from the full buildout, 100-year floodplain. Based on Douglas County and Sarpy County assessor structure values, acquiring the existing 762 structures would cost approximately $151.3 million.
- Approximately 1,013 acres of residential land would need to be purchased to remove structures and to prevent future development. At a cost of $60,000 per acre, this would cost approximately $60.8 million.
- Approximately 493 acres of commercial land would need to be purchased to remove structures from the full build-out, 100-year flood plain with an additional 98 acres requiring purchase due to the properties being inundated by more than 50 percent. At a cost of $60,000 per acre, these purchases would cost $29.6 million and $5.9 million, respectively.
- Easements would be required on all agricultural land based on the percentage inundated, as well as commercial land that would be inundated by less than 50 percent. The approximately 45 inundated acres of commercial land that would require an easement at $60,000 per acre would cost $2.7 million.
- The flooding easement for 1,095 acres of agricultural land would cost approximately $35,000 per acre, for a total of $38.3 million.

The Floodplain Acquisition Alternative is exorbitantly expensive at approximately $288.6 million and was therefore removed from detailed study.

4.2.3.3 Current Conservation Measures Alternative

The Current Conservation Measures Alternative involves full implementation of conservation measures on existing agricultural lands within the drainage basin. Conservation measures are typically administered through incentive programs offered by the NRCS. Measures are designed to maximize rainwater infiltration and reduce soil erosion. These include practices such as no-till

farming, contouring, strip cropping, terraces, grassed waterways, and similar practices. Water and sediment control basins would not be included as part of this alternative.

It is estimated that a majority of farmland in the drainage basin currently has some type of conservation measure in place based on a review of aerial imagery. Remaining farmland in the basin would be eligible for full implementation of additional conservation measures; however, most of this land is already platted for development and will be removed from agricultural production, hence no longer eligible for federally funded conservation measures.

Implementing the Current Conservation Measures Alternative would require a multiagency effort with federal partners. The alternative would have an unknown effect over the long-term planning horizon due to changes in Congressional appropriations and program implementation. Most conservation measures are designed for the purpose of soil retention; conservation measures alone could not provide the desired level of flood risk reduction. Therefore, this alternative is eliminated from further consideration because it does not meet the purpose and need for Site WP-1.

4.2.3.4 Low Impact Development (LID) Alternative

The LID Alternative would require implementation of future conservation methods that are focused on residential and commercial applications, as opposed to agricultural. LID strategies, such as on-site detention ponds or vegetated swales, can be implemented on future developable land as described in Papillion Creek Watershed Management Plan (Management Plan) (PCWP, 2009). One scenario considered the projected 100-year full build-out floodplain with maximum LID (Max LID). This scenario called for construction of on-site detention basins in addition to an assortment of other LID practices to achieve a high reduction of peak flow. Max LID was considered, instead of a conventional LID scenario, because conventional LID practices primarily address water quality issues, as opposed to stormwater runoff reduction to lessen flood risk.

The Management Plan (PCWP, 2009) found that a Max LID strategy could be equally successful at reducing peak flows as would a network of regional detention basins. PCWP (PCWP, 2009) estimates that, at the point of application, the Max LID scenario would allow storm water control and an approximate 90 percent reduction in peak flows through a 100-year storm event based on HEC-1 hydrologic models (P-MRNRD, 2009). Using 2017 aerial images, an estimated 90 percent of the drainage basin remains to be developed. Assuming that the Max LID measures are implemented throughout the remaining 90 percent of the drainage basin, the incremental reduction in peak discharge for the 100-year storm event would be approximately 81 percent. The full build-out, 100-year flood plain peak flow for the watershed is 2,035 cfs. This would drop to 387 cfs with implementation of future conservation measures.

Although a Max LID strategy would successfully reduce peak flows and discharges within the drainage basin, the overall geometry and topography of the Big Papillion Creek Watershed and West Papillion Creek sub-watershed is not conducive to overall peak flow reduction further downstream. Due to north-to-south peak flow timing, peak flow reduction performance on Big Papillion Creek is dependent on the relative success of efforts upstream of NE Highway 36 in Washington County. The implementation horizon for Max LID strategies in Washington County is currently estimated at decades past 2050. During this transition period, the existing risk of flooding

along the lower reaches of the Big Papillion Creek Watershed would remain mostly unchanged. Other logistical hurdles with Max LID include sustainability relative to jurisdictional responsibilities, inexperienced local contractors, uncertainty regarding FEMA acceptance of LID for Flood Insurance Rate Map (FIRM) development, and funding dependent on Congressional budget appropriations.

The LID Alternative, although meeting the project purpose for flood risk reduction, would not provide this effect within an acceptable timeframe to keep pace with development. The alternative would require innumerable state and federal permits because waters on multiple private properties would be likely impacted for construction, increasing uncertainty (as future funding is dependent on Congressional budget appropriations) and cost due to economics of scale. Furthermore, the Sponsor does not have legislative authority to require LID practices on private property. This alternative is eliminated from further consideration because it is not considered logistically feasible and does not meet the purpose and need within an acceptable timeframe.

4.2.3.5 Created and Restored Wetlands Alternative

The Created and Restored Wetlands Alternative would create or restore wetlands and the floodplain in conjunction with buffers and stream restoration to maximize flood storage. Lands that are conducive to wetland creation or enhancement were identified based on location of hydric soils and hydrology. Wetland storage areas would provide habitat quality improvements and water quality benefits.

Soils with hydric components make up 167 acres of the 852-acre drainage basin and are primarily located along streams and within riparian areas, based on Geographic Information System (GIS) spatial analysis results using the Gridded Soil Survey Geographic database (gSSURGO) (USDA, 2017) and its Potential Wetland Soil Landscapes (PWSL) data. The spatial correlation between hydric soils and hydrology across the drainage basin indicates that areas conducive to wetland creation and/or restoration are present. Wetland creation would be accomplished by constructing a series of structures to impound stream flow, creating shallow pools. The maximum storage of floodwater provided per acre of wetland is approximately 4.5 ac-ft (National Oceanic and Atmospheric Administration [NOAA] and EPA, 2003). To provide the necessary protection for the projected full build-out, 100-year flood plain, 85 acres of wetland functioning at maximum efficiency would be required for adequate flood storage of approximately 379 ac-ft. To establish wetlands along channels, conservatively estimating the channel and riparian zone width throughout the basin is 100 feet, 85 acres of wetlands would require approximately 7 miles of stream length. There are approximately 4 miles of stream channel within this reach.

This alternative is eliminated from consideration because there is not enough wetland storage potential along the stream channels to meet the equivalent flood storage volume needed and therefore did not meet the site purpose. This alternative was considered in conjunction with the Stream Restoration Alternative and others as well and none of these alternatives were carried forward for detailed analysis due to inability to meet purpose.

4.2.3.6 Stream Restoration Alternative

The goal of the Stream Restoration Alternative would be to reduce flood flows through stream improvements within the unnamed reaches within the drainage basin. Improvements could include

riffle-pool structures, j-hooks or rock veins, or other stream bank improvements that would effectively roughen the stream bed and channel. Roughening a channel slows velocities, increasing the flow area and wetted perimeter of the channel, potentially expanding the spatial extents of flooding. These measures would provide aquatic habitat improvements and water quality benefits.

This alternative is eliminated from further consideration because the existing 4 miles of channel are in the upper reaches of the watershed and do not provide enough stream length to meet the equivalent flood storage volume needed to meet the purpose. This alternative was considered in conjunction with the Created and Stored Wetlands Alternative as well and was not carried forward for detailed analysis due to inability to meet purpose.

4.2.3.7 Conveyance Alternative

The Conveyance Alternative would improve flow conveyance by using channel modifications, such as levees and stormwater channels, along the urbanized reach of West Papillion Creek for containment of the projected full build-out 100-year flood event. Such structures increase the capacity of streams to carry floodwaters downstream while reducing flood damage to adjacent property. These types of structural flood control measures are typically utilized in the lower portion of a watershed to prevent peak flows from reaching the same place over a short time period. Because peak flows currently exceed existing channel capacity, the existing levees would need to be moved back for the channel to contain the entire peak flow. The existing levee is about 8 to 10 ft high, with a 15-ft top width, and 3:1 side slopes. The levee is approximately 9 miles in length. The cost to remove and replace the entire levee was estimated in 2008 at $70 million based on levee modifications estimated from the study entitled, West Papillion Levee Restoration Evaluation (P-MRNRD, 2008).

This alternative is eliminated from further consideration due to the exorbitant cost. Also, increasing the capacity of the creek would decrease the travel time of flood flows, placing added pressure on the lower reaches of the watershed and diminish the effectiveness of downstream channels and levees. These types of modifications would likely exacerbate downstream flooding.

4.2.3.8 Raise Existing Levees and Bridges Alternative

The Raise Existing Levees and Bridges Alternative would involve raising the existing levees and bridges along West Papillion Creek to allow the levee system to contain the full build-out 100-year flood event and provide 3-ft of freeboard in accordance with FEMA criteria for certification. It is not reasonable to raise the levees less than the height required to provide flood benefits that do not include this 100-year flood event containment and 3-foot freeboard. Therefore, this alternative uses these criteria as the basis for analysis.

A system of earthen levees currently parallels the lower reach of West Papillion Creek. These levees are not shown as certified on the digital FIRM mapping. During large rain events the floodplain inundates surrounding land and structures. Levees extend from the confluence of Walnut Creek (approximately 96th Street) downstream to approximately 42nd Street on the right bank, and from west of 84th Street downstream to approximately 44th Street on the left bank.

Flood Risk Reduction Alternatives Eliminated from Detailed Study
Site: WP-1

The West Papillion Levee Restoration Evaluation (P-MRNRD, 2008) analyzed three scenarios to raise the levees and bridges for certification. These scenarios compared the required effort and cost with and without additional detention structures within the watershed. In addition, the P-MRNRD (2008) report considered two types of levee improvements. One scenario raised the levee with a flood wall and one raised the levee with earthen fill. The study also evaluated the need to raise bridges at 48th Street, 66th Street, and 84th Street. Costs of the scenarios ranged from $23 million to $141 million, and do not include costs needed to relocate businesses along 84th Street in the City of Papillion, an additional cost of approximately $4.7 million.

The P-MRNRD (2008) report indicated that although raising existing levees and bridges alone, without additional detention structures in the watershed, was the most economical; the alternative provides little flood protection upstream of the confluence of West Papillion Creek with Walnut Creek near 96th Street.

This alternative was eliminated from detailed analysis because it provides flood protection that is limited to the downstream reaches of the West Papillion Creek sub-watershed and therefore does not meet the project purpose.

4.2.3.9 Small Detention Dams Alternative

The Small Detention Dams Alternative would involve constructing several smaller detention structures within the watershed to accomplish flood protection while minimizing impacts. These small detention structures would consist of high hazard (based on State of Nebraska dam safety criteria) dry dams along Whispering Ridge Creek and its tributaries. An analysis was completed to determine the size of dry dam structure required, including earthen dam footprint and flood pool extents, and potential locations. Every effort was made to avoid existing infrastructure, including existing developments and roadways.

The drainage basin is 852 acres. Based on existing topography and land use constraints there are only three potential sites for small detention structures. Each has a drainage area between 69 acres and 345, with combined total flood storage of 653 ac-ft. versus 1,164 ac-ft for the one larger site downstream on Whispering Ridge Creek (Alternatives 2-WP1 and 3-WP1, described below).

This alternative was eliminated from consideration because it would not provide adequate flood storage volume and therefore does not meet the Site's purpose and need.

4.3 Alternatives Carried Forward for Detailed Analysis

The following section describes the alternatives that were carried forward for detailed analysis. An incremental analysis was considered and analyzed at each site to determine the individual measures included and the formulation process was used to combine these measures into the alternatives detailed below.

4.3.1 Alternative 1. No Action/Future Without Project

This alternative is the most likely future condition if none of the action alternatives are selected. The future without project at each site is described below. This alternative does not meet the purpose and need; however, it is carried forward through the analysis as a benchmark condition.

Site W-5

In this alternative, the Sponsor would not construct grade stabilization structures and the Boston Branch would continue to experience advancing headcuts, resulting in degradation and widening. The Road 29 bridge abutment would likely be impacted by the continued stream instability and headcuts would move into yards and farm fields as gullies as the Boston Branch profile lowered. Human health and safety concerns would steadily increase as stream banks rose higher, especially with the adjacent residential development and potential for children to play near the stream.

Site D-78

In this alternative, the Sponsor would not construct grade stabilization structures and Ridgewood Creek and its unnamed upstream tributaries would continue to widen and degrade. An upstream home would likely be impacted by future stream instability and widening, and surrounding farm fields would not be protected from headcut progression. Additionally, human health and safety concerns would arise as stream banks rise higher.

Site D-2

In this alternative, the Sponsor would not construct grade stabilization structures and Boettger Creek and its upstream tributaries would continue to degrade and widen. The Highway 133 embankment would likely be threatened from stream instability and progressing degradation and surrounding farm fields would not be protected from headcut progressions. Additionally, human health and safety concerns would arise as stream banks degrade and become steeper.

Site S-5

In this alternative, the Sponsor would not restore the stream and the channel would continue to degrade and widen. Power poles, an adjacent sanitary sewer, yards, homes, and roadway embankments would be threatened by continued degradation and erosion. Additionally, human health and safety concerns would remain and worsen due to shear and steep banks, especially with the adjacent residential development and potential for children to play near the stream.

Site S-15

In this alternative, the Sponsor would not construct grade stabilization structures and Westmont Creek and its upstream tributaries would continue to experience advancing headcuts, resulting in degradation and widening. The roadway embankments at two crossings under S 144th will likely be impacted by the continued stream instability. Adjacent properties would likely experience damage due to stream widening and as gullies as the stream profiles lower. An approximate 10-foot headcut that is progressing from Westmont Creek up the northern tributary that runs adjacent to Highway 370 would continue to move upstream, causing significant channel grade loss and damage along the Highway 370 corridor. Adjacent sanitary sewer lines would also need to be relocated due to the continued degradation. Human health and safety concerns would steadily increase as stream banks rose higher, especially with the nearby residential development and impending development.

Site S-1

In this alternative, the Sponsor would not address sedimentation or construct any grade stabilization and South Papillion Creek and its upstream tributaries would continue to degrade and widen, moving toward

the crossing at S 216th Street and the existing home along the channel. This alternative would also not prevent sediment from entering the planned DS-19 Reservoir.

Site WP-1

This alternative is the most likely future condition if none of the action alternatives are selected and there is no expenditure of federal funds. This alternative would involve no implementation of any flood risk reduction structures or measures. The flood damages to cropland, urban areas, and infrastructure would continue. This alternative does not meet the purpose and need; however, it is carried forward through the analysis as a benchmark condition.

4.3.2 Alternative 2-Combination 1

This combination of alternatives includes practices at each of the seven identified project sites. Incremental analysis utilizing land and infrastructure benefits and projected stable slope was used at each grade stabilization site to determine the number of practices along each stream reach. An incremental analysis was also used at Site S-1 to determine the optimum sediment retention based on land use, site constraints, and economic benefits. Flood risk reduction was also analyzed using an incremental analysis approach along with watershed-wide considerations, which is described more in depth in Appendix D.

Site W-5

This alternative includes the implementation of eight loose rock structures within the channel and one rigid drop structure to preserve upstream land from future degradation and loss. The structures have two versions of a basic design that are carried out through the site. Both structures grade the banks back to a side slope of 3:1 and line the bank to the 100-year flood water surface elevation with riprap. In areas where a tributary enters the stream at the structure, the tributary will not be graded except as needed to tie into the structure; however, the tributaries will be riprap lined to the 100-year flood water surface elevation. Most of the structures will not change the grade of the stream but the riprap will be placed such that the upstream end is slightly above stream grade to encourage deposition and reduce the stream slope upstream of the structure. One structure will be placed at a drop in the stream and will entail some grading of the stream bottom. This structure includes a flat inlet section, a steeper 4:1 middle section, and a flat outlet section. This alternative would stabilize the streams and protect the adjacent farmland and riparian habitat from degrading due future head cut progressions and stream widening. See Appendix C for the locations of the proposed structures and Appendix D for detailed information on the design of this alternative. Project costs are shown in Table 4-3a. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site D-78

This alternative includes the implementation of 11 loose rock structures within the channel and is estimated to preserve approximately 36 acres of land from future degradation and loss. This alternative would stabilize the streams and protect the adjacent farmland and riparian habitat from degrading due future headcut progressions and stream widening. See Appendix C for the locations of the proposed loose rock structures. Appendix D includes detailed information on the design and costs of this alternative. Total project costs are shown in Table 4-3a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site D-2

This alternative includes the implementation of eight loose rock structures and one rigid drop structure within the channel. This alternative is estimated to preserve approximately 13 acres of adjacent farmland and riparian habitat from degrading due to future headcut progressions and stream widening. See Appendix C for the locations of the proposed loose rock structures and rigid drop structure. The loose rock structures consist of rock riprap and would act as deformable energy dissipation structures. The rigid drop structure would repair an existing 6-foot drop, would function as a low water crossing, and would protect the upstream channel and highway embankment from future erosion. See Appendix D for detailed information behind the design of the loose rock structures and rigid drop structure at Site D-2. Total project costs are included in Table 4-3a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-5

This alternative includes the channel grading within approximately 2,400-feet of Beadle Creek and removal and replacement of the 180th Street culvert with an armored drop structure. The drop structure would protect the upstream channel from a large existing headcut progression and scour hole and prevent further damage downstream of the existing culvert. It will also improve the conveyance capacity, protecting the upstream channel from flooding due to backwater. This alternative will also repair the deeply incised and degraded channel to create a more stable and safer stream by repairing the shear and steep channel banks. See Appendix C for the proposed extents and Appendix D for a detailed description of this alternative. Total project costs are included in Table 4-3a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-15

This alternative includes the implementation of seven loose rock structures and one rigid drop structure within the channel and is estimated to preserve approximately 21 acres of adjacent farmland and riparian habitat from degradation due to future headcut progressions and stream widening. See Appendix C for the locations of the proposed structures. The loose rock structures consist of rock riprap and would act as deformable energy dissipation structures. The rigid drop structure would repair an existing 10-foot drop and protect the upstream channel and highway corridor from future erosion. See Appendix D for detailed information behind the design of the loose rock structures and rigid drop structure at Site S-15. Total project costs are included in Table 4-3a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-1

The planned DS-19 Reservoir was evaluated for economic feasibility and environmental impacts in the Papillion Creek and Tributaries Lakes Final Feasibility Report and Environmental Assessment and was included as part of the Recommended Plan. Detailed watershed analysis was conducted for DS-19 as a flood reduction solution for the Papillion Creek Watershed and construction of the site is reasonably foreseeable. Funding for implementation has been recommended and the Sponsor has begun purchasing land for the site.

This alternative includes the implementation of a sediment basin upstream of the planned DS-19 Reservoir and one rigid drop structure within the channel upstream of the sediment basin's permanent pool. The rigid drop structure location is at an existing channel grade drop and water crossing that frequently washes

out. The sediment basin will capture approximately 34 acre-feet of sediment that would otherwise enter the DS-19 Reservoir and therefore extend the life the structure and protect its water quality. It would additionally improve terrestrial and aquatic habitat and provide stream stabilization upstream of the sediment basin. The rigid drop structure would also preserve approximately 3 acres of adjacent farmland and riparian habitat from degrading due to future headcut progressions and stream widening. Total project costs are included in Table 4-3b and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site WP-1

The wet dam alternative consists of a high-hazard floodwater retarding dam on Whispering Ridge Creek, a left bank tributary to West Papillion Creek, in Section 5, Township 15 North, Range 11 East, in Douglas County, Nebraska. This location was previously identified in the 1966 Work Plan for grade stabilization and subsequently identified in the *Multi-Reservoir Analysis, Papillion Creek Watershed* (HDR, 2004) and the *Papillion Creek Watershed Management Plan* (HDR, 2009) for flood risk reduction. This alternative would control approximately 852 acres to provide flood damage reduction to agricultural lands, businesses, and residential areas.

Due to the urban location and potential breach path, this site would be designed to NRCS high-hazard classification standards. The structure would include an earthen embankment approximately 900-feet in length and about 40-feet tall. The principal spillway would consist of a 4-foot by 12-foot concrete riser and 48-inch reinforced concrete pressure pipe with an impact basin consistent with NRCS design criteria. A vegetated auxiliary spillway would be located on the left abutment. Appendix D includes detailed information on hydrology and other methodology used for design and detailed structural information can be found in Table 3, Chapter 7.0.

The dam is designed for a 100-year lifespan and would trap approximately 98 acre-feet below the principal spillway riser, which exceeds NRCS sediment-storage design criteria (USDA 2008a). A sediment basin, designed to extend the life of the reservoir and improve water quality, would consist of a berm and culvert structure located upstream of the main dam and downstream of Fort Street. The dam is designed for a 100-year sediment lifespan without the sediment basin, but the sediment basin provides an area of shallow inundation for the purpose of improving water quality and decreasing sediment transfer to the main reservoir. By trapping the sediment, these structures would protect downstream waterbodies from an influx of sediment and nutrients, and therefore improve overall water quality. Whispering Ridge Creek and West Papillion Creek are degraded channels with low functional value, similar to many tributaries and main channels in the region. Although there is the potential that sediment-hungry water flowing out of the reservoir may increase downstream erosion, reductions in peak flow events and grade control provided upstream of the structure will provide an overall improvement to grade and bank stability of the system. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis.

The dam's permanent pool will provide aquatic habitat, recreation, and grade control within the stream. Wetlands are anticipated to form around and within the shallow regions of the permanent pool as well, improving water quality and providing habitat. Total costs of this alternative are shown in Table 4-3c and detailed cost information is provided in Appendix D.

4.3.3 Alternative 3. Combination 2

The formulation process revealed that two alternatives should be carried forward for detailed analysis at Site S-1 and therefore this alternative includes all aspects of Alternative 2 (Combination 1) except for the measures proposed at Site S-1. Site S-1 measures for Alternative 3 (Combination 2) are described below.

Site S-1

Site DS-19 was evaluated for economic feasibility and environmental impacts in the Papillion Creek and Tributaries Lakes Final Feasibility Report and Environmental Assessment and was included as part of the Recommended Plan. Detailed watershed analysis was conducted for DS-19 as a flood reduction solution for the Papillion Creek Watershed and construction of the site is reasonably foreseeable. Funding for implementation has been recommended and the Sponsor has begun purchasing land for the site. The dredging alternative involves allowing the sediment to enter the planned DS-19 Reservoir and subsequently dredging the reservoir to remove the sediment and the three grade control structures upstream of DS-19 as described in Section 4.2.2.3. Dredging costs were assigned utilizing local knowledge of recent dredging and other water resources projects. Unit costs are included in Appendix D. It is assumed that dredging would occur in 16 years based on predicted sedimentation rates and therefore the amortized present value is used for the analysis. Installation of the grade control structures would occur in the same timeline as the other alternatives and therefore the 2022 cost is used for these. Present value costs are shown in Table 4-3b. This alternative meets the purpose and need and will be carried forward for detailed analysis.

4.3.4 Alternative 4. Combination 3

The formulation process revealed that two alternatives should be carried forward for detailed analysis at Site WP-1 and therefore this alternative includes all aspects of Alternative 2 (Combination 1) except for the measures proposed at Site WP-1. Site WP-1 measures for Alternative 4 (Combination 3) are described below.

Site WP-1

The Dry Dam Alternative would include construction of an earthen embankment and upstream berm at the same locations as the Wet Dam Alternative with the same footprints and elevations. Due to the urban location and potential breach path, this site would be designed to NRCS high-hazard classification Equivalent flood storage volume would be provided as with the Wet Dam Alternative and therefore potential flood damage to downstream properties and infrastructure would be significantly reduced. Costs for the dry dam alternative are approximately 20 percent higher than the wet dam alternative due to geotechnical engineering requirements and maintenance.

The dam is designed for a 100-year lifespan and would trap approximately 98 acre-feet of sediment. By trapping the sediment, these structures would protect downstream waterbodies from an influx of sediment and nutrients, and therefore improve overall water quality. Whispering Ridge Creek and West Papillion Creek are degraded channels with low functional value, similar to many tributaries and main channels in the region. Although there is the potential that sediment-hungry water flowing out of the reservoir may increase downstream erosion, reductions in peak flow events and grade control provided upstream of the structure will provide an overall improvement to grade and bank stability of the system. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis.

This alternative also offers grade control within streams, which would protect and stabilize existing eroding streams. Because there is no reservoir in a dry dam, the volume of storage per vertical foot is smallest at the bottom of the valley and the rate of flood stage increases significantly during a storm event compared to an embankment with a permanent pool. This causes the type of flash flooding characteristic of desert environments. There are no urban developments or homes within the flood pool of the dam; however, there is a risk of rapid inundation that can pose a safety risk to the landowners. This situation is not ideal in a rapidly developing urban setting as development will likely include residential neighborhoods thereby increasing risk to adjacent landowners. Appendix D includes detailed information on hydrology and other methodology used for the design. Total costs of this alternative are shown in Table 4-3c and detailed cost information is provided in Appendix D.

4.4 Alternatives Summary and Comparison

Table 4-4 includes a summary of the groups of alternatives analyzed. Project scoping (see Chapter 2) led to the determination of the number and variety of ecosystem services (or resources of concern) to be considered in the analysis. Information on existing conditions of these resources is provided in Chapter 3, and analysis and discussion of environmental consequences for each resource is provided in Chapter 5. Appropriate metrics were defined for each ecosystem service based on current methodology to quantify impacted services over time. Monetary values were used where appropriate.

To assist in evaluating the trade-offs of the ecosystem services relative to each alternative over time, a symbolic system was developed to show the potential effects. This system and the definitions used to quantify the magnitude of the effects are included below in Table 4-5.

This symbolic summary of the trade-offs is provided in Table 4-6 with details provided in Table 4-7.

Table 4-4. Alternatives Analyzed in Detailed Analysis

Alternative 1. No Action Alternative	Includes the **No Action**/FWOP Alternative at each of the seven sites identified in this Supplemental Plan-EA.
Alternative 2. Combination 1	**Site W-5:** Eight (8) loose rock structures and one (1) rigid rock structure
	Site D-78: Eleven (11) loose rock structures
	Site D-2: Eight (8) loose rock structures and (1) rigid structure
	Site S-5: Channel restoration with downstream drop structure
	Site S-15: Seven (7) loose rock structures and one (1) rigid structure
	Site S-1: Sediment Basin and one (1) rigid structure
	Site WP-1: Regional Detention Basin, Wet Dam
Alternative 3. Combination 2	**Site S-1:** Dredging of DS-19 and three (3) loose rock structures All other Sites are the same as Alternative 2.
Alternative 4. Combination 3	**Site WP-1:** Regional Detention Basin, Dry Dam All other Sites are the same as Alternative 2.

Table 4-5. System for Ecosystem Services Trade-Offs

Symbol	Description
xxx	Alternative will have a major effect on the item or concern. Major impacts include those that are long-term or permanent, result in significant controversy, could result in a loss of life or jeopardize the survival of a sensitive resource, or result in impacts that cannot be mitigated. These also include effects that go directly against the Federal Objective.
xx	Alternative will have a moderate effect on the item or concern. Moderate impacts include those that are short-term or long-term and can be reasonably replaced or restored with mitigation measures.
x	Alternative will have a minor effect on the item or concern. Minor impacts include those that are temporary, short-term, or long-term and do not require mitigation.
--	Alternative will have a negligible impact on the item or concern.
+	Alternative will result in a minor improvement on the item or concern. Minor improvements can include those that are temporary or short-term.
++	Alternative will result in a moderate improvement to the item or concern. Moderate improvements include those that are short-term, long-term, or permanent. These include measurable effects that improve services but are not anticipated to result in a major benefit or life- saving measure.
+++	Alternative will result in a major improvement to the item or concern. Major improvements include those that are long-term or permanent. These include measurable effects that improve services resulting in a designation change or life-saving measure. Examples of a designation change include removing a waterbody from the list of 303(d) impaired waters or significantly improving anticipated survival of a listed species.
Duration of Effects	
Temporary	Brief effects lasting less than 1 year
Short-Term	Effects lasting 1 to 5 years
Long-Term	Effects lasting 5 to 10 years
Permanent	Effects lasting over 10 years

Table 4-6. Summary Comparison of Alternative Plans[1]

Item or Concern		**Alternative 1.** No Action/FWOFI	**Alternative 2.** Combination 1	**Alternative 3.** Combination 2	**Alternative 4.** Combination 3
Installation Cost	Total	$0	$27,925,500	$27,039,900	$29,652,800
Benefits	Net Monetary Benefits (annualized)	$0	$921,700	$868,400	$913,200
PR&G Guiding Principles	Healthy and Resilient Ecosystems*		✓		
	Sustainable Economic Development*		✓		
	Floodplains*		✓	✓	
	Public Safety		✓	✓	
	Environmental Justice	✓	✓	✓	✓
	Watershed Approach		✓		
	**Represents the Federal Objective*				
Alternatives					
Locally Preferred			✓		
Non-Structural		✓			
Ecosystem Service Trade-Offs					
Provisioning Services	Erosion and Sedimentation	XX	**++**	**++**	**++**
	Prime and Unique Farmland	--	--	--	--
	Threatened and Endangered Species	--	--	--	--
	Migratory Birds/Bald and Golden Eagles	--	--	--	--
Regulating Services	Water Quality	--	++	++	++
	Regional Water Management Plans	--	++	+	+
	Floodplain Management	--	+++	--	+++
	Streams and Riparian Habitat	X	++	++	++
	Flood Damages	--	+++	--	+++
	Wetlands	--	++	--	--
	Public Health and Safety	XXX	+++	+	+++
	Climate Change	--	+	+	+
	Land Use	--	--	--	--
	Fish and Wildlife Habitat	X	++	+	+

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Cultural Services	Historic and Cultural Properties	--	--	--	--
	Environmental Justice	--	--	--	--

[1]*See Table 4-5 for a description of the symbols shown in this table.*

Table 4-7. Ecosystem Trade-offs of Alternative Plans

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Provisioning Services	Erosion and Sedimentation	No change in existing condition	Reduction in annual sedimentation rate for the watershed by 4,660 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: Will capture and store 44 acre-feet of sediment over the design life. Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.	Reduction in annual sedimentation rate for the watershed by 3,270 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: No sediment storage on-site.	Reduction in annual sedimentation rate for the watershed by 4,660 tons/year for all sites combined. <u>Sediment Storage:</u> Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.
	Prime and Unique Farmland	Approximately 117,400-acres of prime farmland and farmland of statewide importance are within the subwatershed. There will be a continued risk to prime farmland due to flooding.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 56.2-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 44.5-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 35.5-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Provisioning Services	Threatened and Endangered Species	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts. .	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts. .
	Migratory Birds/Bald and Golden Eagles	No effect.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.
Regulating Services	Water Quality	No change in existing condition	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 4,630 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: Will capture and store 44 acre-feet of sediment over the design life. Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 3,240 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: No sediment storage on-site.	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 4,630 tons/year for all sites combined. <u>Sediment Storage:</u> Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Regional Water Management Plans	No effect.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Sites WP-1 and DS-19 (downstream of Site S-1) were identified as part of the watershed-wide flood risk reduction strategy that was developed through locally funded watershed management plans for Papillion Creek. The plans strongly recommend implementation of a sediment basin upstream of DS-19 to extend the dam's design life and improve water quality.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Site S-1 does not work in conjunction with the current watershed management plan as a sediment basin is strongly recommended at this site.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Site WP-1 was identified as part of the watershed-wide flood risk reduction strategy that was developed through locally funded watershed management plans for Papillion Creek. The previous studies recommend a wet dam at this site instead of a dry dam due to a wet dam's ability to lower resuspension and turbulence of sediment from incoming flow.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Floodplain Management	No effect.	Grade stabilization sites: No effect Site S-1: The FEMA mapped floodplain ends within the limits of this. 100-year inundation post-project would slightly increase upstream of the embankment. There is no effect downstream of the embankment. Site WP-1: This alternative would ensure that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. This site also works as a system with other flood control measures in the watershed to provide optimum flood reduction benefits.	Site S-1: No effect	Site WP-1: This alternative would ensure that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. This site also works as a system with other flood control measures in the watershed to provide optimum flood reduction benefits.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Streams and Riparian Habitat	No effect.	Overall, streams will improve with this Alternative. Preventing headcut progression and stream degradation and widening will result in an increase in stream function and habitat. Some riprap fill as well as earthen excavation will result from the implementation of the grade stabilization structures. Stream length will be lost due to embankments at Sites S-1 and WP-1. Inundation will create open water in areas that were previously stream length. Stream mitigation will account for stream length lost due to embankments and any overall decrease in stream function at Sites S-1 and WP-1. Total Impacts (fill, excavation, inundation): Ephemeral: 241-feet Intermittent: 10,392-feet Perennial: 3,099-feet See Chapter 5 of the Plan-EA for impact specifics.	Total Impacts (fill, excavation, inundation): Ephemeral: 106-feet Intermittent: 4,207-feet Perennial: 3,099-feet See Chapter 5 of the Plan-EA for impact specifics.	Total Impacts (fill, excavation, inundation): Ephemeral: 106-feet Intermittent: 10,392-feet Perennial: 543-feet See Chapter 5 of the Plan-EA for impact specifics.
	Flood Damages	No effect.	Site WP-1: Construction would result in $98,855 in annual flood reduction benefits. All other sites would have no effect.	No effect at Site S-1.	Site WP-1: Construction would result in $98,855 in annual flood reduction benefits.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Wetlands	Potential for loss of riparian wetlands due to continued stream degradation and widening	Net gain of approximately 37-acres of wetlands for all Sites combined. <u>Loss of Riverine Wetlands:</u> Total: 0.58-acres Site S-1: 0.12-acres (fill), 0.46-acres (inundation) <u>Loss of Depressional Wetlands:</u> Total: 0.40-acres Site S-1: 0.03-acres (fill) Site WP-1: 0.37-acres (depressional) <u>Gain of Lacustrine Wetlands:</u> Total: 37.2-acres Site S-1: 9.7-acres Site WP-1: 28.5-acres	Net gain of approximately 28-acres of wetlands for all Sites combined. No gain or loss of wetlands at Site S-1.	Net gain of approximately 9.1-acres of wetlands for all Sites combined. No gain or loss of wetlands at Site WP-1.
	Public Health and Safety	Continued safety risks due to existing high and unsafe stream banks, stream degradation and widening, and flooding.	Alternative will improve safety and protect infrastructure along stream corridors and downstream of Site WP-1. Site S-1 will be implemented in conjunction with the Sponsor-led construction of DS-19. DS-19 is designed a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach. WP-1 is designed as a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach.	Alternative will improve safety and protect land along stream corridors at Site S-1.	Site WP-1 will reduce flood risk downstream of the dam. The structure is designed as a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Climate Change	No effect.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.
	Land Use	No effect.	Minor effect on land use within the project area for grade stabilization sites. Site S-1: Land use change from agriculture to open water at sediment basin location. Land use is rapidly urbanizing and is expected to become low density residential at this location within the next 10-years. Site WP-1: Land use change from agriculture to open water/recreation at dam location. Land use is rapidly urbanizing and is expected to become low density residential within the next 10-years.	Minor effect on land use within the project area for grade stabilization sites.	Minor effect on land use within the project area for grade stabilization sites. Site WP-1: Land use change from agriculture to dry basin at project site. Land use is rapidly urbanizing and is expected to become low density residential at this location within the next 10-years.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Cultural Services	Fish and Wildlife Habitat	Streams would continue to degrade and widen, resulting in minor loss of riparian habitat.	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands (cause):</u> All 7 Sites combined: 12.2-acres Site S-1: 2.5 acres (inundation), 0.12 acres (fill) Site WP-1: 0.83-acres (inundation), 1.05 acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 36-acres Site S-1: 16-acres Site WP-1: 20-acres <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: 9.7-acres Site WP-1: 9.7-acres	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands:</u> All 7 Sites combined: 9.72-acres Site S-1: 0.16 acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 20-acres Site S-1: No gain <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: 9.7-acres Site S-1: No gain	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands:</u> All 7 Sites combined: 11.37-acres Site WP-1: 1.05-acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 16-acres Site WP-1: No gain <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: No gain Site WP-1: No gain
	Historic and Cultural Properties	No effect.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.
	Environmental Justice	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.

5.0 ENVIRONMENTAL CONSEQUENCES

An Environmental Evaluation using NRCS form number NE-CPA-52 was completed during the planning process. Chapter 3 'Affected Environment' describes these resources as they currently exist. This chapter describes the environmental consequences and impacts of the alternatives described in Section 4.3. Each resource of concern (or ecosystem service) is grouped into four service categories. These categories are described in Section 3.15.

Alternatives brought forward for detailed study are shown in Table 5-1 below. Prior to field work and additional analyses performed on each resource concern to determine both indirect and direct impacts, Affected Resource Area (ARA) boundaries were drawn for each alternative listed in Table 5-1. These boundaries include the physical, ecological, economic, and social characteristic of the project area that would be impacted by construction if selected as the preferred alternative. Impacts described in this chapter for each resource concern revolve around the ARAs rather than the entire watershed boundary. See Appendix C for ARA maps associated with each alternative outlined in Table 5-1.

Table 5-1. Alternatives Analyzed in Detailed Analysis

Alternative 1. No Action Alternative	Includes the **No Action**/FWOP Alternative at each of the seven sites identified in this Supplemental Plan-EA.
Alternative 2. Combination 1	**Site W-5:** Eight (8) loose rock structures and one (1) rigid rock structure
	Site D-78: Eleven (11) loose rock structures
	Site D-2: Eight (8) loose rock structures and (1) rigid structure
	Site S-5: Channel restoration with downstream drop structure
	Site S-15: Seven (7) loose rock structures and one (1) rigid structure
	Site S-1: Sediment Basin and one (1) rigid structure
	Site WP-1: Regional Detention Basin, Wet Dam
Alternative 3. Combination 2	**Site S-1:** Dredging of DS-19 and three (3) loose rock structures All other Sites are the same as Alternative 2.
Alternative 4. Combination 3	**Site WP-1:** Regional Detention Basin, Dry Dam All other Sites are the same as Alternative 2.

5.1 Erosion and Sedimentation

No Action Alternative. This alternative would not prevent sediment from entering streams and water bodies and continue to allow the influx of nutrients to enter water and compromise water quality within the watershed. This alternative would have a permanent moderate adverse effect due to decreases in viable farmland, decreases in the aesthetic value of waterbodies, and decreased water quality.

Alternative 2. This alternative includes channel stabilization at Sites W-5, D-78, D-2, S-5, and S-15; a sediment basin at Site S-1; and a wet dam a Site WP-1. Channel stabilization alternatives will prevent channel erosion upstream of Sites W-5, D-78, D-2, S-5 and the sediment basin and wet dam capture and storage accumulated sediment in the S-1 and WP-1 subwatersheds. Due to the reservoir's trapping of sediment, the floodwater that flows out of the reservoirs may be sediment hungry. It is possible this could increase erosion downstream, but the effects are expected to be minimal given the existing conditions of the stream.

Sufficient downstream erosion protection would be installed and has been considered in the economic analysis. This alternative would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. This alternative also reduces sediment loads transported downstream and reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 244,760 tons per year. This alternative provides a long-term, moderate benefit to the watershed. Decreases in sedimentation and erosion increases viable farmland, improves the aesthetic value of the downstream waterbodies, improves water quality, and benefits aquatic and terrestrial habitat for native species. See Table 5-2 for information about the impacts at each site.

Alternative 3. This alternative includes construction of three loose rock structures at Site S-1 and dredging of downstream Structure S-1. The alternative would result in the prevention of channel erosion upstream of Site S-1 and would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. This alternative reduces the amount of sediment that is transported downstream of Site S-1 and reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 249,310 tons per year. See Table 5-2 for information about the impacts at each site.

Alternative 4. This alternative includes construction of a dry dam at Site WP-1 that would result in the capture and storage of 100-years of accumulated sediment in the WP-1 subwatershed. This would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. Due to reservoir's trapping of sediment, the floodwater that flows out of the reservoirs may be sediment hungry. It is possible this could increase erosion downstream, but the effects are expected to be minimal. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis. The Dry Dam Alternative eliminates sediments from being transported downstream in WP-1's subwatershed. All other sites would have the same reduction impacts as Alternative 2. This alternative reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 247,090 tons per year. See Table 5-2 for information about the impacts at each site.

Table 5-2. Sediment Transported Downstream by Structure Subwatershed

Site	Sediment Transported Downstream by Structure Subwatershed (tons/year)			
	Alternative 1. No Action/FWOFI	**Alternative 2.** Combination 1	**Alternative 3.** Combination 2	**Alternative 4.** Combination 3
D-2	970	930	930	930
D-78	2,150	2,020	2,020	2,020
S-1	1,500	0	1,390	0
S-5	790	440	440	440
S-15	1,100	900	900	900
WP-1	2,330	0	0	0
W-5	1,240	1,130	1,130	1,130
Subwatershed Total	10,080	5,420	6,810	5,420
Watershed Total	**249,420**	**244,760**	**249,310**	**247,090**

Note: Values rounded to the nearest 10 tons/year
Both dam alternatives will have a negligible amount of sediment transported downstream. Negligible amounts of sediment are reported as zero for this analysis.

5.2 Prime and Unique Farmland

No Action Alternative. This alternative would not convert any prime or unique farmland or farmland of statewide importance. Continued flooding and land loss due to stream degradation and widening would threaten existing farmland.

Alternative 2. Implementation of the proposed project will directly convert between 70 acres and 154 acres and indirectly convert 62.8 acres of land. This includes direct and indirect conversion between 96 and 167 acres of prime farmland and between 13 and 14 acres of farmland of statewide importance. See Table 5-3 for a summary of the impacts at each site.

The Nebraska NRCS natural resources inventory specialist completed land evaluation analyses using the Form AD-1006 Farmland Conversion Impact Rating for each Site. Form AD-1006 is based on a point system that has 160 points set as a minimum number of 'total points' that triggers in-depth site reviews. Implementation of this alternative results in each site having a 'total points' score of less than 160 and therefore this alternative is clear of Farmland Protection Policy Act (FPPA) significant concerns. Coordination with the NRCS natural resources inventory specialist indicating that the measures within this alternative are clear of FPPA significant concerns and completed AD-1006 forms for each site are included in Appendix E. This alternative does not have an immediate effect on prime or unique farmland but does provide long-term protection of viable farmland which improves economic sustainability to producers.

Table 5-3. Prime and Unique Farmland, Alternative 2

Site	Area Directly Converted[1] (acres)			Area Within ARA[2] (acres)			Area Indirectly Converted[3] (acres)		
	Prime	Statewide Importance	Total	Prime	Statewide Importance	Total	Prime	Statewide Importance	Total
D-2	0.5	0	0.5	14.7	0	14.7	-	-	-
D-78	0.4	0	0.4	34.8	0.1	34.9	-	-	-
S-15	0.1	0	0.1	7.2	1.1	8.3	-	-	-
W-5	1.3	0	1.3	16.7	0.2	16.9	-	-	-
S-5	11.9	0.1	12.0	-	-	-	-	-	-
S-1	11.8	0.1	11.9	-	-	-	6.9	0.4	7.3
WP-1	28.9	2.4	31.3	-	-	-	34.1	9.8	43.9
Total	**53.6**	**2.6**	**56.2**	**56.7**	**1.2**	**57.9**	**41**	**10.2**	**51.2**

[1]Area within proposed fill, excavation, and/or permanent pool extents
[2]Analyzed for FPPA concerns at sites D-2, D-78, S-15, and W-5 for a conservative analysis
[3]Area within top of dam limits, not including those areas directly converted

Alternative 3. Implementation of this alternative is clear of FPPA significant concerns. Impacts at Site-1 are shown in Table 5-4. Impacts at all other sites are shown in Table 5-3. This alternative does not have an immediate effect on prime or unique farmland but does provide long-term protection of viable farmland which improves economic sustainability to producers.

Table 5-4. Prime and Unique Farmland, Alternative 3

Site	Area Directly Converted[1] (acres)		
	Prime Farmland	Farmland of Statewide Importance	Total
S1	0.2	0	0.2

[1]Area within proposed fill, excavation, and/or permanent pool extents

Alternative 4. Implementation of this alternative is clear of FPPA significant concerns. Impacts at WP-1 are shown in Table 5-5. Impacts at all other sites are shown in Table 5-3. This alternative does not have an immediate effect on prime or unique farmland.

Table 5-5. Prime and Unique Farmland, Alternative 4

Site	Area Directly Converted[1] (acres)			Area Indirectly Converted[2] (acres)		
	Prime Farmland	Farmland of Statewide Importance	Total	Prime Farmland	Farmland of Statewide Importance	Total
WP-1	7.1	2.2	9.3	34.1	9.8	43.9

[1]Area within proposed fill and/or excavation extents

[2] Area within top of dam limits, not including those areas directly converted

5.3 Water Quality

No Action Alternative. This alternative would allow the existing level of sediment and associated nutrients to enter streams and downstream waterbodies. Streams would continue to degrade and widen, and the associated sediment loads would decrease water quality.

Alternative 2. Implementation of this alternative would provide grade control to streams and would consequently reduce stream erosion and the influx of nutrients from sediment to downstream waterbodies. Additionally, the construction of the S-1 sediment basin will protect DS-19's water quality by detaining approximately 44 acre-feet of sediment that would otherwise enter the downstream DS-19. The wet dam at WP-1 will store 98 acre-feet of sediment and the WP-1 sediment basin will store an additional 3 acre-feet of sediment, protecting the water quality of downstream streams and water bodies. This alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

Alternative 3. This alternative would allow 44 acre-feet of sediment to enter DS-19 throughout the 50-year design life, thereby reducing water quality of the pool. However, this alternative would still improve water quality in downstream reaches by capturing the sediment and associated nutrients within the DS-19 pool. This alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

Alternative 4. A dry dam at Site WP-1 would provide grade control along Whispering Ridge Creek, decreasing upland and channel erosion. Implementation would also result in capture and storage of 101 acre-feet of sediment, reducing the influx of nutrients from sediment to downstream water bodies. This

alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

5.4 Regional Watershed Management Plans

No Action Alternative. This alternative would have no impact on regional watershed management plans.

Alternative 2. This alternative includes the construction of a wet dam at WP-1 and a sediment basin upstream of DS-19. DS-19 is a planned structure with 60 percent design complete. Land acquisition and Section 404 permitting have begun. WP-1 and DS-19 are included in the regional watershed management plans described below and therefore this alternative works together with other projects and practices to accomplish the defined goals of the Sponsor and the PCWP within the watershed.

The *Multi-Reservoir Analysis, Papillion Creek Watershed* (2004) details the conceptual design of DS-19 and strongly recommends an upstream sediment basin to extend the dam's design life and improve its water quality. This alternative would actualize the proposed sediment basin upstream of DS-19 described in this analysis. The *Papillion Creek Watershed Management Plan* (2009) and the subsequent *Papillion Creek Watershed Management Plan – March 2014 Update* identifies DS-19 and Site WP-1 (named the West Papillion Creek Watershed – Regional Detention Basin 1, or WP-RB1, in the watershed management plans) as proposed and recommended flood risk reduction structures. This alternative would implement the previously identified WP-RB1 dam which works with other previously constructed and planned flood risk reduction structures as a system to reduce the flood damage risk in the watershed. This alternative has the potential to add Federal construction dollars to local and State funding sources to meet watershed goals thereby reducing the local financial requirements and potentially speeding up the projected schedule for implementation at Site WP-1 and the sediment basin associated with DS-19.

Alternative 3. The *Multi-Reservoir Analysis, Papillion Creek Watershed* (2004) details the conceptual design of DS-19 and strongly recommends an upstream sediment basin to extend the dam's design life and improve its water quality. This alternative would ignore this recommendation and instead implement dredging at DS-19 but would not impact the implementation, schedule, or financial outcome of any regional watershed management plans.

Alternative 4. Site WP-1 is identified as a recommended flood risk reduction structure in the *Papillion Creek Watershed Management Plan* (2009) and *Papillion Creek Watershed Management Plan – March 2014*. These previous studies recommend a wet dam at this site instead of a dry dam due to wet dam's ability to lower resuspension and turbulence of sediment from incoming flow, but implementation of a dry dam would provide the same flood risk reduction benefits and would therefore work with other previously constructed and planned flood risk reduction structures as a system to reduce the flood damage risk in the watershed. This alternative has the potential to add Federal construction dollars to local and State funding sources to meet watershed goals thereby reducing the local financial requirements and potentially speeding up the projected schedule for implementation at Site WP-1.

5.5 Floodplains

No Action Alternative. This alternative would have no effect on the 100-year floodplain. Increased development is expected to expand the existing 100-year floodplain within the watershed, as mapped by the future conditions FEMA floodplain.

Alternative 2 and Alternative 4. These alternatives provide major permanent improvements to floodplain management, providing measurable and life-saving measures downstream of Site WP-1.

Sites W-5, D-78, and D-2 are not within the regulatory FEMA floodplain.

Site S-15 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Grade stabilization structures will be placed at existing grade with little fill. What fill may be placed will be mitigated by localized widening of the channel to both promote stability of the structure and to ensure that the structure does not raise water surface elevations at any runoff frequency.

The downstream portion of Site S-5 located within the delineated FEMA Zone AE (includes base flood elevations). Careful consideration was given during design to ensure there would be no rise in the 100-year and 500-year future flood conditions.

A "no-rise" certification for construction within the delineated floodway and flood fringe at Sites S-15 and S-5 would be conducted by taking the effective (current) hydraulic model and adding sufficient detail to represent the proposed changes within the model reach to create a "corrected effective" model. This model would prove that there is not a rise in water surface elevations at the required storm intervals. The model is submitted for review through the local floodplain administrator and, once approved, a floodplain development permit is issued for the work. Floodplain maps are included in Appendix C.

Site WP-1 is not within the delineated FEMA floodplain; however, this alternative would provide a reduction of the 100-year and 500-year floodplain downstream of WP-1 (see figures provided in Appendix C) and will work in conjunction with other flood reduction sites in the watershed to provide floodplain reduction throughout the watershed. It is Nebraska's standard that the flood pool behind all dams that require NDNR approval be mapped as regulatory floodplain and therefore this site will require a Conditional Letter fof Map Revision (CLOMR) and follow up Letter of Map Revision (LOMR). Implementation of Site WP-1 results in a reduction of the 100-year flood extents by 131 acres and a decrease of 90 acres during the 500-year flood event.

The downstream portion of Site S-1 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Site S-1 is not a high-hazard structure and therefore does not technically influence the downstream floodplains. However, this site will be constructed as the sediment basin of the planned downstream flood reduction structure and will also influence the upstream floodplain within the pool extents. Figures of with- and without-project floodplain extents are provided in Appendix C. It is Nebraska's standard that the flood pool behind all dams that require NDNR approval be mapped as regulatory floodplain and therefore this site will require a CLOMR and follow up LOMR.

Floodplain management regulations are described in Section 5.17.

Alternative 3. This alternative would have the same effects as Alternative 2 at Sites W-5, D-78, D-2, S-15 and WP-1.

The downstream portion of Site S-1 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Grade stabilization structures would be placed at existing grade with little fill. What fill may be placed will be mitigated by localized widening of the channel to both promote stability of the structure and to ensure that the structure does not raise water surface elevations at any runoff frequency. A "no-rise" certification for construction within the delineated floodway and flood fringe would be conducted by taking the effective (current) hydraulic model and adding sufficient detail to represent the proposed changes within the model reach to create a "corrected effective" model. This model would prove that there is not a rise in water surface elevations at the required storm intervals. The model is submitted for review through the local floodplain administrator and once approved, a floodplain development permit is issued for the work. Floodplain maps, which show existing floodplains, are included in Appendix C. Floodplain management regulations are described in Section 5.17.

5.6 Wetlands

The extents and types of existing wetlands within each ARA are shown in figures included in Appendix C.

No Action Alternative. No change to existing conditions.

Alternative 2. This alternative has a moderate, long-term beneficial effect to wetlands and associated benefits to water quality and habitat improvements. Wetland impacts of this alternative are shown below in Table 5-6.

Table 5-6. Wetland Impacts of Alternative 2

Site	Cowardin Wetland Classification[1]	Hydrogeomorphic Classification	Type of Impact	Impacts (ac)
D-2	-	-	-	-
D-78	-	-	-	-
S-1	PEMA/C	Depressional	Fill	0.03
S-1	PEMA/C	Riverine	Fill	0.12
S-1	PEMA/C	Riverine	Inundation	0.46
S-5	-	-	-	-
S-15	-	-	-	-
W-5	-	-	-	-
WP-1	PEMA	Depressional	Inundation	0.37
			Total	0.98

[1]*PEMA = Palustrine emergent temporarily flooded*
PEMA/C = Palustrine emergent temporarily/seasonally flooded

A total of 0.15 acres of wetlands are impacted by earthen fill for the S-1 sediment basin embankment. Additionally, 0.83 acres of wetlands will be inundated from the S-1 and WP-1 permanent pools. There will be approximately 1 acre of cumulative wetland impacts.

Approximately 38.2 acres of lacustrine fringe wetlands will be created around the S-1 and WP-1 permanent pools. Wetland vegetation is predicted to establish at 2-feet vertically above and below the permanent pool elevation based on local experience. Wetland vegetation will be planted at 1-foot vertically above the permanent pool as a conservative estimate for wetland establishment due to the large spillway and 2-feet

below the permanent pool based on existing topography and proposed grading at the S-1 sediment basin. Lacustrine fringe wetlands established above and below the permanent pool elevations will result in a net gain of 37.2 acres of wetlands for all sites.

Alternative 3. This alternative does not have any wetland impacts at S-1. All impacts at the other sites are the same as listed in Table 5-6 above. This alternative does not create any wetlands at Site S-1 and results in a net gain of 28.1 acres of wetlands for all sites combined. This alternative would have negligible impacts to wetlands at Site S-1.

Alternative 4. This alternative does not cause any immediate wetland impacts at WP-1 and all impacts at the other sites are the same as listed in Table 5-6 above. This alternative would result in a net gain of 9.1 acres of wetlands for all sites combined. This alternative would have negligible impacts to wetlands at Site WP-1.

5.7 Streams and Riparian Habitat

The extents and types of streams within the ARAs are shown in Appendix C.

No Action Alternative. This alternative would not place fill in or inundate any streams. However, the streams within the ARAs are experiencing continual degradation, widening, and erosion. All streams within the ARAs will continue to degrade and widen and stream erosion will continue with this alternative and therefore it has a long-term adverse impact to stream health, habitat, human safety, and property values.

Alternative 2. This alternative has a moderate, long-term beneficial impact to stream and riparian habitat, providing improvements to property values, protection of land and infrastructure, and a reduction in safety risk. A summary of the stream impacts at each site is shown below in Table 5-7. This alternative would provide grade stabilization and headcut progression prevention in the streams and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety. Site WP-1 impacts approximately 543 feet of perennial stream impacts due to fill, which results in a loss of stream functional units (Olsson, 2019) according to the Nebraska Stream Condition Assessment Protocol. Therefore, stream mitigation would be required to account for this loss. Stream inundation caused by the permanent pool is offset by creation of lentic aquatic habitat. The restoration at Site S-5 will greatly improve stream function and quality. Fill associated with the raising of the channel grade is not included in fill quantities as the result is a channel elevation and improvement but not a loss.

Table 5-7. Stream Impacts, Alternative 2

Site	Length of Stream Impacts (feet)			
	Ephemeral	Intermittent	Perennial	Impact Type
D-2	-	782	-	Excavation (earthen)
D-2	-	95	-	Fill (earthen)
D-2	46	401	-	Fill (rock riprap)
D-78	-	488	-	Excavation (earthen)
D-78	-	500	-	Fill (rock riprap)
S-1		66		Excavation (earthen)
S-1	-	291	-	Fill (earthen)

Site	Length of Stream Impacts (feet)			
	Ephemeral	Intermittent	Perennial	Impact Type
S-1	-	68	-	Fill (rock riprap)
S-1	135	6,027	-	Inundation
S-15	-	242	-	Excavation (earthen)
S-15	-	125	-	Fill (earthen)
S-15	-	369	-	Fill (rock riprap)
W-5	60	938	-	Fill (rock riprap)
WP-1	-	-	543	Fill (earthen)
WP-1	-	-	2,556	Inundation
Total Fill	106	2,787	543	Fill (earthen and rock)
Total Inundation	135	6,027	2,556	Inundation
Total Excavation	0	1,578	0	Excavation
Total Impacts	241	10,392	3,099	Fill, Inundation, and Excavation

Alternative 3. This alternative includes 36 feet of rock riprap fill within the intermittent South Papillion Creek and 97 feet of rock riprap fill in an intermittent unnamed tributary at Site S-1. All other stream impacts remain the same as those listed in table 5-7 above. This alternative would provide grade stabilization and headcut progression prevention and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety.

Alternative 4. This alternative includes 543 feet of rock riprap fill within the perennial channel at Site WP-1 from the dam embankment. All other stream impacts remain the same as those listed in Table 5-7 above. This alternative would provide grade stabilization and headcut progression prevention and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety. However, this alternative does not provide the same benefit of aquatic and terrestrial habitat improvements as identified at Site WP-1 for the wet dam due to the absence of the permanent pool. This alternative would lead to an overall loss of stream functional units (Olsson, 2019) and would therefore require mitigation.

5.8 Threatened and Endangered Species and Fish and Wildlife Coordination Act

Coordination with both USFWS and NGPC was conducted to obtain feedback on the impacts that any of the alternatives had on streams or other bodies of water and what recommendations were offered to minimize impacts (allowing fish passage, de-watering preventatives, etc.) in order to comply with the Fish and Wildlife Coordination Act.

On September 27, 2023, both the USFWS IPaC and the NGPC CERT were run again, using the ARA boundaries created for each proposed alternative, to determine the list of species with habitat ranges that intersect the boundaries of the ARAs. Out of the 11 species identified in Chapter 3 (using the entire watershed as the boundary), six of those species (Lake Sturgeon, Sturgeon Chub, American Ginseng, Interior Least Tern, Eastern Black Rail, and the Rufa Red Knot) did not appear on either report generated. These six species do not have suitable habitat that intersect the boundaries of any ARA, and result in a no effect finding.

The reports did list the remaining five species, and suitable habitat could exist within the boundaries of any one of the ARAs. Each species is listed below with a description of how impacts were identified, and what the initial determinations were based off of those findings. Please note that these findings are only associated with determining any significant impacts that would otherwise prevent the creation and signature of a FONSI. Consultation will need to occur with both USFWS and NGPC, through the creation of a Biological Assessment, for the preferred alternative selected prior to any construction efforts to ensure impacts are properly avoided, minimized, or mitigated.

Eastern Black Rail

No Action Alternative. This alternative would have no effect on the Eastern black rail.

All Other Alternatives. This is a transient migrant that only uses Nebraska as a stopover site during its spring and fall migrations. Because of this, any proposed alternatives selected as the preferred would not significantly impact the species, and thus have no effect on the Eastern black rail.

Rufa Red Knot

No Action Alternative. This alternative would have no effect on the rufa red knot.

All Other Alternatives. Similar to the eastern black rail, this species is a transient migrant that would only use Nebraska during its bi-annual migration periods. Because of this, any proposed alternatives selected as the preferred would not significantly impact the species, and thus have no effect on the rufa red knot.

Pallid Sturgeon

No Action Alternative. This alternative would have no effect on the pallid sturgeon.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the pallid sturgeon.

Lake Sturgeon

No Action Alternative. This alternative would have no effect on the lake sturgeon.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the lake sturgeon.

Sturgeon Chub

No Action Alternative. This alternative would have no effect on the sturgeon chub.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the sturgeon chub.

Piping Plover

No Action Alternative. This alternative would have no effect on the piping plover.

All Other Alternatives. Site observations, IPaC, and CERT reports all indicate that the species would not have any suitable habitat within the boundaries of any of the ARAs, as the streams lack perennial flows or lack sandy banks due to erosion and degradation. The other issue associated with this species would be depletions in the Platte River. Any suitable habitat present on the Missouri River is not influenced by small tributaries located in Nebraska. However, the watershed as a whole does not empty into the Platte River, but rather the Missouri River. Because of this, any proposed alternatives selected as the preferred will have no effect on the piping plover.

Interior Least Tern

No Action Alternative. This alternative would have no effect on the interior least tern.

All Other Alternatives. Site observations, IPaC, and CERT reports all indicate that the species would not have any suitable habitat within the boundaries of any of the ARAs, as the streams lack perennial flows or lack sandy banks due to erosion and degradation. The other issue associated with this species would be depletions in the Platte River. Any suitable habitat present on the Missouri River is not influenced by small tributaries located in Nebraska. However, the watershed as a whole does not empty into the Platte River, but rather the Missouri River. Because of this, any proposed alternatives selected as the preferred will have no effect on the interior least tern.

American Ginseng

No Action Alternative. This alternative would have no effect on the American ginseng.

All Other Alternatives. This species lacks suitable within any of the ARAs, as habitat is limited to deciduous forests along the Missouri River, which none of the proposed alternatives are located along the Missouri River bluffs and no high-quality woodlands are present within any of the ARAs. Because of this, any proposed alternatives selected as the preferred will have no effect on the American ginseng.

Northern Long-Eared Bat

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

All other alternatives. The northern long-eared bat range is within the ARA limits; however, there are no known hibernacula within the ARAs or within 0.25 miles of one. Northern long-eared bats could conceivably roost underneath bark, in cavities, or in crevices in both live and dead trees that will be cleared.

As of March 31, 2023, the re-classification of this species was finalized, listing it as a federally and state endangered species. Currently, updated conservation conditions and other requirements are being discussed and have not been finalized. Because construction efforts are not anticipated prior to April 1, 2024, the Interim Consultation Framework does not apply. New guidance to avoid adverse impacts to Northern long-eared bat will be issued in April of 2024. Once known, the newest conservation conditions will be implemented as necessary to avoid adverse impacts to the species. Current field observations, IPaC report, and CERT reports have identified there is suitable habitat, in the form of roosting trees, within the ARAs and no tree removal will occur during the active season or prior to new guidance scheduled to be released April 2024. The initial determination is that any proposed alternatives selected as the preferred are not likely to adversely affect the Northern long-eared bat. However, due to the guidance changes associated

with this species, additional coordination and consultation will be required prior to implementation of any alternatives.

Western Prairie Fringed Orchid

No Action Alternative. This alternative would have no effect on the Western prairie fringed orchid.

All Other Alternatives. The Western prairie fringed orchid range is within ARA limits. Current field observations, IPaC report, and CERT reports have identified there is potential suitable habitat, in the form of sporadic wetlands and sandy channels, within the ARAs but the proposed alternatives should not result in any significant impact to the species. Though current conditions of the landscape would suggest a lack of suitable habitat for the species (historic cropping or degraded vegetation within wet meadows), no official surveys have been conducted in any of the ARAs. Because of this, additional consultation with USFWS and NGPC will be required prior to any construction efforts. The initial determination is that any proposed alternatives selected as the preferred are not likely to adversely affect the Western prairie fringed orchid.

Monarch Butterfly

No Action Alternative. This alternative would have no effect on the monarch butterfly.

All Other Alternatives. The monarch butterfly range is within ARA limits. There is the potential for milkweed species to inhabit many areas with the ARA limits and therefore, there is the potential for suitable habitat for the monarch butterfly. The monarch butterfly is currently a candidate species. If the monarch butterfly becomes listed prior to construction, consultation with USFWS would occur and avoidance measures would be followed. Conservation measures will be taken to include milkweed species into any seeding plan to increase forage availability for the species.

5.9 Fish and Wildlife Habitat

No Action Alternative. No change in existing conditions.

Alternative 2. This alternative would impact approximately 12 acres of woodlands, as shown in Table 5-8 below. It would provide grade control along streams, enhancing overall stream function and consequently improve in-stream fish habitat. Existing streams at grade stabilization sites are actively incising and large headcuts frequently cut off fish passage within the watershed. The proposed loose rock structures will be placed at-grade and will launch as headcuts progress upstream toward the structures, resulting in a ramp. These structures will improve stream connectivity by reducing the chance of severe, vertical drops frequently found within the watershed that are a result of unchecked stream degradation. Proposed rigid ramp structures are being placed at existing vertical drops and will improve stream connectivity and wildlife passage.

The permanent pools at Sites WP-1 and S-1 will provide approximately 36-acres of additional fish habitat. The WP-1 Reservoir will provide 20 acres of the fish habitat and has a watershed to lake ratio of approximately 45, which is slightly higher but relatively close to the preferred watershed to lake ratio of 30:1 for desirable fish habitat. Overall, this alternative improves fish habitat and results in minimal impact to woodland and agricultural wildlife habitats.

Table 5-8. Woodland Impacts, Alternative 2

Site	Inundation	Tree Removal	Total (acres)
D2	0	1.0	1.0
D78	0	0.5	0.5
S1	2.5	0.1	2.6
S15	0	1.3	1.3
S5	0	3.2	3.2
W5	0	1.7	1.7
WP1	0.8	1.1	1.9
		Total	12.2

Alternative 3. This alternative would impact 0.2 acres of woodlands at Site S-1. Impacts at the other sites would be the same as shown in Table 5-8 above and therefore this alternative results in a total woodland impact of 9.7 acres and a gain in 20 acres of open water habitat. Providing grade stabilization along South Papillion Creek and the unnamed tributary would enhance overall stream function and improve aquatic and terrestrial habitat. Sediment entering downstream DS-19 would decrease water quality and aquatic habitat within the DS-19 permanent pool. This alternative would improve habitat and have negligible impacts to woodlands and other fish and wildlife habitat.

Alternative 4. This alternative would impact 0.8 acres of woodlands at WP-1 with construction of the embankment and an additional 0.8 acres as the structure fills with sediment over time. Impacts at the other sites would be the same as shown in Table 5-8 above and therefore results in an immediate impact of 11.4 acres of woodlands and a gain of 16 acres of open water habitat. The dry dam would reduce sedimentation and associated nutrients from moving downstream and would therefore improve aquatic habitat downstream. However, this alternative would fill the existing upstream reach with sediment over the project design life and does not create any additional wetland or stream habitat. Overall, this alternative improves fish and wildlife habitat at the other six sites but has a negative impact on fish and wildlife habitat at Site WP-1.

5.10 Migratory Birds and Eagles

No Action Alternative. This alternative would have no impact on migratory birds or eagles.

All Other Alternatives. Based off of the IPaC report ran on the ARAs, 13 total species of migratory birds can potentially nest in this area ad are listed below.

List of Migratory Birds within the range of any one ARA:

- American Golden-plover (*Pluvialis dominica*)
- Bobolink (*Dolichonyx oryzirorus*)
- Cerulean Warbler (*Dendroica cerulea*)
- Chimney Swift (*Chaetura pelagica*)
- Henslow's Sparrow (*Ammodramus henslowii*)
- Hudsonian Godwit (*Limosa haemastica*)
- Lesser Yellowlegs (*Tringa flavipes*)
- Prothonotary Warbler (*Protonotaria citrea*)

- Red-headed Woodpecker (*Melanerpes erythrocephalus*)
- Rusty Blackbird (*Euphagus carolinus*)
- Short-billed Dowitcher (*Limnodromus griseus*)
- Upland Sandpiper (*Bartramia longicauda*)
- Wood Thrush (*Hylocichla mustelina*)

Because of the species listed above, any alternative selected as the preferred would have to avoid any habitat destruction during the nesting and breeding season for the species present. If any type of habitat destruction must occur during these times, bird surveys would be conducted (5 days prior to scheduled construction activities) to ensure compliance with the Migratory Bird Treaty Act. Conservation measures will also be implemented during the construction phase to limit impacts to habitat such as re-establishing vegetation cover, use of erosion blankets, watering down soil to prevent erosion, manage artificial lighting, etc.

Based off of results gathered from the IPaC report, bald eagles are known to occur within any one of the ARAs. Eagle surveys will be conducted within 0.5 miles of each alternative selected as the preferred during the leaf-off (dormant season), prior to construction. If bald eagles are nesting in the area, consultation with USFWS and NGPC will take place prior to any construction efforts. These alternatives are not likely to adversely impact migratory birds or bald eagles.

5.11 Flood Damages

No Action Alternative and Alternative 3. Frequent flooding and subsequent damages would continue at the existing rates.

Alternative 2 and Alternative 4. Site WP-1 is the only site that provides flood damage reduction and would provide the same reduction with a wet or dry dam. An economic analysis using the 2022 federal discount rate of 2.25 percent and a design life of 100-years was conducted with construction expected to occur in 1 year. Construction of this alternative would result in over $100,000 of annual flood reduction benefits.

5.12 Historic and Cultural Properties

Section 106 of the NHPA [54 U.S.C. § 306108] and its implementing regulations, "Protection of Historic Properties" [36 CFR part 800] requires Federal agencies to determine whether their undertakings will have an adverse impact on historic properties that are listed on or are eligible for listing on the National Register of Historic Places and to afford the Advisory Council on Historic Preservation a reasonable opportunity to provide comment. In compliance with Section 106 of the NHPA, consulting parties including Indian Tribes were identified and contacted to identify the presence of properties of historic, religious, and cultural significance within the study area. For a list of Tribes contacted see Table 6-1. The public was afforded an opportunity to provide input on cultural resources during the July 24th, 2019 and March 23rd, 2020 public meetings.

After the preferred alternative was identified, the area of potential effect (APE) for each proposed site was surveyed for the presence of historic properties by a professional consultant who meets the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. Cultural resources investigations were completed in late October and early November 2019.

No Action Alternative. There would be no immediate change to the surrounding lands resulting in No Federal Action that has the potential to affect historic properties and no further NHPA compliance would be required. This alternative would not impact any cultural and historic properties. There will be a continued threat to historic and cultural properties due to streambank erosion.

All Other Alternatives. One cultural resource was identified during the archeological survey. This resource consists of a segment of a cut-off rail line constructed by the C, B, & Q Railroad between 1914 and 1917. This rail line does not meet the criteria for National Register of Historic Places eligibility. No other cultural resources were identified. Based on the results of the cultural resource inventory, NRCS determined that no historic properties would be affected by the proposed watershed plan improvements. NRCS consulted with the Nebraska State Historic Preservation Office and the Tribal governments identified in Table 6-1 (and included in Appendix A) on the results of the cultural resource inventory and its determination of effect in letters dated September 10, 2020. The Nebraska State Historic Preservation Office concurred that no historic properties would be affected in a letter received September 18, 2020 (Appendix A). The Pawnee Nation of Oklahoma concurred with the determination of no historic properties affected in a letter received October 14, 2020 (Appendix A). The Otoe-Missouria Tribe of Indians concurred with the no historic properties affected determination in a letter received November 23, 2020 (Appendix A). There was no response received from other Tribes.

It is possible that construction activities could result in disturbance to unknown cultural resources through accidental discovery depending on the extent of the resources and their proximity to structures and access roads. If cultural resources are inadvertently discovered during construction, a stop work order will be issued until the resources can be evaluated by a professional archeologist. NRCS will notify the State Historic Preservation Officer, consulting tribal governments, and the Advisory Council on the Historic Preservation. NRCS will act as prescribed in NRCS GM 420, Part 401, to protect or recover any significant cultural resources discovered during construction.

5.13 Social and Demographic Data

No Action Alternative. This alternative would not adversely impact minority groups.

All Other Alternatives. This alternative will not adversely impact any known minority groups or individuals living in poverty. No private property will be taken without just compensation and no relocations are anticipated for this alternative. The community and landowners will benefit from stream stabilization and flood damage reduction.

5.14 Public Health and Safety

No Action Alternative. Risks to public safety from high and eroding stream banks will continue and likely worsen as stream banks continue to degrade and widen. High and steep stream banks, especially near developments, pose a risk to loss of life. If the streams continue to degrade to the predicted stable slope in the watershed, major infrastructure including state highways, county roads, residential roads, sanitary sewers, and power transmission lines will be at risk. Residential properties and homes near Sites S-5 and W-5 will also be susceptible to encroachment and damage. Additionally, the potential for risk to loss of life, property, and essential public services due to flooding downstream of Site WP-1 will remain and likely increase with predicted future development.

Alternative 2 and Alternative 4. This alternative would stabilize the stream banks within the ARAs to minimize degradation and erosion and therefore improving public safety in and near the streams within and upstream of the project areas. This alternative also involves restoration of an existing stream at Site S-5, which will reduce the current risks associated from the steep banks and erosion and provide infrastructure protection. Implementation of the flood reduction dam at WP-1 would decrease flood damages and reduce risks to the public health and safety. Utility protection is expected to be $42,000 annually for the 50-year lifespan of the grade control structures. In addition, protection to roadway embankments, power infrastructure, agricultural land, and homes are expected. A breach analysis was completed for Sites WP-1 and the sediment basin at Site S-1 and figures are included in Appendix C. Site WP-1 is a high-hazard dam and an emergency action plan (EAP) will be developed prior to implementation. The breach path for Site S-1 is contained within the flood pool of the Sponsor-led DS-19 site, which is a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach. Overall, this alternative has a permanent, major beneficial effect to public health and safety.

Alternative 3. This alternative would provide a minor, long-term improvement to safety and protect land along stream corridors at Site S-1.

5.15 Indirect Effects

Indirect effects are those that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). These can be positive or negative and can include effects to the human socioeconomic environment and/or the natural environment. An indirect effect of the no action alternative would be continued stream degradation, resulting in increased bank instability and channel widening. This would also result in loss of land, loss of production, and increased maintenance costs for producers. Another indirect effect could be an increase to the floodplain and continued flood risk. An indirect effect of Alternative 2 could be increased residential properties due to the recreation benefits of the permanent pool at Site WP-1 and open space and increased property values around the pools of Site WP-1 and S-1. Development is occurring throughout the watershed, and this will likely ultimately preserve open space and habitat as opposed to decreasing it.

5.16 Cumulative Impacts

Cumulative impacts are defined by the Council on Environmental Quality (CEQ) as:

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

These impacts include both the direct and indirect impacts of the proposed project with any other projects that have happened in the past or could reasonably happen in the future. Reasonably foreseeable actions must have progressed far enough through planning or design so that they are likely to be carried out. The framework provided in CEQ's "Considering Cumulative Effects under the National Environmental Policy Act" was consulted for this analysis. As is discussed in the aforementioned framework, a method to discern cumulative impacts is to assess potential resources affected by the proposed action, to look at other past

or future projects that could also impact those resources, and to analyze the locations and timeframes of those actions to determine if cumulative impacts are present.

Actions occurring within the Papillion Creek Watershed were considered for this analysis. Flood damage reduction and impacts to stream stability, wetlands, and streams were identified as the primary resources to consider. This Plan-EA is the only NRCS watershed plan for the area and therefore no other new NRCS structures are planned in the foreseeable future. Foreseeable actions within the watershed impacting stream stability and flood damage reduction include other flood damage reduction structures previously studied and recommended in the watershed (see Sections 3.4, 5.4). Cumulative impacts could include loss of stream length and potential degradation downstream due to sediment-hungry water. Other planned flood reduction structures within the watershed will work in conjunction with WP-1 and the previously implemented flood reduction measures to reduce current and future floodplains and bring needed flood damage reduction to the watershed. Reduced floodplain downstream of WP-1 and in conjunction with the other flood reduction structures could increase developments downstream of the site and within the watershed. Residential development around the WP-1 top of dam could also increase due to the recreation amenities provided.

Any additional stream stabilization projects will provide an overall benefit to watershed streams and surrounding land.

5.17 Compliance with Federal, State, and Local Laws

The following permit and compliance requirements must be met for construction of the Project to occur.

- **Clean Water Act Section 404.** CWA Section 404 permits must be obtained from the USACE to account for fills within jurisdictional waters of the United States prior to construction. The Sponsor will obtain a 404 permit for sites prior to construction. It is anticipated that individual Section 404 permits, issued by USACE, and 401 water quality certifications, issued by NDEE, will be required for Sites WP-1 and S-1 and a Nationwide Permit 27 will be issued for the other locations.
- **Migratory Bird Treaty and Bald/Golden Eagle Acts**. To avoid migratory bird nesting impacts, construction activities will be avoided nesting and breeding seasons (refer to Chapter 3). Additionally, conservation measures will be implemented during the construction phase to limit impacts to habitat such as re-establishing vegetation cover, use of erosion blankets, watering down soil to prevent erosion, manage artificial lighting, etc. If any construction measures must occur during this time, a field survey will be conducted 5 days before any construction activities occur to ensure compliance with the Migratory Bird Treaty Act. If migratory bird species are found, additional consultation with both USFWS and NGPC will be required prior to construction. Additionally, because bald eagles are known to occur within any one of the ARAs, eagle surveys will be conducted within 0.5 miles of each alternative selected as the preferred during the leaf-off (dormant season), prior to construction. If bald eagles are nesting in the area, consultation with USFWS and NGPC will take place prior to any construction efforts.
- **Endangered Species Act and Fish and Wildlife Coordination Act.** Though conferences have been held with both USFWS and NGPC regarding impacts and initial determinations to listed species, no official concurrence will be awarded until the next phase of the project, when the designs are 100%

completed. At that time, consultation with both agencies will be required to further analyze impacts to listed or proposed species. A Biological Assessment will be required to compile and document any impacts, determinations, surveys, or additional information required for each alternative selected as the preferred prior to any concurrence.

Additionally, coordination with both USFWS and NGPC has indicated that the Plan-EA complies with the Fish and Wildlife Coordination Act by reducing impacts to stream channels and improving the system as a whole through restoration and stabilization efforts.

- **NDEE.** A National Pollutant Discharge Elimination System (NPDES) construction storm water permit from the Nebraska Department of Environment and Energy (NDEE) will be required at each site if more than 1-acre of land is disturbed for construction.
- **Dust Regulations.** Title 129 Chapter 15 Section 003fugitive dust regulations shall apply to all excavation and construction activities.
- **Excavation.** All applicable regulations in Nebraska Title 128 and Title 132 must be followed. Any solid or hazardous wastes generated or discovered during project operations must be properly handled, contained, disposed, and (if necessary) characterized. No waste permit required.
- **National Historic Preservation Act.** Section 106 of the NHPA [54 U.S.C. § 306108] and its implementing regulations, "Protection of Historic Properties" [36 CFR part 800] requires Federal agencies to determine whether their undertakings will have an adverse impact on historic properties that are listed on or are eligible for listing on the National Register of Historic Places and to afford the Advisory Council on Historic Preservation a reasonable opportunity to provide comment. In compliance with Section 106 of the NHPA, consulting parties were identified including Indian tribes that might attach religious and cultural significance to historic properties within the APEs. The public was afforded an opportunity to provide input during the July 24th, 2019, and March 23, 2020, public meetings. The APE for each site was identified and reviewed for the presence of historic properties by a professional archeologist. Cultural resource investigations were completed in late October and early November 2019. No cultural resources that are eligible for listing on the National Register of Historic Places were identified during the investigations. Therefore, a determination of "no historic properties affected" was made for these alternatives. The Nebraska State Historic Preservation Office, the Pawnee Nation of Oklahoma, and the Otoe-Missouria Tribe of Indians concurred with this determination of effect. No other responses were received.
- **Storage Permit.** A water storage permit will be obtained from NDNR prior to construction.
- **Dam Safety.** The final engineering plans will be reviewed and approved by the NDNR Dam Safety Section prior to construction. Before approval of a dam, NDNR will have to verify the dam has the proper hazard classification.
- **Water wells.** Coordination with NDNR will occur prior to construction to locate any registered water wells.
- **Operation and Maintenance.** An O&M Plan will be prepared using the NRCS National Operation and Maintenance Manual.

- **Floodplain Management.** Prior to construction, the Sponsor will participate in and comply with applicable Federal, State, and Local floodplain management rules and regulations.
    - Any and all development in the regulatory floodplain or floodway will require a local Floodplain Development Permit (Neb. Rev. Stat. § 31-1021 & Title 455 Nebraska Administrative Code, Chapter 1). This includes all Special Flood Hazard Areas identified on FEMA's Flood Insurance Rate Maps, and any other area adopted by the local jurisdiction. Development is defined as "Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling operations or storage of equipment or materials."
    - Any development that causes more than a foot of rise in a regulatory floodplain without floodway or any rise in a regulatory floodplain with floodway is required to obtain a Conditional Letter of Map Revision (CLOMR) from FEMA. (44 CFR 65.12/60.3c10/60.3d3/60.3d4). The floodplain development permit application must contain engineering that shows the project meets these requirements.
    - Any development that causes a change to the regulatory floodplain or floodway boundary must submit a Letter of Map Revision (LOMR) within six months of project completion (44 CFR 65.3)
- **National Environmental Policy Act.** This document was prepared to comply with the National Environmental Policy Act and the Principles and Guidelines for Water and Related Land Resources Implementation Studies.

5.18 Possible Conflicts with Plans and Policies

No potential conflicts between land use plans, regional water resource management plans, policies, or controls for the area were identified.

5.19 Risk and Uncertainty

Each alternative contains risk factors and uncertainty values that could involve changes in costs and benefits. Costs, structural data, and benefits were based on an evaluated life of 50 years for grade stabilization structures and 100-years for the flood risk reduction dam (Site WP-1). Sedimentation rates were calculated using existing land use and conditions. Land use could change and therefore increase or decrease these rates and urbanization can cause a rapid influx of sediment into the basin. Costs, including land values, were determined by engineer estimates for project implementation and were based on local experience and engineering judgement. All estimated costs and benefits are subject to change due to local, regional, or world economics. These uncertainties were not considered for this analysis.

5.19.1 Climate Change

Climate change In Nebraska could result in an increase in extreme storm events (UNL, 2014), leading to increased flooding and an increase in stream degradation rates. All regulations were followed in the design of Site WP-1 as a high-hazard classification dam. In addition, stream banks at the grade stabilization structures are protected up to the 100-year flood event. Overall, all alternatives brought forward for detailed

analysis increase climate change resiliency within the watershed by reducing peak flows and protecting streams from headcuts progression and stream degradation.

5.19.2 Land Use

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

5.19.3 Adaptive Management

Adaptive management can be a useful tool to reduce uncertainty and maximize goals. Stream grades can change and headcuts can form and migrate quickly, especially with extreme events or in response to a human-induced change. Grade stabilization alternatives were analyzed with an understanding that these changes could occur between the planning process and final design and implementation. ARAs were determined and kept broad enough for individual grade stabilization structure locations to adjust to potential changes and resource impacts were determined and analyzed conservatively. Uncontrollable changes to stream profile and banks during the implantation timeline as well as survey completed during the final design phase may modify the planned design and footprint at grade stabilization sites. For example, sheet pile may be needed at some sites to protect the structure but not at others and some planned locations may shift within their respective ARAs. These changes are expected due to the fluid nature of stream dynamics and are not anticipated to impact the outcome of the included environmental assessment or economic analysis.

5.20 Precedent for Future Actions with Significant Impacts

Implementation of the proposed action does not set a precedent for future actions with significant impacts. Future projects would be analyzed by their own circumstances and evaluated for effects based on resources of concern identified during the scoping process.

5.21 Controversy

There have been no areas of controversy identified. The planning process included public meetings, coordination with interested agencies and groups, and printed public information to raise issues, resolve conflicts, and recommend the most desirable plan features. Comments were generally in-favor at all project sites and landowner recommendations and preferences were considered and utilized when possible. The Plan-EA's preferred alternative is also the locally preferred alternative.

6.0 CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

The following section details agency and public participation efforts throughout the planning process. Additional internal consultation and coordination took place between the Sponsor and NRCS throughout the planning process. An online website with the primary project contact information, project meeting information, and relevant project information was additionally made available to keep the public informed and address any concerns they may have had throughout the planning process.

6.1 Scoping Meetings

The Sponsor held agency and public scoping meetings on July 24, 2019 to provide information to the public about the Project and to gather comments that may be relevant to the scoping process. Summaries of the meetings are included in Sections 6.1.1 and 6.1.2 below. The sponsor also held internal scoping meetings with the NWMC, NRCS staff, and consultants to address questions and receive input during the initial scoping phase.

Table 6-1. Agency Mailing List

Agency / Tribe	Position	Name	Address
U.S. Fish and Wildlife Service	Wildlife Biologist (Consultation)	Carrie Allison	9325 South Alda Road Wood River, NE 68883
U.S. Fish and Wildlife Service	Wildlife Biologist (Consultation)	Santiago Martin	9325 South Alda Road Wood River, NE 68883
U.S. Fish and Wildlife Service	Field Supervisor	Lee Andrews	9325 South Alda Road Wood River, NE 68883
Nebraska Game and Parks Commission		Carey Grell	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Douglas County Conservation Officer	Rich Berggren	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Washington County Conservation Officer	Jon Reeves	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Sarpy County Conservation Officer	Dan Evasco	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Commissioner at Large	Scott Cassels	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	District #1 Commissioner	Dan Kreitman	1689 County Road E Wahoo, NE 68066
Nebraska Game and Parks Commission	District #2 Commissioner	Dick Bell	9960 Bloomfield Drive Omaha, NE 68114
Nebraska Game and Parks Commission	District #3 Commissioner	Jim Ernst	11 Wildwood Drive Columbus, NE 68601
United States Army Corps of Engineers		John Moeschen	Nebraska Regulatory Office

Agency / Tribe	Position	Name	Address
			8901 South 154th Street Omaha, NE 68138
United States Army Corps of Engineers		Matthew Wray	Nebraska Regulatory Office 8901 South 154th Street Omaha, NE 68138
U.S. Environmental Protection Agency	Region 7 NEPA Reviewer	Larry Shepard	National Environmental Policy Act 11201 Renner Blvd. Lenexa, KS 66219
Nebraska Department of Environmental Quality	Nonpoint Source Pollution Management Program contact	Carla McCullough	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Management Division Deputy Director	Steve Goans	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Quality Division Administrator	Marty Link	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Permits Division Administrator	Shelley Schneider	1200 N. Street Suite 400 Lincoln, NE 68509
Office of the Governor	Governor	Pete Rickets	P.O. Box 94848 Lincoln, NE 68509
City of Blair	Mayor	Richard Hansen	2323 Colfax Street Blair, NE 68008
City of Bennington	Mayor	Matt John	15505 Warehouse Street Bennington, NE 68007
Bennington Public Works		John Bohrer	PO Box 221 Bennington, NE 68007
City of Omaha	Mayor	Jean Stothert	1819 Farnam Street Omaha, NE 68183
Omaha Public Works	Public Works Director	Robert G. Stubbe	1819 Farnam Street Omaha, NE 68183
City of Gretna	Mayor	Jim Timmerman	204 N McKenna Ave P.O. Box 69 Blair, NE 68028
City of Gretna	Public Works Director	Kris Faris	Public Works Building 20090 Husker Drive Gretna, NE 68028
Washington County/Blair Public Works	Director	Al Schoemaker	218 South 16th Street Blair, NE 68008
Washington County Planning and Zoning	Administrator and Planning/Zoning	Ryan Sullivan	1555 Colfax Street Blair, NE 68008

Agency / Tribe	Position	Name	Address
Washington County	Board of Supervisors: District #3	Bob Frahm	1133 Park Street Blair, NE 68008
Douglas County Planning and Zoning	Planning Commission Member	Murray McArdle	P.O. Box 501 Eklhorn, NE 68022
Douglas County	Board of Supervisors: District #7	Clare Duda	1819 Farnam St. Omaha, NE 68183
Douglas County	Engineer	Tom Doyle	15505 W Maple Rd Omaha, NE 68116
Douglas County	Planning/Zoning	Doug Cook	3015 Menke Circle Omaha, NE 68134
Sarpy County Planning and Zoning	Planning and Building Director	Bruce Fountain	1210 Golden Gate Drive Suite #1240 Papillion, NE 68046
Sarpy County	Board of Supervisors: District #5	Jim Warren	1210 Golden Gate Dr #1250 Papillion, NE 68046
Sarpy County	Board of Supervisors: District #2	David Klug	1210 Golden Gate Dr #1250 Papillion, NE 68046
Sarpy County	Engineer	Denny Wilson	15100 S 84th Street Papillion, NE 68046
OPPD	Chair of the Board	Anne McGuire	444 S 16th Street Mall Omaha, NE 68102
OPPD	Chief Executive Officer President	Timothy J. Burke	444 S 16th Street Mall Omaha, NE 68102
Metropolitan Utilities District	Board Chairperson & Subdivision 4 Board Member	Tim Cavanaugh	1723 Harney Street Omaha, NE 68102
Metropolitan Utilities District	Compensation Manager & Subdivision 1 Board Member	James Begley	1723 Harney Street Omaha, NE 68102
Metropolitan Utilities District	Real Estate & Subdivision 7 Board Member	Jack Frost	1723 Harney Street Omaha, NE 68102
Federal Emergency Management Agency Region VII	Director, Flood Insurance and Mitigation Division	Michael Scott	9221 Ward Parkway Kansas City, MO 64114
Federal Emergency Management Agency Region VII	Regional Administrator	Paul Taylor	9221 Ward Parkway Kansas City, MO 64114
Nebraska State Historical Society	Director and SHPO	Trevor Jones	1500 R Street P.O. Box 82554 Lincoln, NE 68501
Nebraska State Historical Society	Deputy State Historic Preservation Officer	Jill Dolberg	1500 R Street P.O. Box 82554

Agency / Tribe	Position	Name	Address
			Lincoln, NE 68501
Nebraska State Historical Society		John Rissetto	1500 R Street P.O. Box 82554 Lincoln, NE 68501
Iowa Tribe of Kansas and Nebraska	Chairman	Timothy Rhodd	3345 B Thrasher Rd. White Cloud, KS 66094
Iowa Tribe of Oklahoma	Chairman	Edgar B. Kent, Jr.	335588 E. 750 Road Perkins, OK 74059
Otoe-Missouria Tribe of Indians	Chairman	John R. Shotton	8151 Highway 177 Red Rock, OK 74651
Omaha Tribe of Nebraska	Chairman	Isaac Sherman	PO Box 368 Macy, NE 68039
Pawnee Nation of Oklahoma	President	Walter R. Echo-Hawk	881 Little Dee Drive Pawnee, OK 74058
Ponca Tribe of Nebraska	Chairman	Larry Wright, Jr.	2523 Woodbine Street P.O. BOX 288 Niobrara NE 68760
Ponca Tribe of Indians of Oklahoma	Chairman	Oliver Little Cook	20 White Eagle Drive Ponca City, OK 74601
Sac and Fox Nation of Missouri in Kansas and Nebraska	Chairwoman	Tiauna Carnes	305 North Main Reserve, Kansas 66434
Sac & Fox Tribe of the Mississippi in Iowa	Chairwoman	Judith Bender	349 Meskwaki Road Tama, IA 52339
Sac & Fox Nation, Oklahoma	Chief	Justin Freeland Wood	920883 S Highway 99 Building A Stroud, Oklahoma 74079

6.1.1 Public Scoping Meeting (July 24, 2019)

A public scoping meeting was held on July 24, 2019 from 5:30 – 7:30pm in the P-MRNRD conference room in Omaha, Nebraska. This meeting was held after business hours to accommodate the public. Letters about the meeting were mailed to the potentially impacted and nearby landowners and a notice about the meeting was posted in the Omaha World Herald. This public meeting included an open house and presentation to provide an overview of the Supplemental Plan-EA, discuss any concerns, and begin an open line of communication with the public. An overview of the project was presented and included information about the project history, the NEPA planning process, preliminary site locations, and types of projects being considered at each project site. Time was allotted for the public to ask questions and to address concerns from the public. An information sheet, a Resources of Concern questionnaire, and comment cards were available to provide information and receive feedback from the public. Posters of the preliminary ARAs were available to provide close-up views of potential project extents.

6.1.2 Agency Scoping Meeting (July 24, 2019)

An agency scoping meeting for the Supplemental Plan-EA was held on July 24, 2019 from 3:30pm – 4:30pm in the P-MRNRD conference room in Omaha, Nebraska. This meeting was held during business hours to accommodate agency staff. Letters and a project location figure were sent to the agency members in Table 10-1. The Sponsor, state NRCS staff, engineering consultants, and representatives from USACE Regulatory and NGPC were in attendance. An overview and history of the project and the planning schedule were presented. An informational sheet, Resources of Concern questionnaire, and comment cards were available to provide information and receive feedback about the project. Posters of the preliminary ARAs were available to provide close-up views of potential project extents.

6.2 Public and Agency Meetings

The Sponsor additionally planned pubic and agency meetings for March 23, 2020. Adhering to the Centers for Disease Control Prevention (CDC) recommendation to cancel large gatherings due to the Coronavirus Disease 2019 (COVID-19), the in-person public and agency meetings were canceled, and the information was moved online. The planned presentation and site-specific posters detailing the proposed work were posted on the project website for the public to view. The public and agencies were notified of the online presentation and paper copies of the information as well as additional project information was made available upon request.

6.3 Threatened and Endangered Species, Fish & Wildlife Coordination Act, Migratory Birds, and Eagles

In compliance with the ESA, Fish & Wildlife Coordination Act, Migratory Birds Treaty Act, and the Bald and Golden Eagle Protection Act, Nebraska NRCS has reached initial determinations for species impacts. Conferences with both USFWS and NGPC confirm that these findings are adequate based off of impacts gathered through this document. However, consultation will be required with both agencies (using a Biological Assessment as documentation) to further analyze impacts and conservation measures required for each species listed below prior to any construction activities.

Table 6-2. Threatened & Endangered Species, Migratory Birds, and Eagles Initial Determinations

Common Name	Scientific Name	State/ Federal	Threatened or Endangered	Discussion & Determination
Northern Long-eared Bat	*Myotis septentrionalis*	Federal and State	E	Suitable habitat present. Consultation required in next phase of project. No significant impacts detected. Not likely to adversely affect.
Western Prairie Fringed Orchid	*Platanthera praeclara*	Federal and State	T	Suitable habitat may be present. Consultation required in next phase of project. No significant impacts detected. Not likely to adversely affect.
Piping Plover	*Charadrius melodus*	Federal and State	T	No suitable habitat and no depletion concerns. No effect.

Interior Least Tern	Sternula antillarum athalassos	State	E	No suitable habitat and no depletion concerns. No effect.
Pallid Sturgeon	Scaphirhynchus albus	Federal and State	E	No suitable habitat and no depletion concerns. No effect.
Lake Sturgeon	*Acipenser fulvescens*	State	T	No suitable habitat and no depletion concerns. No effect.
Sturgeon Chub	Macrhybopsis gelida	State	E	No suitable habitat and no depletion concerns. No effect.
American Ginseng	*Panax quinquefolius*	State	T	No suitable habitat. No effect.
Rufa Red Knot	*Calidris canutus rufa*	Federal and State	T	Proposed alternatives will create new habitat for this transient migrant. No significant impacts detected. No effect.
Eastern Black Rail	*Laterallus jamaicensis*	Federal and State	T	Proposed alternatives will create new habitat for this transient migrant. No significant impacts detected. No effect.
Migratory Birds	*N/A*	N/A	N/A	13 species may be located within the ARAs. Species surveys will be conducted, and avoidance and conservation measures will be required. Consultation required in next phase of project. No significant impacts detected. Not likely to adversely affect.
Bald Eagles	*N/A*	N/A	N/A	Bald eagles may be present within the ARAs. Species surveys will be conducted, and avoidance and conservation measures will be required. Consultation required in next phase of project. No significant impacts detected. Not likely to adversely affect.

6.4 Farmland Protection Policy Act

Coordination was conducted with the NRCS natural resources inventory specialist to ensure that the proposed measures are clear of FPPA significant concerns. Completed AD-1006 forms for each site and correspondence with NRCS are included in Appendix E.

7.0 The Preferred Alternative

7.1 Rationale for the Preferred Alternative

Four alternatives were analyzed in detail during project formulation and Alternative 2 provides the most ecosystem service benefits, best meets the Federal Objective, is the locally preferred alternative, and provides a positive monetary benefit to cost ratio. Therefore, Alternative 2 has been agreed upon as the Preferred Alternative. Ecosystem trade-offs for all alternatives analyzed in detail are shown in Tables 4-6 and 4-7, economic tables for the preferred alternative are provided at the end of this chapter, and additional information on the alternatives analysis can be found in Chapter 4.0. Please see Appendix D for additional information about the investigation and analysis of the preferred alternative.

7.2 Measures to be Installed

The proposed action includes a high-hazard flood risk reduction dam (Site WP-1), grade stabilization structures (Sites W-5, D-78, D-2, S-15, and S-1), channel restoration (Site S-5), and a sediment basin (Site S-1) as shown below in Table 7-1.

Table 7-1. The Preferred Alternative

Preferred Alternative	**Site W-5:** Eight (8) loose rock structures and one (1) rigid rock structure
	Site D-78: Eleven (11) loose rock structures
	Site D-2: Eight (8) loose rock structures and (1) rigid structure
	Site S-5: Channel restoration with downstream drop structure
	Site S-15: Seven (7) loose rock structures and one (1) rigid structure
	Site S-1: Sediment basin and one (1) rigid structure
	Site WP-1: Regional detention basin, wet dam

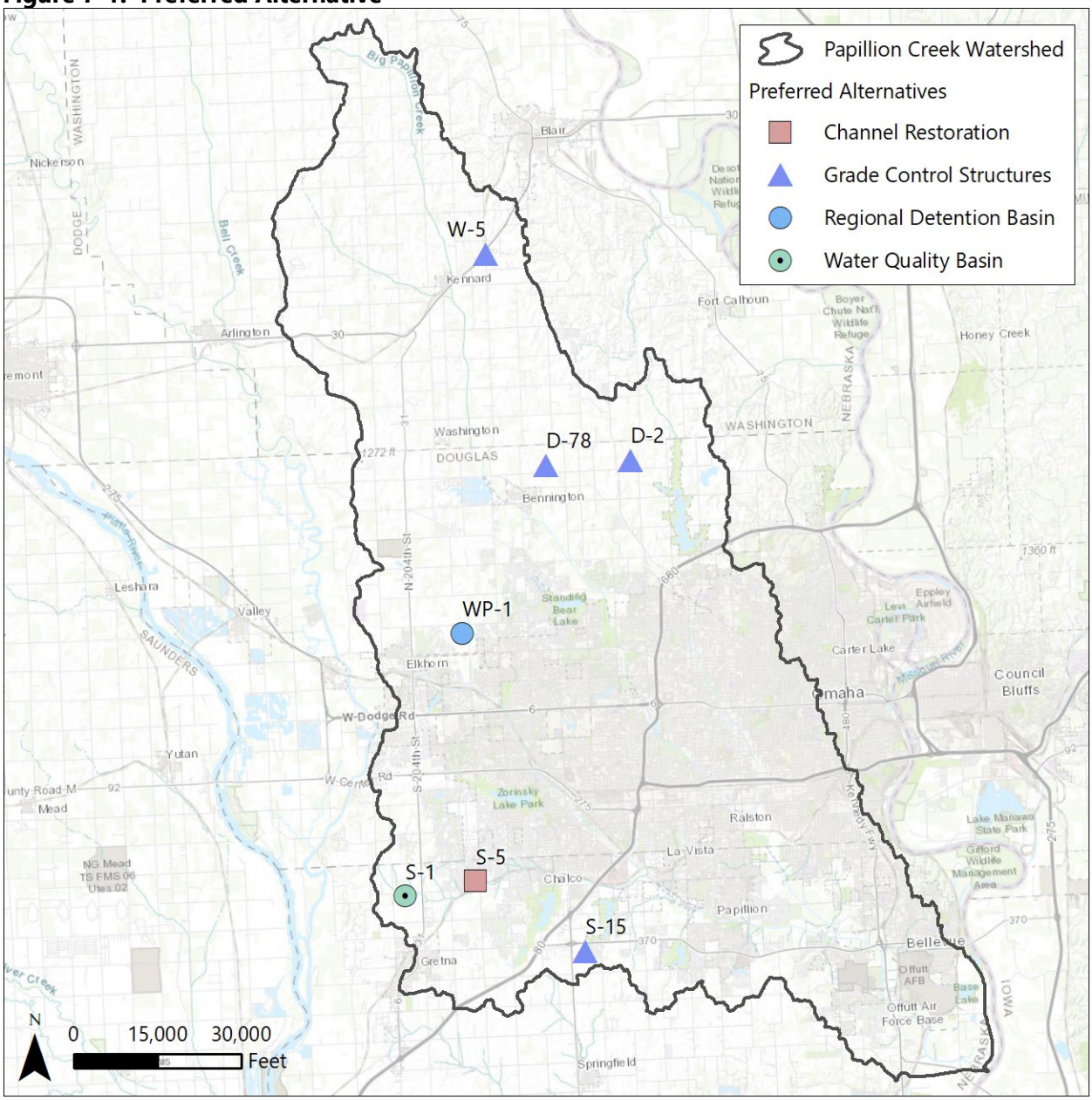
Loose rock structures will consist of rock riprap that will act as a deformable energy dissipation structure to "catch" headcuts as they progress upstream. The rock riprap will be placed along the channel bottom and partially up the banks, to a height of the 100-year flood event or the top of bank if flow is not conveyed within the channel at the 100-year event. Riprap will be placed at a depth of approximately 4-feet and will deform to changes in the stream slope. The riprap will be keyed-in at the downstream end to twice this depth. Sheet pile will be used when necessary to ensure longevity. Channel banks will be graded back at a 3:1 ratio upstream of the rock structure to allow stream flow to naturally expand without hitting the channel banks and transitioned back towards the existing channel downstream of the structures at a 1:1 ratio based on stream flow's typical contraction ratio. Rigid rock structures vary and are dependent on site-specific geometry and flows. Typical sections and design details are provided in Appendices C and D.

Channel improvements at Site S-5 include approximately 2,400-feet of channel grading within Beadle Creek and removal and replacement of the 180th Street culvert with an armored drop structure. Channel grading will repair the deeply incised and degraded channel to create a more stable and safer stream by repairing the shear and steep channel banks. The improved channel section, low flow channel, and in-stream benches will provide improved habitat. The drop structure would protect the upstream channel from a large existing headcut progression and scour hole and prevent further damage downstream of the existing culvert. It will also improve the conveyance capacity, protecting the upstream channel from flooding due to backwater. Project extents and detailed information are provided in Appendices C and D.

The Preferred Alternative at Site S-1 includes the implementation of a sediment basin upstream of the Sponsor planned DS-19 regional detention basin and one rigid structure within the channel upstream of the sediment basin's permanent pool. The rigid structure location is at an existing channel grade drop and water crossing that frequently washes out. The sediment basin will be 17-feet tall with a 13.5-acre permanent pool, 24-inch reinforced concrete pressure pipe principal spillway, and articulated concrete block auxiliary spillway. It will capture approximately 41-acre-feet of sediment that would otherwise enter the DS-19 reservoir.

The regional detention basin at Site WP-1 includes a 40-foot tall, 900-foot long earthen embankment on Whispering Ridge Creek. The principal spillway consists of a 4-foot by 12-foot concrete riser and 48-inch reinforced concrete pressure pipe with an impact basin consistent with NRCS sediment-storage design criteria. The proposed vegetated auxiliary spillway is located at the dam's left abutment with a bottom width of 200-feet, a crest length of 50-feet, 3H:1V side slopes, a 1.0 percent approach slope, and a 4.5 percent downstream slope. The reservoir will impound a permanent pool with a surface area of approximately 21-acres, with 98 acre-feet of sediment storage. The dam would provide 1,164 acre-feet of total storage volume and a maximum flood pool area of 80-acres. The proposed upstream sediment basin impounds a permanent pool of approximately two acres with a sediment volume storage of 3-acre-feet.

Figure 7-1. Preferred Alternative



7.3 Mitigation

There will be minor adverse impacts to some wildlife habitat and other sensitive resources during installation of the Project. Impacts to wildlife habitats include woodlands, streams, and wetlands expected to be permanently lost to construction within structure extents as well as from inundation by permanent pools. Field surveys were conducted within the ARAs to determine the quantities of wetlands and streams to be impacted by implementation of the Plan. Aerial images, ArcMap toolsets, and field investigations were used to determine the areas of woodlands expected to be lost.

Every effort was made to minimize and avoid impacts to sensitive resources. Embankment locations were chosen to help minimize impacts to wetlands. Disturbance limits were limited to those necessary for

structure placement and access roads are planned to avoid disturbing riparian habitat as much as possible. Open water habitat and dedicated upland buffer will be created as a result of the proposed action.

Mitigation requirements were determined in conjunction with NRCS specialists and based on USACE Regulatory requirements of similar, recent projects within eastern Nebraska. Land needed for mitigation measures will be located at or near the Sites and will be acquired by the Sponsor. The designated mitigation areas will be fenced to manage or prevent livestock grazing.

7.3.1 Wetland Mitigation

The Preferred Alternative would result in a loss of 0.58-acres of riverine wetlands and 0.40-acres of depressional wetlands. Mitigation bank credits are not available in the service area where impacts would occur and therefore on-site compensatory mitigation is proposed and will result in no net loss of wetlands.

Mitigation site construction would focus on creating wetland and aquatic habitats typical of the region by restoring hydrology, establishing native vegetation communities, and siting on soil types with the best potential for wetland establishment. A 12-point Mitigation Plan for Compensatory Mitigation has been developed in cooperation with the USACE to account for compensatory mitigation for Site WP-1 and a similar plan will be created for Site S-1. Approximately 38-acres of lacustrine fringe wetlands will be created around the S-1 and WP-1 permanent pools. Wetland vegetation is predicted to establish at 2-feet vertically above and below the permanent pool elevation at Site WP-1 based on local experience. Wetland vegetation will be planted at 1-foot vertically above the permanent pool as a conservative estimate for wetland establishment due to the large spillway and 2-feet below the permanent pool based on existing topography and proposed grading at the S-1 sediment basin. Lacustrine fringe wetlands established above and below the permanent pool elevations will result in a net gain of approximately 37-acres of wetlands for all sites.

7.3.2 Stream Mitigation

Overall, streams will improve with the Preferred Alternative. Preventing headcut progression and stream degradation and widening will result in an increase in stream function and habitat. Some riprap fill as well as earthen excavation will result from the implementation of the grade stabilization structures. Stream length will also be lost due to embankments at Sites S-1 and WP-1. Inundation will create open water in areas that were previously stream length. A loss of approximately 241-feet of ephemeral stream, 10,392 feet of intermittent stream, and 3,009-feet of stream will be impacted due to fill, excavation, and inundation for the Preferred Alternative. Most of this impact will be from grade stabilization structures, which does not result in a loss of stream length. Stream mitigation will account for stream length lost due to embankments and any overall decrease in stream function at Sites S-1 and WP-1 in accordance with USACE guidance.

Total earthen fill for embankments in the Preferred Alternative include 291-feet of intermittent stream and 543-feet of perennial stream. Inundation from Sites S-1 and WP-1 includes 135-feet of ephemeral stream, 6,027-feet of intermittent stream, and 2,556-feet of perennial stream. These streams are generally low functioning and highly degraded.

An analysis following the Nebraska Stream Condition Assessment Procedure (NeSCAP) was performed at Site WP-1 to assess impacts and potential loss of functional units, which resulted in a loss of approximately 918 functional units (USACE, 2016) from the embankment. Permanent loss to stream channel will be mitigated through restoration of approximately 808-feet of Whispering Ridge Creek immediately below the dam structure in a manner that will achieve, at a minimum, equal functional replacement. Using a holistic

and ecologically based approach, stream mitigation in Whispering Ridge Creek may be combined with the creation of abutting wetlands to maximize the effects of aquatic/terrestrial interactions in the stream corridor. Restoration activities are estimated to result in an increase of approximately 1,593 functional units based on NeSCAP analysis, surpassing the 918 functional units lost due to fill activities.

Channel restoration techniques would include:

- Pull back and contour incised/terraced banks to reestablish floodplain connectivity.
- Achieve improved channel stability with a priority on ecological solutions. Re-establish native vegetation and community structure, enhance bank structure and morphology to reduce erosion, and integrate riparian and upland buffering.
- Establish in-stream structure. Riffle and pool habitat, cover, step pools, check logs, and appropriate substrate to enhance the establishment of a diverse aquatic life community.
- All mitigation areas not abutting existing WOTUS will be protected by a 50-foot buffer consisting of native vegetation.

No mitigation for the 2,556-feet of stream channel that will be inundated by the permanent pool is proposed as the project will result in a functional increase (488,332 functional units) based on methodology established by the USACE (2016). Similar mitigation techniques for Site S-1 will be established.

7.4 Permits and Compliance

The following permit and compliance requirements must be met for construction of the Project to occur.

- **Clean Water Act Section 404.** CWA Section 404 permits must be obtained from the USACE to account for fills within jurisdictional waters of the United States prior to construction. The Sponsor will obtain a 404 permit for sites prior to construction. It is anticipated that individual Section 404 permits, issued by USACE, and 401 water quality certifications, issued by NDEE, will be required for Sites WP-1 and S-1 and a Nationwide Permit 27 will be issued for the other locations.
- **Migratory Bird Treaty and Bald/Golden Eagle Acts**. To avoid migratory bird nesting impacts, construction activities will be avoided nesting and breeding seasons (refer to Chapter 3). Additionally, conservation measures will be implemented during the construction phase to limit impacts to habitat such as re-establishing vegetation cover, use of erosion blankets, watering down soil to prevent erosion, manage artificial lighting, etc. If any construction measures must occur during this time, a field survey will be conducted 5 days before any construction activities occur to ensure compliance with the Migratory Bird Treaty Act. If migratory bird species are found, additional consultation with both USFWS and NGPC will be required prior to construction. Additionally, because bald eagles are known to occur within any one of the ARAs, eagle surveys will be conducted within 0.5 miles of each alternative selected as the preferred during the leaf-off (dormant season), prior to construction. If bald eagles are nesting in the area, consultation with USFWS and NGPC will take place prior to any construction efforts.
- **Endangered Species Act and Fish and Wildlife Coordination Act.** Though conferences have been held with both USFWS and NGPC regarding impacts and initial determinations to listed species, no official concurrence will be awarded until the next phase of the project, when the designs are 100% completed. At that time, consultation with both agencies will be required to further analyze impacts

to listed or proposed species. A Biological Assessment will be required to compile and document any impacts, determinations, surveys, or additional information required for each alternative selected as the preferred prior to any concurrence.

Additionally, coordination with both USFWS and NGPC has indicated that the Plan-EA complies with the Fish and Wildlife Coordination Act by reducing impacts to stream channels and improving the system as a whole through restoration and stabilization efforts.

- **NDEE.** A National Pollutant Discharge Elimination System (NPDES) construction storm water permit from the Nebraska Department of Environment and Energy (NDEE) will be required at each site if more than 1-acre of land is disturbed for construction.
- **Dust Regulations.** Title 129 Chapter 15 Section 003 fugitive dust regulations shall apply to all demolition, grading, excavation, and construction activities.
- **Excavation.** All waste generated or discovered on site must be properly handled, contained, and disposed as per all applicable regulations found in NE Title 128 - Nebraska Hazardous Waste Regulations and NE Title 132 - Integrated Solid Waste Management Regulations. This includes proper waste determinations and characterization before disposal. Where possible, materials generated by this project will be reused or recycled.
- **National Historic Preservation Act.** In accordance with Section 106 of the NHPA [54 U.S.C. § 306108] and its implementing regulations, "Protection of Historic Properties" [36 CFR part 800] NRCS has identified cultural resources within the Area of Potential effect, evaluated those resources for eligibility for listing on the National Register of Historic Places, made a determination of effect, and consulted with the Nebraska State Historic Preservation Officer (NeSHPO)and other consulting parties on the determinations of effect and eligibility. NRCS determined that no historic properties would be affected by the activities proposed in this Plan-EA. The NeSHPO, Pawnee Nation of Oklahoma, and Otoe-Missouria Tribe of Oklahoma concurred with this determination of effect. If cultural resources are discovered before or during construction, NRCS shall consult with the NeSHPO and consulting parties to seek avoidance or minimization strategies and/or to resolve adverse effects in accordance with 36 CFR 800.6. Post review discovery procedures are outlined in Appendix D.
- **Storage Permit.** A water storage permit will be obtained from NeDNR prior to construction.
- **Dam Safety.** The final engineering plans will be reviewed and approved by the NeDNR Dam Safety Section prior to construction. Before approval of a dam, NeDNR will have to verify the dam has the proper hazard classification.
- **Water wells.** Coordination with NeDNR will occur prior to construction to locate any registered water wells.
- **Operation and Maintenance.** An O&M Plan will be prepared using the NRCS National Operation and Maintenance Manual.
- **Floodplain Management.** Prior to construction, the Sponsor will participate in and comply with applicable Federal, State, and Local floodplain management rules and regulations.

- Any and all development in the regulatory floodplain or floodway will require a local Floodplain Development Permit (Neb. Rev. Stat. § 31-1021 & Title 455 Nebraska Administrative Code, Chapter 1). This includes all Special Flood Hazard Areas identified on FEMA's Flood Insurance Rate Maps, and any other area adopted by the local jurisdiction. Development is defined as "Any man-made change to improved or unimproved real estate, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation, drilling operations or storage of equipment or materials."
- Any development that causes more than a foot of rise in a regulatory floodplain without floodway or any rise in a regulatory floodplain with floodway is required to obtain a Conditional Letter of Map Revision (CLOMR) from FEMA. (44 CFR 65.12/60.3c10/60.3d3/60.3d4). The floodplain development permit application must contain engineering that shows the project meets these requirements.
- Any development that causes a change to the regulatory floodplain or floodway boundary must submit a Letter of Map Revision (LOMR) within six months of project completion (44 CFR 65.3)

- **National Environmental Policy Act.** This document was prepared to comply with the National Environmental Policy Act and the Principles and Guidelines for Water and Related Land Resources Implementation Studies.

7.5 Costs and Cost Sharing

This Project received funding through two NRCS P.L. 83-566 programs, the Regional Conservation Partnership Program (RCPP) and the Watershed and Flood Prevention Operations program (WFPO). RCPP has a program wide goal of a minimum of a 1:1 ratio of Sponsor to NRCS contributions. RCPP allocated funds include a portion of Site WP-1 planning ($380,600), design ($750,000), and construction observation ($400,000) for Sponsor use. RCPP also allocated funds for NRCS technical use, including $86,000 for planning, $200,000 for design, and $400,000 in construction observation. Financial assistance was also funded in the amount of $2,202,469 for construction. Additional costs for WP-1 (including all costs for recreation facilities) will be funded by the Sponsor. WFPO allocated funds include 100 percent funding for planning ($560,000) for the six additional sites. It is anticipated that that 100 percent of design costs and 26 percent of total construction costs for the six sites will also be funded by the WFPO program. The Sponsor will be responsible for all permitting, mitigation, and land acquisition costs. The availability of Federal funds is contingent upon appropriations available for this purpose.

A description of the costs and cost sharing for the preferred alternative are included below. Economic Tables 1, 2, 2B, 4, 5, 5a, and 6 are included at the end of this chapter and further cost and assumption details are included in Appendix D. Cost and cost sharing details are also presented in the Papillion Creek Supplemental Watershed Agreement No. 9 between the Sponsor and NRCS.

7.5.1 Construction

Construction costs include all costs to build the proposed project, including mitigation. Major components include mobilization, clearing and grubbing, excavation, fill, reinforced concrete, reinforced concrete pressure pipe, sheet pile, and riprap. A detailed engineer's estimate is included in Appendix D and economic

Tables 1 and 2 provided at the end of this chapter summarize construction costs and cost share. The Sponsor is responsible for 100 percent of the mitigation costs.

7.5.2 Engineering

Engineering costs include final design of the preferred alternative, surveys, geotechnical investigations, construction observation, and permit acquisition. The Sponsor is responsible for 100 percent of the permit acquisition costs. Engineering costs are based on contracts in-place between the Sponsor and a private engineering consultant for WP-1 and engineering judgement for the other sites. Construction observation costs are estimated at 10 percent of the construction cost (not including mitigation). See economic Tables 1 and 2 at the end of this chapter and Appendix D for a summary of engineering costs and cost share.

7.5.3 Real Property Acquisition and Easements

The Sponsor is responsible for 100 percent of real property acquisition and easements. Easements for construction and maintenance access will be required for approximately 14 acres for project implementation. Payment to the landowner for access easements are estimated at 50 percent of land value ($30,000/acre). Easements for land within the grade stabilization structure extents at Sites W-5, D-78, D-2, S-1, and S-15 (approximately 4 acres) are estimated at 75 percent of land value ($45,000/acre). Land acquisition for areas within the top of dam limits, embankments, and areas within the limits of the auxiliary spillway at Sites WP-1 and S-1 (approximately 80-acres) are estimated at 100 percent of land value ($60,000/acre). It is assumed that the property at Site S-5 (approximately 9 acres) will be acquired at no cost due to the protection and improved safety for the adjacent homes. See economic Tables 1 and 2 at the end of this chapter and Appendix D for a summary of real property rights costs and cost share.

7.5.4 Operation, Maintenance, and Replacement

Costs of operation and maintenance of the measures is based on experience from similar structures and is included at 0.75 percent of the construction cost, not including mitigation. Replacement costs were included in the economic analysis for structures with a design life less than the project life (100 years). The Sponsor is responsible for 100 percent of the operation and maintenance costs for the planned life of the structures. Maintenance costs include items such as seeding and fence repairs, repair of riprap after large events, and other maintenance requirements. See economic Tables 1 and 2 at the end of this chapter and Appendix D for a summary of operations and maintenance costs and cost share.

7.5.5 Project Administration

Project administration is estimated based on local experience. Project administration includes project oversight and review, contract administration and supervision, and checking installation measures to ensure the proposed and installed works meet NRCS criteria. The Sponsor would be required to provide 100 percent of funding for its own administrative costs. See economic Table 2 at the end of this chapter for a summary of project administration cost and cost share.

7.6 Installation and Financing

7.6.1 Framework for Carrying out the Plan

Final design for all seven sites would occur in the first two years. Construction would occur over a 5-year period. Table 7-2 shows the distribution of estimated total project costs.

Table 7-2. Distribution of Total Project Costs, Installation of Preferred Alternative

Project Costs	PL 83-566 Funds	Other Funds	Total
Construction[1]	$ 8,727,900	$ 8,401,700	$ 17,129,600
	51%	49%	100%
Engineering[2,3]	$ 3,875,100	$ 378,600	$ 4,253,700
	91%	9%	100%
Real Property Rights[4]	$ -	$ 5,394,000	$ 5,394,000
	0%	100%	100%
Project Administration	$ 354,300	$ 793,900	$ 1,148,200
	31%	69%	100%
Total Project	$ 12,957,300	$ 14,968,200	$ 27,925,500
	46%	54%	100%

[1]*Includes mitigation*

[2]*Includes construction observation*

[3]*Includes permit acquisition*

[4]*Includes cost of legal fees and land appraisals*

7.6.2 Planned Sequence of Installation

Table 7-3 depicts the timeline for the preferred alternative. The Sponsor has taxing authority for project funding and the power of imminent domain if needed.

Table 7-3. Preferred Alternative Timeline

Action	Timeframe
Site WP-1 final design plans and specifications complete. Sponsor obtains USACE Section 404 permit for Site WP-1.	2022
Secure easements and complete construction for Site WP-1.	2022-2023
Site S-1 final design plans and specifications complete. Sponsor obtains USACE Section 404 permit for Site S-1.	2023
Secure easements and complete construction for Site S-1.	2024
Site S-5 final design plans and specifications complete.	2024
Sponsor obtains USACE Section 404 permit for Site S-5. Secure easements and complete construction for Site S-5.	2025
Site W-5, S-15, D-2, and D-78 final design plans and specifications	2026
Sponsor obtains USACE Section 404 permit for Sites W-5 and S-15	2025
Secure easements and complete construction for Sites W-5 and S-15	2026
Sponsor obtains USACE Section 404 permit for Sites D-2 and D78	2026
Secure easements and complete construction for Sites D-2 and D78	2027

7.6.3 Responsibilities

The Sponsor is responsible for obtaining all permits and ensuring compliance as identified in Section 7.4, Permits and Compliance. In addition, the Sponsor is responsible for obtaining all land rights and easements required for project implementation. The Sponsor has analyzed their financial needs and is able to make funds available when needed. Federal funds are to be provided by NRCS for a portion of the construction

of Site WP-1 through the Regional Conservation Partnership Program and final design and construction of the six additional sites through the Watershed and Flood Prevention Operations program. Federal funds are to be provided for project administration, technical assistance, and construction observation as well. The availability of Federal funds is contingent upon appropriations available for this purpose. Prior to entering into agreements that obligate funds of NRCS, the Sponsor will have a financial management system for control, accountability, and disclosure of P.L. 83-566 funds received and for control and accountability for property and other assets purchased with P.L. 83-566 funds.

7.6.4 Contracting

Each site will be constructed through project agreements between the NRCS and the Sponsor by means of Federal contract procedures and resultant contracts.

7.6.5 Real Property and Relocations

Easements on approximately 27 acres and land acquisition of approximately 80 acres will be acquired by the Sponsor for project implementation. No relocations are anticipated.

7.6.6 Financing

The Sponsor has the power and authority to levy taxes, issue revenue bonds for the purpose of financing authorized construction facilities, and exercise the power of eminent domain. Costs for easements, permits, and mitigation are the responsibility of the Sponsor.

7.6.7 Conditions for Providing Assistance

The estimated cost of installing the project is $27,004,500. The NRCS, under authority of the Watershed Protection and Flood Prevention Act, Public Law 566, as amended, will provide $8,367,331. The Sponsor, using other authorities and private funds, will provide approximately $18,637,169. Federal financial assistance for construction is contingent upon appropriations for this purpose.

7.7 Operation, Maintenance, and Replacement

Operation includes the administration, management, and performance of non-maintenance actions needed to keep the structures safe and functioning as planned. Maintenance includes performance of work to prevent deterioration of practices and repair damage of the structures if one or more of their components fail. Damages to a completed structure caused by normal deterioration, droughts, flooding caused by rainfall in excess of design rainfall, or vandalism are considered maintenance.

Structures in this Plan-EA would be operated and maintained by the Sponsor with the technical assistance from Federal, State, and local agencies in accordance with their delegated authority. A specific Operations and Maintenance (O&M) plan would be prepared using the NRCS National Operation and Maintenance Manual for each site. The Sponsor obligation for Federal O&M on a work of improvement is complete when the measure reaches its evaluated life. However, the Sponsor may have continued O&M responsibilities in order to remain in compliance with applicable Federal, State, and local laws, regulations, and ordinances and a separate O&M agreement would be developed before construction of each site in this case. The agreement would provide for inspections, reports, and procedures for performing the maintenance items. The agreement would include specific provisions for retention, use, and disposal of property acquired or improved with federal assistance. The term of this new O&M agreement would be for a period equivalent to the life expectancy of each project.

The structures are to be inspected by the Sponsor on a regularly scheduled basis; during or immediately following major storms or other occurrences that may adversely affect the structure and appurtenant works. The floodwater retarding structure at Site WP-1 and the sediment basin at Site S-1 are also to be inspected during or immediately following the initial filling of the reservoirs. A vigorous stand of vegetation shall be maintained on the vegetated banks at the grade stabilization structures. All gullies in the bank shall be filled and reseeded as necessary. Rock riprap that is displaced shall be replaced and woody debris deposited on the toe rock shall be removed. Problems that may occur affecting the project area shall be repaired in a timely manner.

The estimated average annual operation and maintenance costs are $119,450 for the design life of all structures and $51,915 for the remainder of the design life of WP-1.

7.8 Emergency Action Plan

An EAP is a formal document that identifies potential emergency conditions at a dam and specifies actions to be followed to minimize loss of life and property damage (FEMA, 2013). An EAP commensurate with the potential impact of a dam failure or operational incident will be developed by the Sponsor prior to construction of each dam site. The Sponsor will update the EAP annually with input from local emergency response officials, as needed. NRCS will provide technical assistance throughout the development and update of each EAP.

TABLE 1

Estimated Installation Costs

Papillion Creek Watershed, NE

(Dollars) 1/

Works of Improvement	Unit	Non-Federal land 2/	Estimated cost (dollars) 1/		
			Public Law 83-566 Funds	Other Funds	Total
Floodwater Retarding Structure	No.	1	3,952,500	9,711,000	13,663,500
Sediment Basin	No.	1	1,467,800	2,023,500	3,491,300
Grade Stabilization Sites	No.	6	7,537,000	3,233,700	10,770,700
Total			12,957,300	14,968,200	27,925,500

1/ Price base: 2022 Prepared: 02/2022

2/ Only nonfederal land is involved in this project

TABLE 2
Estimated Cost Distribution
Structural Measures
Papillion Creek Watershed, NE
(Dollars) 1/

Works of Improvement	Structure No.	Installation Cost-Public Law 83-566					Installation Cost - Other funds					Total
		Construction	Engineering 2/	Real Property Rights	Project Admin.	Total Public Law 566	Construction 3/	Engineering 2/4/	Real Property Rights 5/	Project Admin.	Total other	Installation Costs
1 Floodwater Retarding Site, 1 Sediment Basin, 6 Grade Stabilization Sites	W-5	1,353,200	451,000	0	63,000	1,867,200	541,000	90,000	163,500	63,000	857,500	2,724,700
	D-78	553,700	185,000	0	26,000	764,700	221,500	37,000	142,500	26,000	427,000	1,191,700
	D-2	871,100	290,000	0	40,500	1,201,600	348,400	58,000	126,000	40,500	572,900	1,774,500
	WP-1	2,202,500	1,700,000	0	50,000	3,952,500	5,894,000	27,200	3,300,000	489,800	9,711,000	13,663,500
	S-1	1,107,400	369,100	0	51,800	1,528,300	442,900	45,400	1,506,000	51,600	2,045,900	3,574,200
	S-5	2,050,700	683,000	0	95,500	2,829,200	718,500	82,000	45,000	95,500	941,000	3,770,200
	S-15	589,300	197,000	0	27,500	813,800	235,400	39,000	111,000	27,500	412,900	1,226,700
Total		8,727,900	3,875,100	0	354,300	12,957,300	8,401,700	378,600	5,394,000	793,900	14,968,200	27,925,500

1/ Price base: 2022

Prepared: 02/2022

2/ Includes construction observation

3/ Includes mitigation

4/ Includes permit acquisition

5/ Includes cost of legal fees and land appraisals

TABLE 2b
Recreational Facilities - Estimated Construction Costs
Papillion Creek Watershed, NE
(Dollars) 1/2/3/

Item	Number	Estimated Unit Cost	Total Construction Cost
Boat Ramp	1	25,000	25,000
Picnic Shelter	1	30,000	30,000
Concrete Trail	1	552,300	552,300
Restroom	1	50,000	50,000
Site Paving	1	473,800	473,800
Lighting	1	10,000	10,000
Total			1,141,100

1/ Price base: 2022 Prepared: 02/2022
2/ Estimated quantity, subject to minor variation at time of detailed planning
3/ All recreation costs are responsibility of Sponsor

TABLE 3
Structural Data - Dams with planned storage capacity
Papillion Creek Watershed, NE

Item	Unit	WP-1	S-1
Class of structure		High	Low
Seismic zone		1	1
Uncontrolled drainage area	mi^2	1.35	2.73
Controlled drainage area	mi^2	0	0
Total drainage area	mi^2	1.35	2.73
Runoff curve No. (1-day) (AMC II)		83	80
Time of concentration (Tc)	hrs	1.0	0.9
Elevation top of dam	ft	1194	1181
Elevation crest auxiliary spillway	ft	1189.5	1178
Principal spillway crest elevation	ft	1178	1177
Auxiliary spillway type		Veg.	ACB 2/
Auxiliary spillway bottom width	ft	200	150
Auxiliary spillway exit slope	percent	5	14
Maximum height of dam	ft	40.0	17.0
Volume of fill	yd^3	202,200	16,600
Total capacity 1/	acre-ft	552	44
Sediment submerged	acre-ft	94	37
Sediment aerated	acre-ft	10	7
Floodwater retarding	acre-ft	448	0
Surface area			
Sediment pool	acres	20.2	13.5
Floodwater retarding pool 1/	acres	61.2	13.5
Principal spillway design 3/			
Rainfall volume (1-day)	in	9.06	
Rainfall volume (10-day)	in	12.90	
Runoff volume (10-day) (1-day)	in	10.7	
Capacity at auxiliary spillway crest elevation	ft^3/s	286	74
Dimensions of conduit	in	48	24
Type of conduit		RCPP	RCPP
Frequency operation-auxiliary spillway	percent chance	0.2	
Auxiliary spillway hydrograph			
Rainfall volume	in	11.32	
Runoff volume	in	9.17	
Storm duration	hrs	24	
Velocity of flow (Ve)	ft/s	0.0	
Max. reservoir water surface elev.	ft	1189.3	
Freeboard hydrograph			
Rainfall volume	in	23.7	9.4
Runoff volume	in	21.4	7.5
Storm duration	hrs	24	24
Max. reservoir water surface elev.	ft	1193.4	1180.8
Capacity equivalents			
Sediment volume	in	1.4	0.3
Floodwater retarding volume	in	6.2	0.0

1/ Crest of auxiliary spillway
2/ Articulated Concrete Blocks
3/ Principal and auxiliary spillway designs considered NCRS CPS-350 for the design of S-1

TABLE 4
Estimated Average Annual Costs
Papillion Creek Watershed, NE
(Dollars) 1/

Works of Improvement	Amortization of Installation Cost	Operation and Maintenance Cost	Total
Floodwater Retarding Structure (WP-1)	325,400	57,300	382,700
Sediment Basin (S-1)	94,000	10,300	104,300
Grade Stabilization Sites (6 sites)	315,200	50,200	365,400
Total	734,600	117,800	852,400

Prepared: 02/2022

1/Price base: 2022, amortized over 105 years at a discount rate of 2.25%

Table 5
Estimated Average Annual Flood Damage Reduction Benefits – Site WP-1
Papillion Creek Watershed, NE

Item	Estimated average annual flood damage					
	Without Project		With Project		Damage reduction benefit	
	Agriculture related	Non Agriculture-related	Agriculture related	Non-Agriculture related	Agriculture related	Non-Agriculture related
Road and Bridge		31,300		29,100		2,200
Urban		434,600		342,300		92,300
Total	0	465,900	0	371,400	0	94,500

1/Price base: 2022, amortized over 105 years at a discount rate of 2.25% Prepared: 02/2022
2/For Site WP-1

Table 5a
Estimated Average Annual Watershed Protection Damage Reduction Benefits - All Sites
Papillion Creek Watershed, NE
(Dollars) 1/

Works of Improvement	**Item**	Damage reduction benefit, average annual	
		Agriculture-related 2/	Non-Agricultural-related
Floodwater Retarding Structure (WP-1)	Recreation	188,800	0
	Ecosystem Services	137,900	0
Sediment Basin (S-1)	Ecosystem Services	104,700	0
Grade Stabilization Sites (6 sites)	Crop Stand Damage	11,400	0
	Land Voiding and Depreciation	109,400	0
	Infrastructure	168,200	0
	Ecosystem Services	106,800	0
Total		827,200	0

1/Price base: 2022, amortized over 105 years at a discount rate of 2.25% Prepared: 02/2022
2/ Includes rural benefits, as defined by the NWPM

TABLE 6

Comparison of Benefits and Costs

Papillion Creek Watershed, NE

(Dollars) 1

Works of Improvement	Average Annual Benefits					Average Annual Cost 3/	Benefit : Cost Ratio
	Flood Damage Reduction		Watershed Protection Reduction		Total		
	Agriculture related	Non-Agriculture related	Agriculture related 2/	Non-Agriculture related			
Floodwater Retarding Structure (WP-1)	0	94,500	326,700	0	421,200	382,700	1.10
Sediment Basin (S-1)	0	0	104,700	0	104,700	104,300	1.00
Grade Stabilization Sites (6 sites)	0	0	395,800	0	395,800	365,400	1.08
Total Project (all sites)	0	94,500	827,200	0	921,700	852,400	1.08

1/Price base: 2022, amortized over 105 years at a discount rate of 2.25% Prepared: 02/2022

2/ Includes rural benefits, as defined by the NWPM

3/ From Table 4

8.0 ENVIRONMENTAL ASSESSMENT

This chapter serves as the environmental assessment for the Papillion Creek Supplemental Watershed Plan No. 9. It is an abbreviated version of the watershed plan designed to meet the 75-page limit for Environmental Assessments. It contains duplicate information already made available in the previous chapters.

8.1 PURPOSE AND NEED FOR ACTION

8.1.1 Introduction

The intent of this document is to identify and evaluate alternatives at locations previously identified in the 1966 Work Plan under guidelines outlined in the NRCS Title 390 – National Watershed Program Manual (NWPM), 4th edition (NRCS, 2015) and to satisfy National Environmental Policy Act (NEPA) and Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G) requirements.

8.1.2 Watershed History

A Watershed Work Plan for the Papillion Creek Watershed was prepared in August 1966 (1966 Work Plan) under the authority of the Watershed Protection and Flood Prevention Act (Public Law 83-566, 83d Congress, 68 Stat. 666) as amended. The 1966 Work Plan was prepared by a combination of conservation districts, county commissioners, county supervisors and the Papio Watershed Board with assistance by the U.S. Department of Agriculture (USDA) Soil Conservation Service, USDA Forest Service, and the State of Nebraska Soil and Water Conservation Commission. The 1966 Work Plan identified flooding, grade stabilization, and sediment and erosion damages within the watershed. The 1966 Work Plan proposed a combination of land treatment measures and 52 grade stabilization structures. Eight Supplements have been completed since this 1966 Work Plan and 30 of the 52 grade stabilization structures have been constructed.

The U.S. Army Corps of Engineers (USACE), Omaha District issued a report in 1967 entitled *Review Report for Papillion Creek and Tributaries, Nebraska* (USACE, 1967), which was being written when the 1966 Work Plan was issued. The proposed 1967 USACE Report was referenced in the 1966 Work Plan as the means to address the flooding problems within the watershed. This 1967 USACE Report proposed a system of 21 dams for the purposes of flood control, recreation, and water quality. Of the 21 structures, nine have been constructed and one structure is no longer viable due to a proposed roadway (DS 14).

The Papillion Creek Watershed Partnership (PCWP) was formed in 2001 through an inter-local agreement between nine local governments to analyze and address the issues of water quality and water quantity throughout the watershed. Many studies have been completed since the creation of the PCWP. Three of these studies that addressed the issue of water quantity include the *Multi-Reservoir Analysis* (HDR, 2004), the *Papillion Creek Watershed Management Plan* (Management Plan) (HDR, 2009), and the *Papillion Creek Watershed Management Plan March 2014 Update* (HDR, 2014).

The *Multi-Reservoir Analysis* (HDR, 2004) evaluated fourteen of the remaining dam sites as identified in the 1967 USACE Report in various dam combination alternatives. The Management Plan (HDR, 2009) evaluated water quantity and water quality improvement strategies and policy controls, including an analysis of 19

dam sites and other potential solutions to water quantity issues such as using low impact development (LID) strategies to address both existing (2004) conditions and full build-out (future) conditions. The 19 dam sites included eight sites from the 2004 analysis (HDR, 2004) and 11 additional sites. The Management Plan recommended a combination of 15 dam sites in conjunction with LID strategies to provide the watershed with flood risk reduction.

8.1.3 Problems and Opportunities

8.1.3.1 Problems

Most major channels within the Papillion Creek Watershed were straightened in the early 1900s, increasing velocities and accelerating channel degradation. Channel degradation and widening within the watershed was identified in the 1966 Work Plan and continues to be a common problem due to the deep deposits of loess soil. This results in incised channels, high banks, and loss of land. Vertical channel banks of greater than 20-feet are commonplace and pose a risk to the public. Infrastructure is often placed along the channel corridor and channel degradation and widening cause costly and dangerous infrastructure damage. Channel bed and bank erosion also results in sedimentation that decreases water quality downstream. All sites within this Supplemental Plan-EA were identified in the 1966 Work Plan and continue to show signs of degradation.

Flooding is another significant problem within the watershed that results in damage to urban, agricultural, and rural lands. Many studies have been completed within the watershed to identify flood damages and potential flood damage reduction measures, as discussed in Section 1.2. Sites WP-1 and DS-19 were included in the PCWP 2009 Management Plan and the PCWP 2014 Plan Update (HDR, 2014) as part of the overall watershed approach to reduce flood damages.

8.1.3.2 Opportunities

There are many opportunities to improve the quality of life and environmental conditions within this watershed. Protecting streams from degradation, restoring streams, capturing sediment to improve water quality and farming, and reducing flooding will improve economic conditions and decrease the threat to human safety. 1.3 Purpose and Need

Channel degradation continues to be a problem in the Papillion Creek Watershed where the planned grade stabilization structures in the original Papillion Creek Watershed plan were not implemented. The sponsors have also identified flooding damages and water quality issues due to sedimentation as problems the public wants to be addressed. Representative photographs of existing conditions at each site are included in Appendix D.

The purpose of **Sites W-5, D-78, D-2, and S-15** is to provide watershed protection through grade stabilization along their respective creeks, as identified in the original 1966 Work Plan. Site S-15 was removed from the 1966 Work Plan in a 1995 Supplemental Plan due to interference with a planned urban development. The planned development did not come to fruition due to insufficient funding and grade stabilization remains a problem at this site. Therefore, Site S-15 is being reintroduced within this Supplemental Plan-EA.

The purpose of **Site S-5** is to provide watershed protection through grade stabilization and improved safety along the Beadle Creek stream corridor between Lillian Street and the confluence of South Papillion Creek

The purpose of **Site S-1** is to provide watershed protection through sediment capture on South Papillion Creek and grade stabilization along South Papillion Creek and an unnamed tributary between South 204th Street and South 216th Street.

The purpose of Site D-31 (referred to herein as **Site WP-1**) is to provide long term flood damage reduction within the West Papillion Creek subwatershed so that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA.

The hazard classification of all structures evaluated in the original work plan was low hazard. A low hazard classification is for dams in predominantly rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and county roads. Since the work plan was approved, additional residential development has occurred in the watershed downstream of the structures, and additional development is in the planning stage. Approximately 2,000 acres of agricultural land is developed each year in the Omaha metro area. Structure WP-1 is now classified as high hazard due to the proximity to the city limits and potential loss of life if the structure would fail. The NRCS State Conservation Engineer has concurred with the high hazard designation.

8.2 AFFECTED ENVIRONMENT

The following chapter describes the existing conditions of resources identified as relevant during scoping (see Table 2-1). Due to watershed changes that have occurred since the 1966 Work Plan, the resources are described for the entire watershed except where noted below.

8.2.1 Soil Erosion and Sedimentation

Approximately 896,940 tons of soil erode annually, resulting in resource problems within the Papillion Creek Watershed. Erosion losses are shown in Table 8-1 and calculation details are provided in Appendix D.

Table 8-1. Annual Erosion within Papillion Creek Watershed

Erosion Source	Amount of Erosion (tons/year)
Sheet and Rill	857,470[1]
Ephemeral and Gully	1,880[2]
Channel/Streambank	37,590[2]
Total	**896,940**

[1]See Table D6-1
[2]See Table D6-3
Note: Values rounded to the nearest 10 tons/year

Sediment is produced from all parts of the watershed from all land uses. Sheet and rill erosion is the dominant erosion process in the watershed, accounting for over ninety percent of total erosion. The largest single contributor to this is untreated cropland. Sheet and rill erosion reduces crop yields and lowers long-term productivity of cropland due to depletion of topsoil. Crops are destroyed or damaged as sediment is redistributed on fields, especially where sediment laden runoff moves across areas of reduced slope or encounters roads and fence lines. Farm machinery is also subjected to additional wear and tear during farming operations in these areas. The second largest contributor of erosion is channel/streambank erosion, and the watershed contains many continually eroding streams. Stream degradation and widening results

in loss of agricultural and urban land and poses a public health and safety concern as the stream banks become vertical and can reach heights of over 30 feet tall.

Sedimentation is the portion of total erosion that is transported from its point of origin and delivered to a specific location such as the stream system or the watershed outlet. Sediment transport occurs primarily by water, either as overland runoff or channelized flow in this watershed.

The largest erosion process contributing to delivered sediment is sheet and rill erosion and the largest contributing land use is cropland. Sheet and rill erosion, however, has a low sediment delivery efficiency because overland runoff leaves material behind as depositions on fields, at field boundaries, in road ditches, and other obstacles. An estimated 25 percent of sheet and rill erosion produced annually moves through the stream system. Ephemeral and gully erosion is somewhat more efficient at sediment delivery, due to the proximity to flow channels with an estimated 65 percent delivery rate. Streambank erosion is much more efficiently delivered, due to the greater carrying capacity of channelized flow with an estimated 90 percent delivery rate. Based on the estimated sediment delivery rates, the total sediment produced annually within the Papillion Creek Watershed is 249,420 tons of sediment per year (Table 8-2).

Table 8-2. Sediment Produced Annually within Papillion Creek Watershed

Erosion Source	Sediment Transported Downstream (tons/year)
Sheet and Rill	214,370
Ephemeral and Gully	1,220
Channel/Streambank	33,830
Total	**249,420**

Note: Values rounded to the nearest 10 tons/year

8.2.2 Prime and Unique Farmland

The Farmland Protection Policy Act (FPPA) was established to avoid significant, irreversible losses of farmland. Prime farmland (defined under the FPPA) and farmland of statewide importance are lands that exhibit the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses (SSM 2017). These lands have the soil quality, growing season, and moisture supply needed to produce economically sustainable high yields of crops. The use of acceptable farming methods, including water management, can be used to attain sustainable yields. Prime farmlands generally have an adequate and dependable water supply (from precipitation or irrigation), are not excessively erodible or saturated for long periods of time, and do not flood frequently (SSM 2017). Prime farmland is land that is available for farming, but could currently be cropland, pastureland, rangeland, forestland, or other land, but not urban built-up land or water. More information about the criteria for prime farmland and farmland of statewide importance is available at the local office of the NRCS.

There are approximately 117,400-acres of prime farmland and farmland of statewide importance within the watershed, or approximately 48 percent of the land. Figure 3-1 shows the extents of the prime farmland and farmland of statewide importance within the watershed. The soil types and areas of NRCS soil map units within the watershed that are prime farmland and farmland of statewide importance are listed in Table 3-3 below.

8.2.3 Water Quality

The 2018 Nebraska Water Quality Integrated Report (IR) is used to establish a priority ranking of perennial streams based on water quality and beneficial uses. The IR defines multiple categories of waterbodies to help present information in a complete, descriptive manner.

These categories include the following:

- Category 1. Waterbodies where all designated uses are met.
- Category 2. Waterbodies where some of the designated uses are met but there is insufficient information to determine if all uses are being met.
- Category 3. Waterbody where there is insufficient data to determine if any beneficial uses are being met.
- Category 4. Waterbody is impaired, but a total maximum daily loads (TMDL) is not needed.
- Category 5. Waterbody where one or more beneficial uses are determined to be impaired by one or more pollutants and all the TMDLs have not been developed. Category 5 waters constitute the Section 303(d) list subject to EPA approval/disapproval.

There are five stream segments within the Papillion Creek Watershed listed as Category 5 waterbodies. All five of these streams are listed on the State's 303(d) list due to impaired aquatic life. Four of the streams have impaired aquatic communities and one has impaired dissolved oxygen for aquatic life. Additionally, one stream segment is listed for impaired stream aesthetics due to trash located within the stream. There are five stream segments listed as Category 4 waterbodies due to recreational E. coli impairments and an E. coli TMDL was approved in September 2009. See Figure 3-2 for a map of the IR Stream Categories.

Beneficial uses are assigned to surface waters within or bordering the State of Nebraska according to the Nebraska Department of Environment and Energy (NDEE). All uses are not assigned to all waters and use attainability analyses are utilized on a waterbody by waterbody basis to determine whether the use(s) are applicable. These beneficial uses defined by the NDEE include Primary Contact Recreation, Aquatic Life (Coldwater A, Coldwater B, Warmwater A, and Warmwater B), Water Supply (Public Drinking Water, Agricultural, and Industrial), and Aesthetics. The beneficial uses within the Papillion Creek Watershed are described below.

Primary Contact Recreation. Primary contact recreation applies to surface waters which are used, or have a high potential to be used, for primary contact recreation activities. Primary contact recreation includes activities where the body may come into prolonged or intimate contact with the water, such that water may be accidentally ingested and sensitive body organs (e.g., eyes, ears, nose, etc.) may be exposed. These waters shall be free from toxic substances, alone or in combination with other substances, in concentrations that result in adverse health impacts to humans participating in primary contact recreation and *E. coli* bacteria shall not exceed a geometric mean of 126/100 ml. Six streams and nine lakes within the watershed are listed for Primary Contact Recreation.

Aquatic Life. Aquatic life for each waterbody is ranked as being either Coldwater (Class A or B) or Warmwater (Class A or B). The most downstream reaches of Papillion Creek and Big Papillion Creek and all reservoirs

in the 2018 IR Report within the Watershed are listed as Warmwater Class A. Classification for Class A Warmwater Aquatic Life means that these waters provide, or could provide, a habitat suitable for maintaining one or more identified key species (channel catfish) on a year-round basis. These waters can maintain year-round populations of a variety of other warmwater fish and associated vertebrate and invertebrate organisms and plants. The upstream tributaries within the watershed are listed as Class B Warmwater, which means these are waters where the variety of warmwater biota is presently limited by water volume or flow, water quality (natural or irretrievable human-induced conditions), substrate composition, or other habitat conditions. These waters are only capable of maintaining year-round populations of tolerant warmwater fish and associated vertebrate and invertebrate organisms and plants. Key species may be supported on a seasonal or intermittent basis but year-round populations cannot be maintained.

Water Supply. All waters within Papillion Creek Watershed are classified for Class A Agriculture Water Supply. Designation for Water Supply means that Class A Agriculture waters can be used for general agriculture purposes such as irrigation and livestock watering without treatment. Nitrate and nitrite as nitrogen cannot exceed 100 mg/l, selenium cannot exceed 0.02 mg/l, and conductivity cannot exceed 2,000 umhos/cm between April 1 and September 30.

Aesthetics. These waters are also protected for an Aesthetic Beneficial Use, meaning they must be free from human induced pollution that causes noxious odors; floating, suspended, colloidal, or settleable materials that produce objectionable film, colors, turbidity, or deposits; and the occurrence of undesirable or nuisance aquatic life such as algal blooms.

8.2.4 Regional Watershed Management Plans

This Supplemental Plan-EA includes locations covered under the following regional water resource plans that were considered during the scoping process.

Multi-Reservoir Analysis, Papillion Creek Watershed (2004). This analysis was released in September 2004 by the Sponsor to analyze flooding problems in the watershed as a continuation of the 1967 Report. The analysis assesses the feasibility of the unbuilt dams from the 1967 Report and includes two locations near sites that were identified in the 1966 Work Plan (S-1 and WP-1).

Papillion Creek Watershed Management Plan (2009). The Papillion Creek Watershed Management Plan (Management Plan) was released in April of 2009 by the Papillion Creek Watershed Partnership (PCWP) as a part of their on-going objective for improved stormwater management within the watershed. The Sponsor is a member of the PCWP. The watershed management plan includes updated stormwater management policies, enabling bonding and a stormwater utility fee system authority for the Sponsor, recommended project and financing, and potential long-term capital improvement projects. This analysis also included two locations near sites that were identified in the 1966 Work Plan (S-1 and WP-1).

Papillion Creek Watershed Management Plan – March 2014 Update. The plan update was released in March of 2014 as part of the PCWP's mission for improved stormwater management. This plan provides progress updates on various management practices, including financial needs for remaining structural projects.

Papio-Missouri River Basin Water Quality Management Plan (2018). This plan was released in June of 2018 by the Sponsor to provide a concise summary of water resource conditions to provide direction and a

coordinated approach for addressing nonpoint source pollution. This plan received Section 319 funding through the Nebraska Nonpoint Source Management Program administered by the Nebraska Department of Environment and Energy (NDEE), formerly the Nebraska Department of Environmental Quality (NDEQ), to facilitate the management of nonpoint source pollution.

P-MRNRD Groundwater Management Plan (2018). This groundwater management plan was adopted in February of 2018 for the P-MRNRD boundary, which encompasses the entire watershed. The purpose of the plan is to describe the groundwater resources available, current demands and contamination levels of the resources, and define the methods that the NRD will use to oversee the sustainable use of the groundwater resources.

Papillion Creek and Tributaries Lakes, Nebraska Final Feasibility Report and Environmental Assessment (2021). The USACE developed a final feasibility report, environmental assessment, and Finding of No Significant Impact (FONSI) as part of a General Reevaluation Study of the Papillion Creek to reduce flood risks for the Papillion Creek Watershed. The study identifies opportunities, develops alternatives, and selects a proposed plan to reduce flood risk within the watershed. The Recommended Plan was also the National Economic Development (NED) plan for flood risk management and included Site DS-19. NEPA considerations were analyzed for the site, it was recommended for implementation funding, and the Sponsor has begun purchasing land for construction.

8.2.5 Floodplains

The Federal Emergency Management Agency (FEMA) 100-year floodplains and floodways are mapped by FEMA along major streams within the watershed and encompass areas with a 1 percent chance of being inundated by a flood event in any given year. The 100-year floodplain is broken down into five types of zones, three of which are included within the watershed. Zone A does not include base flood elevations, Zone AE includes base flood elevations, and Zone AO includes sheet flow, ponding, or shallow flooding and also includes base flood depths above ground elevation. In the Papillion Creek Watershed, Zone A is generally mapped within Washington County, Zone AE within Douglas and Sarpy County, and there is one small area of Zone AO (see Figure 3-3). All areas outside of the 100-year floodplain have less than a 1 percent chance of inundation in any given year.

The delineated FEMA Floodway includes areas with restrictions on cumulatively raising the water surface elevation above a designated height. Development in the FEMA Floodways are regulated to ensure that there are no increases in upstream flood elevations and are mapped along streams in Douglas and Sarpy Counties, as shown in Figure 3-3.

8.2.6 Wetlands

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) provides detailed information on the abundance, characteristics, and distribution of wetlands within the United States. There are approximately 2,700-acres of NWI areas within the watershed. Approximately half of these NWI areas are riverine wetlands within and along the streams and tributaries. Freshwater emergent wetlands in this area are typically represented by *Phalaris arundinacea* and freshwater forested/shrub wetlands are typically dominated by *Salix species* and *Populus deltoides*. The acreage within the subwatershed of each type of

wetland and the Cowardin classification (as classified by the NWI) are included in Table 8-3 below and shown in Figure 3-4.

Table 8-3. NWI Areas within the Papillion Creek Watershed

Wetland Type	Cowardin Classification	Area (ac)
Freshwater Emergent Wetland	Palustrine emergent, temporarily flooded	21
	Palustrine emergent, seasonally flooded	219
	Palustrine emergent, semi-permanently flooded	1
	Subtotal	241
Freshwater Forested/Shrub Wetland	Palustrine forested, temporarily flooded	200
	Palustrine scrub-shrub, temporarily flooded	23
	Subtotal	224
Freshwater Pond	Palustrine aquatic bed, semi-permanently flooded	17
	Palustrine unconsolidated bottom, semi-permanently flooded	174
	Palustrine unconsolidated bottom, intermittently exposed	23
	Palustrine unconsolidated shore, temporarily flooded	2
	Palustrine unconsolidated shore, seasonally flooded	8
	Subtotal	225
Lake	Lacustrine limnetic unconsolidated bottom, permanently flooded	576
	Lacustrine littoral aquatic bed, intermittently exposed	23
	Lacustrine littoral unconsolidated shore, seasonally flooded	28
	Subtotal	627
Riverine	Riverine lower perennial unconsolidated bottom, intermittently exposed	50
	Riverine intermittent streambed, temporarily flooded	2
	Riverine intermittent streambed, seasonally flooded	1235
	Riverine unknown perennial unconsolidated bottom, permanently flooded	102
	Subtotal	1,388
	Total	**2,704**

Source: United States Fish and Wildlife Service (USFWS). National Wetlands Inventory. NE Wetlands East. Last updated October 2018.

8.2.7 Streams and Riparian Habitat

Papillion Creek, Big Papillion Creek, Little Papillion Creek, and West Papillion Creek are the four main perennial streams within the Papillion Creek Watershed and flow in a southeasterly direction. These four creeks are perennial except for the headwaters of the Big Papillion Creek and Little Papillion Creek, which are intermittent. The creek lengths and drainage areas of these major streams are included in Table 8-4 and shown in Figure 3-5.

Table 8-4. Stream Lengths with Papillion Creek Watershed

Stream	Drainage Area (mi^2)	Length (mi)
Papillion Creek	384	10.2
Big Papillion Creek	233	39.3
West Papillion Creek	69	16.4
Little Papillion Creek	59	18.4

Source: United States Geological Survey (USGS), National Hydrography Dataset (NHD). Updated: 2020.

8.2.8 Threatened and Endangered Species & Fish and Wildlife Coordination Act

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

On September 27, 2023, both the US Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) Tool and the Nebraska Game and Park Commission's (NGPC) Conservation and Environmental Review Tool (CERT) were run to determine the initial list of species with habitat ranges that intersect the boundaries of the watershed. In total, 11 species were identified including: Northern Long-eared Bat, Piping Plover, Pallid Sturgeon, Monarch Butterfly, Western Prairie-Fringed Orchid, Lake Sturgeon, Sturgeon Chub, American Ginseng, Interior Least Tern, Eastern Black Rail, and the Rufa Red Knot.

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

- Little Brown Bat (*Myotis lucifugus)*- Currently a non-listed proposed species.
- Tricolored Bat (*Perimyotis subflavus*)- Currently a proposed endangered species that is subject to re-classification in Fall of 2023.
- Plains Spotted Skunk (*Spilogale subflavus*)- Currently a non-listed proposed species that is subject to re-classification in Fall of 2023.

8.2.9 Fish and Wildlife Habitat

The available wildlife habitat within the watershed is largely disturbed by agriculture and developments. Almost half of the watershed is developed with urban and suburban areas. Rabbits, coyotes, opossums, raccoons, skunks, and squirrels are some of the main types of mammals typically found in the developed areas. Agricultural land is another primary wildlife habitat and is typically home to species that feed on crops such as white-tailed deer, rabbits, mice, squirrels, striped skunks, raccoons, and pheasants. Grassland and pastureland provide habitat for similar species and are scattered throughout the watershed, predominantly as small, discontinuous areas in agricultural areas or adjacent to streams. Grasslands in this part of Nebraska were often historically tallgrass prairies that have since been plowed for agriculture or development. Small artificial wetland areas have been established in some of the agricultural fields or riverine areas and make up a small percentage of the watershed. These wetlands provide habitat for wildlife species that vary by season and wetland hydrologic condition.

Woodland habitats are commonly located adjacent to streams and make up approximately two percent of the watershed. In eastern Nebraska, woodland community types are considered relatively rare. The woodlands found within the Papillion Creek Watershed pre-settlement would probably have been classified as either the Eastern Dry-Mesic Bur Oak Forest and Woodland ecological system or the Eastern Upland Oak Bluff Forest ecological system (NGPC 2010). The trees that are typical of the watershed include *Fraxinus pennsylvanica* (green ash), *Populus deltoides* (eastern cottonwood), *Morus alba* (white mulberry), *Acer saccharinum* (silver maple), *Ulmus pumila* (siberian elm), *Ulmus americana* (american elm), *Celtis occidentalis* (hackberry), *Gleditsia triacanthos* (honey locust), and *Salix nigra* (black willow). The watershed is most closely represented by the Eastern Riparian Forest within the Eastern Upland Oak Bluff Forest ecological system. Underlined species represent species that are listed as 'most abundant' within the Eastern Riparian Forest community by Rolfsmeier and Steinauer (NGPC 2010). The woodland areas may provide habitat for nesting of migratory birds, which occurs primarily between April 1st and July 15.

In-stream habitat for fish is generally lacking throughout the watershed due to poor substrate conditions and lack of vegetation and cover. Fish habitat is predominantly limited to small impoundments and major streams. Numerous ponds and lakes throughout the watershed provide habitat for fish, many of which are open to the public for fishing. Bluegill, channel catfish, largemouth bass, and walleye are some of the most prevalent fish within these waterbodies. There are four public waterbodies within the watershed that are known to contain trout.

8.2.10Migratory Birds and Eagles

The Migratory Bird Treaty Act (MBTA) of 1918, as amended, Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds), and the Bald and Golden Eagle Protection Act (BGEPA) of 1940, as amended, require NRCS to consider impacts on migratory bird and bald and golden eagle populations and habitats. Migratory birds are essentially all wild birds found in the United States with the exception of the house sparrow, starling, feral pigeon, and resident game birds. The protections under MBTA and BGEPA cover the birds and their parts (including eggs, nests, and feathers) and therefore it is unlawful for private individuals or Federal agencies to kill, capture, collect, possess, buy, sell, trade, ship, import, or export any migratory bird. The BGEPA includes protections for any disturbance to bald and golden eagles and their nests.

Although the MBTA and BGEPA are applicable year-round, it is accepted that most migratory bird nesting activity occurs in Nebraska during the period of April 1 to July 15. Some migratory birds nest outside of this range. For example, raptors generally nest in woodland habitats during the period of February 1 to July 15, whereas sedge wrens, which occur in some wetland habitat, normally nest from July 15 to September 10.

Many species of migratory birds could be present and could nest within the watershed. Bird species of conservation concern can be found within and near the watershed and those with priority concern are included with habitat descriptions in Table 8-5 below (USFWS). The woodlands surrounding tributaries provide ample habitat for birds protected under the MBTA to nest. Golden eagles breed in western Nebraska, outside the range of the watershed, and are only found within the watershed during winter months. Bald eagles can be found within the watershed year-round and areas of high and moderate density of bald eagles are near the watershed.

Table 8-5. Birds of Conservation Concern

Species	Potential to Breed in Area	Description
Black-billed Cuckoo* *Coccyzus erythropthalmus*	Yes	This species typically occupies dense, wooded habitats that have strong associations with water. They are often found in environments such as deciduous woods, bogs and marshes, lakeshores, or abandoned farmlands or pastures.
American Golden-plover *Pluvialis dominica*	No	This species breeds in the Arctic tundra during the spring. During winter, the species can be seen in prairies, fields and pastures, mudflats, shorelines, and beaches.
Bobolink *Dolichonyx oryzirorus*	Yes	This bird is often found in hayfields and meadows, but during migration they are usually found in marshes.
Cerulean Warbler *Dendroica cerulea*	Yes	This bird is often found in forested areas with large, tall trees and limited undergrowth.
Chimney Swift *Chaetura pelagica*	Yes	This bird prefers dark spaces such as caves or tree hollows but has also been found in anthropogenic structures such as chimneys and other vertical surfaces that lack light.
Eastern Whip-poor-will *Antrostomus vociferus*	Yes	For most of the year, this species prefers wooded areas, primarily deciduous forests, and will use old leaf litter as nests. Then the species migrates South for the Winter.
Henslow's Sparrow *Ammodramus henslowii*	Yes	Though research is still ongoing to determine preferred habitats, this species often prefers fields and meadows to breed in. They are known to inhabit wet meadows, weedy pastures and lowland prairies.
Hudsonian Godwit *Limosa haemastica*	No	The Hudsonian Godwit is typically found occupying marshes, prairie pools, and mudflats. In the summer they can be found on the edge of the tundra. Their nesting habitat is in the far north where ponds, open woods, and patches of tundra are mixed.
Kentucky Warbler *Oporornis formosus*	Yes	In the summer these birds are often found in deep shaded woods with dense, humid thickets, bottomlands near streams, ravines in upland deciduous woods, and edges of swamps. In the winter the Kentucky Warbler prefers the dense lowland forests and second growth.
Lesser Yellowlegs *Tringa flavipes*	No	These birds often occupy marshes, mudflats, shores, and ponds, and in the summer they favor open boreal woods. They occur widely in migration, including coastal estuaries, salt and fresh marshes, and edges of lakes and ponds, typically more common on freshwater habitats.
Prothonotary Warbler *Protonotaria citrea*	Yes	The Prothonotary Warbler can typically be found near wooded swamps. They nest near lakes, rivers, and ponds.
Red-headed Woodpecker *Melanerpes erythrocephalus*	Yes	This bird can be found in groves, farm country, orchards, shade trees, and large scattered trees.

Species	Potential to Breed in Area	Description
Ruddy Turnstone *Arenaria interpres morinella*	No	These are stout shorebirds that breed in the high arctic tundra's and winter along the Atlantic Coast. They may be seen in the area, passing over during migration, but will only stay for a short period of time.
Rusty Blackbird *Euphagus carolinus*	No	The Rusty Blackbird can be found in river groves and wooded swamps. During migration and winter, these birds favor areas with trees near water such as wooded swamps and riverside forest. They have also been known to forage in open fields and cattle feedlots.
Short-billed Dowitcher *Limnodromus griseus*	No	These birds are usually found in mudflats, tidal marshes, and pond edges. They favor freshwater ponds with muddy margins when they are inland.
Upper Sandpiper *Bartramia longicauda*	Yes	Prefer open densely grassed areas, and breed in small, loose nesting colonies. The breeding season lasts from early-to-late summer.
Wood Thrush* *Hylocichla mustelina*	Yes	This bird occupies mainly deciduous woodlands. During migration they are found in various kinds of woodland.

8.2.11 Flood Damages

Flood damage is a major concern within the watershed, which has a history of damaging floods. Approximately 40 percent of annual precipitation occurs during the summer thunderstorm season and floods or threats of floods occur almost every year during this season. The most damaging flood event occurred in June of 1964 and resulted in the loss of seven lives. Several recent flood events (1994, 1997, 1999, 2004, 2008, 2014, and 2019), three of which resulted in loss of life, highlight the severe flood risks that remain within the watershed despite flood-control measures implemented since the 1964 flood event (USACE 2019). Papillion Creek consistently results in damage from flood events due to the convergence of several major streams on the Papillion Creek. Significant urban development is progressing within the watershed, predominantly located in the upper portions of the watershed, and will continue to increase the damage potential from flooding. Despite construction of flood control, substantial potential for flood damages remains due to development and agriculture adjacent to streams and rapid development within the watershed.

Existing urban, road, and bridge flooding is extensive along West Papillion Creek (shown within the area of benefit downstream of Site WP-1 in Appendix B). Existing flood damages for various storm events are shown below in Table 8-6.

Table 8-6. Existing Flooding Damages Downstream of Site WP-1

Flood Event	Road and Bridge Damages	Structure and Content Damages
50 year	$730,400	$1,417,800
100 year	$935,000	$6,138,500
500 year	$3,029,400	$55,973,800

8.2.12Historic and Cultural Resources

Cultural resources are physical or other expressions of human activity or occupation and include archeological sites, buildings, bridges, business districts, culturally significant landscapes, isolated artifacts or features, culturally sacred places, and objects of cultural and historic significance. In order for a cultural resource to be eligible for the NRHP, it must be associated with events significant to the broad patterns of history; associated with the lives of persons significant in the past; embody distinctive characteristics of a type, period, or method of construction, represent the work of a master, possess high artistic value, or represent a significant and distinguishable entity; and/or must yield or be likely to yield, information important to history or prehistory. If an undertaking will alter, damage, or destroy a historic property, the agency has a responsibility to avoid, minimize, or mitigate the adverse effect.

Several formal archeological surveys have been completed in the general project area, and over 200 archeological sites representing all periods of human occupation have been recorded within the watershed. Only five previously recorded archeological sites are located within one mile of the Preferred Alternative. These resources consist of historic farmsteads, prehistoric artifact scatters, and an early 20th century railroad grade.

Several properties listed on the NRHP are located within the watershed, including Father Flanagan's Boy's Home, Fort Crook Historic District, Gold Coast Historic District, the South Omaha Main Street District, portions of the Lincoln Highway, and two Central Plains Tradition archeological sites. None of these properties are located within 0.5-miles of the proposed area of potential effects.

2019 Cultural Resource Inventory: A cultural resource inventory consisting of background research and field surveys of the APE of the Preferred Alternative was completed in October and November of 2019. Background research did not identify any properties listed on or eligible for the National Register of Historic Properties within the APE. The field surveys identified only one cultural resource site, a segment of an early 20th century railroad grade. The railroad grade was evaluated against the criteria of eligibility for listing on the National Register of Historic Places and was determined not eligible in consultation with the Nebraska State Historic Preservation Office in August 2021.

8.2.13 Social and Demographic Data

The watershed is rapidly developing and there are no anticipated major social, cultural, or political factors that may influence major changes in land use, speed of development, or management of resources. The watershed is located within Douglas, Sarpy, and Washington counites in Nebraska. There are over 170 census tracts located within the Papillion Creek Watershed. The watershed is part of the Omaha-Council Bluffs Metropolitan Statistical Area, which encompasses multiple population centers. The City of Omaha is the largest population center in the area. Populations of the counties and major population centers within the watershed are shown below in Table 8-7. As shown in Table 8-7, populations within the watershed have been increasing over the last 10 years.

Table 8-7. Social and Demographic Data

Population Centers	2010 Populations[1]	2017 Populations[2]	2020 Populations[3]
Douglas County	517,110	549,706	584,526
City of Omaha	408,958	463,081	486,051

City of Ralston	5,943	7,348	6,494
City of Bennington	1,458	1,611	2,026
Sarpy County	158,840	175,188	190,604
City of Papillion	18,894	19,478	24,159
City of La Vista	15,758	17,062	16,746
City of Bellevue	50,137	53,040	64,176
Offutt Air Force Base	4,644	5,142	5,363
City of Gretna	4,441	5,045	5,083
Washington County	20,234	20,414	20,865
City of Blair	7,990	8,011	7,790

[1]*Source: 2010 Census Data*

[2]*Source: 2017 American Community Survey (ACS) 5-Year Estimates*

[3]*Source: 2020 Census Data*

In accordance with the Environmental Justice Departmental Regulation, it is imperative that the project is compliant with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." Although this project will provide many benefits, it is important to ensure any negative human health and/or environmental impacts are not disproportionately carried by minorities or low-income populations. Demographic and poverty data within the watershed are described below to ensure that the project will not disproportionally impact minority or low-income groups.

Table 8-8 shows the percentage of minorities within the three counties, the state of Nebraska, and the United States from 2020 Census data. A minority is a person who is a member of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic. As shown in Table 8-8, the percentage of minorities within the three counties vary significantly, with Douglas County having a significantly larger percent minority population than Sarpy and Washington Counties. The percentage of minorities within Douglas County is higher than the percentage of Nebraska but lower than the United States. Sarpy and Washington Counties, however, have percent minority populations below both the state and the country percentages.

Table 8-8. 2020 Census Demographic Data

Category	Douglas County	Sarpy County	Washington County	Nebraska	United States
Percent Minority	31.8%	20.0%	6.5%	21.6%	38.4%

Source: United States Census Bureau. 2020 Census.

Table 8-9 shows the percentage of people of all ages and minors (people under 18-years of age) below the poverty line within the watershed's counties, the state of Nebraska, and the United States from 2017 Census Bureau, Small Area Income and Poverty Estimates (SAIPE) Program data. Low-Income populations are identified as the populations living below the poverty line. As shown in Table 8-9, the percentages of all people and minors living below the poverty line in Douglas County are greater than Nebraska percentages and lower than the United States. Sarpy and Washington County have lower percentages in poverty than the state and nationwide percentages.

Table 8-9. 2020 Poverty Data

Category	Douglas County	Sarpy County	Washington County	Nebraska	United States
Percent in Poverty (all ages)	9.8%	4.9%	5.3%	9.2%	11.9%
Percent in Poverty (under 18)	10.2%	5.1%	6.3%	10.1%	15.7%

Source: United States Census Bureau. 2020 SAIPE data.

The minority, low income, and demographic index were analyzed with the Environmental Protection Agency's (EPA) Environmental Justice Screening and Mapping Tool (EJ SCREEN). The 2019 EJ Screen results showed 541 census block groups within the watershed. These 541 census block groups have ranges between 0 to 95 percent minority and 0 to 93 percent low-income (defined as income less than two times the poverty level). The demographic index (a combination of percent minority and percent low-income) varies between 0 and 87 percent within the watershed, which is in the 0 to 99th percentile for the state of Nebraska. The average demographic index, percent minority, and percent low income are 24 percent, 23 percent, and 26 percent, respectively.

Environmental justice communities, specifically minorities, low income, and Indian Tribes (NWPH 600.30) are not located within the affected resources areas of the 7 project sites.

8.2.14Public Health and Safety

The Papillion Creek Watershed is a mix of urban and rural and has been continually developing. There is a potential risk to loss of life, property, and essential public services due to flooding. Multiple studies have analyzed flooding potential and developed a watershed approach to flood risk reduction (see Sections 1.2 and 3.4). Additionally, some streams are experiencing major degradation and widening and pose a risk to the public due to high and eroding banks. Neighborhoods are often developed near watershed streams and as degradation and widening occur, stream footprints encroach into yards and homes. Stream degradation and bank failures also lead to infrastructure damage and interruptions to essential services, particularly to sanitary sewer and power lines that are frequently located adjacent to and cross under stream corridors within the watershed.

8.2.15Ecosystem Services

An ecosystem services framework is required by the PR&G and provides for an integrated approach that allows consideration and transparent evaluation of the benefits (both tangible and intangible) and trade-offs of potential alternatives. Four categories of ecosystem services are described in PR&G and are included below for ease of reference.

5. **Provisioning services** are tangible goods provided for direct human use and consumption, such as food, fiber, water, timber, or biomass.
6. **Regulating services** maintain a world in which it is possible for people to live, providing critical benefits that buffer against environmental catastrophe – examples include flood and disease control, water filtration, climate stabilization, or crop pollination.
7. **Supporting services** refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.

8. **Cultural services** make the world a place in which people want to live – recreational use, spiritual, aesthetic viewsheds, or tribal values.

Project scoping (see Chapter 2) led to the determination of the number and variety of ecosystem services (or resources of concern) to be considered in the analysis and the existing conditions of these resources have been described in this chapter. Each resource of concern (or ecosystem service) is grouped into four service categories, shown below in Table 8-10. Ecosystem service flows are both monetary and non-monetary and appropriate metrics should be based on current methodology to quantify impacted services over time and project- and regional-specific information and values. A concept diagram included below as Figure 3-6 helps to provide a visual representation of the linkages between actions and social values.

Table 8-10. Categories of Ecosystem Services

Category	Resource
Provisioning Services	Erosion and Sedimentation
	Prime and Unique Farmland
	Threatened and Endangered Species
	Migratory Birds/Bald and Golden Eagles
Regulating Services	Water Quality
	Regional Water Management Plans
	Floodplain Management
	Streams and Riparian Habitat
	Wetlands
	Flood Damages
	Public Health and Safety
	Climate Change
	Land Use
	Fish and Wildlife Habitat
Cultural Services	Historic and Cultural Properties
	Environmental Justice

8.3.0 ALTERNATIVES

Project formulation revolved around the project purpose and need at each previously identified site, existing resource conditions, originally identified preferred alternatives, and changes in design, technology, and environmental policies and requirements. Plans that could be implemented under the authorities of other Federal agencies, state and local entitles, and nongovernmental interests were also considered. Accordingly, local, state, regional, Federal, and nongovernmental interests participated in the formulation process. Measures considered in the formulation of alternative plans included those measures believed to be effective, efficient, and acceptable in achieving or satisfying the purpose at each previously identified site. Table 8-11 provides a summary of the recommended alternatives in the 1966 Work Plan.

Table 8-11. Recommended Alternative in 1966 Work Plan

Site	Drop (feet)	Type of Structure[1]	Hazard Classification[2]
W-5	25	Drop Inlet	b (Significant)
D-78	14	Drop Inlet	b (Significant)
D-2	20	Drop Inlet	b (Significant)
D-31 (WP-1)	19	Drop Inlet	b (Significant)
S-1	17.5	Drop Inlet	b (Significant)
S-5	24	Drop Inlet	b (Significant)
S-15	25	Drop Inlet	b (Significant)

[1]Drop inlet consists of earthen dam with riser, principal spillway pipe, and grassed emergency spillway. Typical structure detail included in Appendix D.
[2]Class b (Significant Hazard) classification based on projected build-out at time of 1966 Work Plan development.

8.3.1 Formulation Process

The formulation process is the basis for selecting combinations of measures to include as alternatives. The combination of alternatives developed are based on measures that could meet the project site purposes and take into consideration multiple Federal requirements to streamline the planning and decision-making process. This analysis is meant to satisfy the alternative development and screening criteria requirements of NEPA, Clean Water Act (CWA) Section 404(b)(1) guidelines, and Principles, Requirements, and Guidelines (PR&G) for Federal investments in water resources. This means that a wider range of alternatives and a varied screening process was used to satisfy all applicable Federal alternatives analysis requirements to reduce the time, cost, and cumbersome agency reviews that often come with multiple analysis documents. Table 8-12 below gives a description of when each of these regulations are required.

Table 8-12. Federal Requirements for Alternatives Analyses

NEPA	404(b)(1)	PR&G
National Environmental Policy Act requires Federal agencies to assess the environmental effects of proposed major Federal actions prior to making decisions.	Clean Water Act guidelines for an alternative analysis when an Individual Permit for fill in jurisdictional wetlands and/or streams is required from the USACE.	Alternatives analysis requirements when Federal funds are used for water projects. Agencies have specific guidelines, including the USDA (who is funding this Supplemental Plan-EA).

Once an appropriate range of alternatives is selected, each alternative is screened to determine if it should be carried forward for a more detailed analysis. Detailed analysis includes a more refined preliminary design, analysis of environmental and social consequences (both beneficial and detrimental), and a detailed economic analysis. This pre-screening allows for a detailed look at a narrower range of alternatives, which allows for a more efficient decision-making process. Different Federal requirements and guidelines present different screening criteria based on the overarching goal of the policy. This screening criteria is shown in Figure 4-1.

Tables 8-13a, 8-13b, and 8-13c summarize the alternatives, the screening process summary, and whether each alternative was carried forward for detailed study. Alternatives not carried forward for detailed study are included in Section 4.2 and further information is provided in Appendix D. Costs included in the table include construction, project administration, engineering, construction observation, permitting, and mitigation.

Table 8-13a. Range of Alternatives and Determination for Detailed Study for Grade Stabilization Sites[1]

Site	Goal	FWOFI	Rigid Drop Structures			Loose Rock Structures	Channel Restoration	Loose Rock Structures with Channel Bank Stability
			Drop Spillways	Chute Spillways/ Channel Linings	Drop Inlet Spillways (High Hazard Dams)			
W-5	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$4,625,900 Economics/Cost/ Efficiency	$2,724,700 **Carried Forward**	$6,560,000 Economics/Cost/ Efficiency	N/A
D-78	Grade Stabilization	**Carried Forward**	Logistics	Logistics	$10,720,900 Economics/Cost/ Efficiency	$1,191,700 **Carried Forward**	$5,400,000 Economics/Cost /Efficiency	N/A
D-2	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$5,584,000 Economics/Cost/ Efficiency	$1,774,500 **Carried Forward**	$6,151,000 Economics/Cost/ Efficiency	N/A
S-15	Grade Stabilization	**Carried Forward**	Logistics	**Carried forward** with Loose Rock Structures Alternative	$8,506,900 Economics/Cost/ Efficiency	$1,226,700 **Carried Forward**	$6,450,000 Economics/Cost/ Efficiency	N/A
S-5	Grade Stabilization / Improved Safety	**Carried Forward**	Logistics	**Carried forward** with Channel Restoration Alternative	Logistics	Purpose and Need	$3,770,200 **Carried Forward**	$5,875,800 Economics/Cost/ Efficiency

[1]*If an alternative is not carried forward for detailed study, the reason is listed in the table. Logistics includes inability to implement due to specific site conditions and not meeting the Federal objective. Information is provided in the following sections and Appendix D to support the rationale.*

Table 8-13b. Range of Alternatives and Determination for Detailed Study for Site S-1[1]

Site	Goal	FWOFI	Sediment Basin	Maintenance Dredging of DS-19	Conservation Measures	Small Sediment Basins	Rigid Drop Structures	Drop Inlet Spillways (High Hazard Dams)	Loose Rock Structures
S-1	Sediment Reduction	**Carried Forward**	$3,491,300 **Carried Forward** in combination	$2,605,700 **Carried Forward** in combination	Purpose	Purpose	N/A	Logistics/ Ability to Implement/ Efficiency	N/A
S-1	Grade Stabilization	**Carried Forward**	N/A	N/A	N/A	N/A	**Carried Forward** in combination	Logistics/ Ability to Implement/ Efficiency	**Carried Forward** in combination

[1]*If an alternative is not carried forward for detailed study, the reason is listed in the table. Information is provided in the following sections and Appendix D to support the rationale.*

Table 8-13c. Range of Alternatives and Determination for Detailed Study for Site WP-1[1]

Site	Goal	FWOFI	Nonstructural	Floodplain Acquisition	Current Conservation Measures	Low Impact Development	Created and Restored Wetlands
WP-1	Flood Risk Reduction	**Carried Forward**	Purpose	$288,600,000 Economics/Cost/ Efficiency	Purpose	Logistics/ Ability to Implement/ Efficiency	Purpose
		Stream Restoration	**Conveyance**	**Raise Existing Levees & Bridges**	**Small Detention Dams**	**Regional Detention Site (Dry Dam)**	**Regional Detention Site (Wet Dam)**
		Purpose	Purpose	Purpose	Purpose	**Carried Forward** $15,390,800	**Carried Forward** $13,663,500

[1]*If an alternative is not carried forward for detailed study, the reason is listed in the table. Information is provided in the following sections and Appendix D to support the rationale.*

8.3.2 Alternatives Eliminated from Detailed Study

The alternatives eliminated from detailed study were analyzed on a site-by-site basis. The following alternatives either did not satisfy the project purpose and need (problems and opportunities) or were otherwise removed from detailed study due to the factors shown in Figure 4-1. To reduce redundancy and improve readability, these are first grouped by site goal and then by specific site where clarity is needed. Alternatives are also shown in Tables 8-13a, 8-13b, and 8-13c above.

8.3.2.1 Site Goal: Grade Stabilization

Applicable Sites: W-5, D-78, D-2, S-5, S-15

The following briefly describes alternatives that were eliminated from detailed study for sites that have an identified purpose of grade stabilization (sites W-5, D-78, D-2, S-15, and S-5).

8.3.2.1.1 Standard NRCS Grade Stabilization Structures

Applicable Sites: W-5, D-78, D-2, S-5, S-15

Standard grade stabilization structures as presented in the USDA NRCS National Engineering Handbook (NEH) Part 650 - Engineering Field Handbook were recommended for all sites in the 1966 Work Plan and, more specifically, drop inlet structures were recommended at all sites discussed in this Supplement (Table 8-11). Site visits and desktop surveys were used to determine if standard NRCS grade control structures could still be reasonable alternatives. Structure types, techniques, and design guidelines presented in Technical Supplement (TS)-14G, NEH Part 650, NEH Part 654, 584-CPS-1, NE-410-1, and others were referenced during the analysis. Many alternatives were considered and rejected due to site conditions. A brief description of some of these are included below.

Although all of sites in this Supplement are experiencing bed degradation, existing channel profile drops as identified in the 1966 Work Plan are no longer evident at Sites W-5, D-78, and D-2. This yields a portion of the structures identified in Figure 6-4 of NEH Part 650 unreasonable as they do not fit the site conditions. There is one large headcut progressing upstream toward HWY 370 at Site S-15, a large existing drop at the 180th Street culvert at Site S-5, and at an abandoned bridge crossing at Site W-5 and therefore these are considered further at specific locations within those sites, as discussed in the sections below.

Drop inlet spillways (i.e., earthen embankment dams) were given further consideration due to the recommendation in the 1966 Work Plan and the potential additional benefits of flood risk reduction and water quality. Consultation with Nebraska Department of Natural Resources (NDNR) Dam Safety indicated that all structures at these locations would need to be designed to high hazard dam criteria due to development in the watershed and existing infrastructure. High hazard potential means that a failure or misoperation of the dam results in a probable loss of human life (NDNR, 2013). Further information on this alternative is provided below.

8.3.2.1.2 High Hazard Dam Alternative

Applicable Sites: W-5, D-78, D-2, S-5, S-15

This alternative involves the construction of an earthen embankment dam and was considered at Sites W-5, D-78, D-2, S-5, and S-15. The dams were designed as high hazard flood control

structures due to existing development and predicted future build-out downstream of these structures that would result in a probable loss of human life in the case of the dam failure. Design specifications described in NRCS Technical Release 210-60 (TR 210-60) were followed to set the elevations for the dams using National Oceanic and Atmospheric Administration (NOAA) Atlas 14 precipitation values and the NRCS Water Resources Site Analysis Program (SITES) program. Wet and dry dams are sized to the same design criteria and therefore this preliminary analysis encompasses both types of dams. If the alternative were found to be reasonable, both wet and dry dams would be analyzed separately. Additional design information can be found in Appendix D, including figures that show the locations and extents of each high hazard dam alternative that was analyzed. Due to property constraints caused by existing and platted development there is no plausible location at Site S-5 and therefore it is not included in a figure.

Costs were determined at each site to assess if the alternatives were reasonable and were guided by the assumptions listed below. Unit costs, provided in Appendix D, were based on local knowledge and similar, recent projects in the local area. Total project costs for each site are included in Table 8-13a.

- Embankment volume and extents were determined with 3H:1V side slopes, a 10-foot-wide access berm, a 10-foot wide buttress on the upstream face, and a 30-foot long stability berm on the downstream face.
- Rock riprap would be placed above and below the permanent pool elevation on the upstream face to protect from wind action.
- Land will be purchased for the embankment, auxiliary spillway, and top of dam extents. When land purchase area encompasses over ¾ of the parcel, the whole parcel will be purchased.
- Any homes within the top of dam elevation extents will be purchased.
- A 20 percent contingency was added to the construction costs to account for unforeseen expenses during construction.

This alternative meets the purpose and need and would provide additional benefits in the form of flood risk reduction, water quality, ecological improvements, and passive recreation. However, costs for this alternative are unreasonably expensive in comparison to other available alternatives for the purpose of grade stabilization. This alternative would also create significantly more impacts to waters of the United States (WOTUS). Therefore, this alternative is not reasonable and was not carried forward for detailed analysis at Sites W-5, D-78, D-2, S-5, and S-15.

8.3.2.1.3 Nonstructural Alternatives

Applicable Sites: W-5, D-78, D-2, S-5, S-15

Nonstructural alternatives include changes to policy, existing land use, infrastructure, and/or management practices to meet the project purpose and need and potentially minimize adverse changes and impacts to existing hydrologic, geomorphic, and ecological processes. To meet the grade stabilization purpose, a nonstructural alternative (or combination of nonstructural/structural alternatives) would need to halt and prevent future stream degradation including progressing headcuts.

Stream degradation is a known problem within the watershed due to the deep deposits of highly erosive Peoria Loess soil types. Existing policies for development have been established through the PCWP and include stream setbacks, maintaining peak flows on significant developments, and others (PCWP, 2014). Although policies can help to slow stream degradation or protect future developments from being built too close to a stream, public and regulatory policies cannot prevent the headcut progression that is common in the area. Changes in land use are equally as ineffective. One potential nonstructural alternative is to buy the land that is expected to fall within the stream limits as the streams continue to degrade and widen and allow the channel banks to become higher and the stream footprint to continue to expand. However, this would remove the farmland and residential homes that this project is intending to protect and therefore does not meet the project purpose. This alternative also leaves risk to public health and safety as stream banks can frequently become over 30 feet tall, posing a significant safety risk to residents. Risks to infrastructure, including sewer lines and power poles, previously placed adjacent to and crossing under the streams also remain in this alternative. Relocating infrastructure in conjunction with buying property would also be exorbitantly expensive, would not be socially acceptable, and would be ecologically detrimental as streams would continue to degrade and widen thus leading to further habitat loss. No nonstructural alternatives for grade stabilization were brought forward for detailed analysis.

8.3.2.1.4 Stream Restoration Alternative

Applicable Sites: W-5, D-78, D-2, S-15

This alternative involves the implementation of a two-stage channel design to meet the project purpose of grade stabilization and to improve stream and ecological function. This alternative would include the grade stabilization structures as well as in-channel grading according to the NRCS Two-Stage Channel Design (NRCS 2007). The two-stage channel design involves grading the channel to create low channel benches that function as floodplains to restore natural alluvial channel processes. This alternative would reduce in-stream erosion due to the shallower flows during large events, which would stabilize streams, lower in-stream maintenance, and improve water quality and ecological function. The implementation of loose rock grade stabilization structures according to detailed methodology included in Appendix D (in conjunction with the two -stage channel design) would also be required to prevent future headcut progression. Assumptions and design criteria utilized to determine costs are listed below.

- Floodplain benches would be graded at the ordinary high water mark (OHWM) elevation to be at the elevation where benches are anticipated to form.
- Floodplain bench widths were determined using a 4:1 floodplain bench width to bankfull channel width ratio.
- Channel bank slopes were graded with 3H:1V side slopes.
- The Manning's equation was used to verify adequate floodplain widths to ensure a stable stream velocity of 3 feet per second at bankfull conditions.
- The stream slope was selected based on NEH stable channel design for Loess soils with plasticity index of less than 15.

Costs were determined to assess if the alternatives were reasonable and are included in Table 8-13a. Unit costs, provided in Appendix D, were based on local knowledge and similar, recent projects in the local area. Costs for each site were determined based on specific excavation quantities calculated at Sites D-2 and S-5 and then applied to the other sites. Although land acquisition/easements would be required, these costs were not determined due to the already exorbitant costs without these values included.

This alternative meets the Project's purpose and need and would provide grade control benefits. However, costs for this alternative are unreasonably expensive in comparison to other available alternatives. This alternative also removes much of the land that other alternatives would protect from future channel degradation and widening because of required grading extents. Therefore, this alternative is not reasonable and was not carried forward for detailed analysis at Sites W-5, D-78, D-2, and S-15.

8.3.2.1.5 Loose Rock Structures

Applicable Sites: S-5

The loose rock structures alternative at Site S-5 involves the implementation of rock riprap grade stabilization structures within Beadle Creek that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream. Stream degradation occurs within the watershed due to highly erosive soil types and it is predicted that streams will continue to degrade until reaching a stable stream bed slope. Beadle Creek is nearly fully degraded, but rock structures could be used to prevent further degradation as the stream reaches the stable stream slope. Appendix D provides detailed information about the design and placement of loose rock structures.

As stated in Section 1.3, the purpose of Site S-5 is to provide grade stabilization AND to improve safety along the Beadle Creek stream corridor between Lillian Street and the confluence of South Papillion Creek. This alternative does not improve safety along the Beadle Creek stream corridor and was therefore not carried forward for detailed analysis.

8.3.2.1.6 Loose Rock Structures with Channel Bank Stability

Applicable Sites: S-5

The loose rock structures with channel stability alternative at Site S-5 involves the implementation of rock riprap grade stabilization structures within Beadle Creek that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream as well as laying the channel banks back to provide less steep and more stable bank slopes. Stream degradation occurs within the watershed due to highly erosive soil types and it is predicted that streams will continue to degrade until reaching a stable stream bed slope. Beadle Creek is nearly fully degraded, but rock structures could be used to prevent further degradation as the stream reaches the stable stream slope. Appendix D provides detailed information about the design and placement of loose rock structures.

Ideal channel bank slopes are 3:1 (horizontal:vertical) as they are inherently stable using area soils and would significantly reduce public safety concerns. Steeper slopes would likely lead to failure and increased risk to public safety. Due to the extremely high velocities and subsequent stream

power, green armor matting would be required along the channel bed and up the channel slopes for the entire stretch of protected Beadle Creek. The existing sanitary sewer and power poles that are adjacent to Beadle Creek would require relocation and subsequent property easements (and potentially property buyouts) with this alternative. This alternative would improve public safety but would not decrease the over 20-foot-tall banks and therefore would not remove the public risk. This alternative also has an exorbitant cost (almost $5.9 million without including any property costs) and was therefore not carried forward for detailed analysis. Cost details are provided in Appendix D.

Other alternatives for stabilizing the channel banks were also considered to avoid the need for infrastructure relocation by stabilizing the banks in-place. These included sheet pile steps to allow for vertical walls, concrete geowebs, and other alternatives that stabilize the vertical banks. These alternatives do not improve public safety along Beadle Creek and were therefore not carried forward for detailed analysis.

8.3.2.2 Site Goal: Sediment Retention and Grade Stabilization

Applicable Site: S-1

The following briefly describes alternatives that were eliminated from detailed study for Site S-1. Combinations of alternatives were considered to meet the project purpose.

8.3.2.2.1 Conservation Measures

Applicable Site: S-1

The conservation measures alternative was analyzed at Site S-1 and uses policy to ensure current conservation methods are used on private agricultural land within the watershed as well as requiring increased conservation measures on private agricultural land within the watershed. Conservation measures maximize infiltration and reduce erosion. Agricultural land takes up approximately 82 percent of the S-1 watershed and 55 percent of those agricultural acres currently utilize conservation practices including grade terraces, ponds, and grassed waterways.

This leaves 45 percent of existing agricultural land available for full implementation of conservation measures. It is estimated that terraces can reduce sedimentation with an 85 percent efficiency. If terraces were applied to all existing agricultural land available for conservation measures, it would only provide a sediment load reduction of approximately 16.7 acre-feet. This alternative will not provide sufficient sediment load reductions to meet the project purpose.

The conservation measures alternative was also analyzed for the entire Site DS-19 watershed. Agricultural land makes up approximately 61 percent of the DS-19 watershed and approximately 60 percent of those agricultural acres currently utilize conservation practices including grade terraces, ponds, and grassed waterways.

This leaves 40 percent of existing agricultural land available for full implementation of conservation measures. It is estimated that terraces can reduce sedimentation with an 85 percent efficiency. If terraces were applied to all existing agricultural land available for conservation measures, it would

provide a sediment load reduction of approximately 19 acre-feet over 50-years. This alternative would not provide sufficient sediment load reductions to meet the project purpose.

Additionally, the Sponsor does not have authority to force landowners to implement conservation measures on their land. This alternative is not practical to implement and does not meet the project purpose and was therefore eliminated from further study.

8.3.2.2.2 Small Detention Basins

Applicable Site: S-1

The small sediment basins alternative involves constructing combinations of small sediment basins to provide the same sediment detention benefits as a single, larger downstream structure at Site S-1 to potentially minimize impacts to stream length and other resources. The S-1 watershed was analyzed for potential locations based on existing streams, topography, and drainage basin areas. Five potential locations for small sediment basins were found with a cumulative watershed area of 0.95 square miles (Figure 4-6). If all five basins were constructed, it is predicted that they would capture approximately 16 acre-feet of sediment over 50 years. Therefore, this alternative does not meet the project purpose and was eliminated from detailed study.

The loose rock structures alternative at Site S-1 involves the implementation of two rock riprap grade stabilization structures and one rigid structure within South Papillion Creek and its tributary that would function as deformable energy dissipation structures to "catch" headcuts as they progress upstream and maintain existing grade. The location of the proposed structures is shown in Figure 4-7, with Structure 3 being the rigid structure that would allow for stream crossing. This location has an existing channel grade drop and water crossing that frequently washes out. Stream degradation is a problem within the watershed due to highly erosive soil types and it is predicted that the streams will continue to degrade until reaching a stable stream bed slope. The structures would stabilize the stream bed slope and protect approximately 4-acres of upstream land from degradation. See Appendix D for detailed information about the design and placement of the grade stabilization structures.

This alternative meets the Project's purpose to provide grade stabilization benefits; however, does not meet the purpose of sediment retention and therefore this alternative alone was not carried forward for detailed study at Site S-1. Loose rock structures were considered in combination with other alternatives to meet the project purpose and one of these combinations was carried forward for detailed analysis as discussed in Section 4.3.

8.3.2.3 Site Goal: Flood Risk Reduction

Applicable Site: WP-1

The following briefly describes alternatives that were eliminated from detailed study for site WP-1, which has an identified purpose of providing long term flood damage reduction within the West Papillion Creek subwatershed so that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. Where applicable, alternatives were analyzed using the same drainage area to compare them without bias. This drainage area is referred to simply as 'drainage basin' in the following sections for brevity.

8.3.2.3.1 Nonstructural Alternatives

Nonstructural alternatives include changes to policy, existing land use, infrastructure, and/or management practices to meet the Project purpose and need. To meet the flood damage reduction purpose, a nonstructural alternative (or combination of nonstructural/structural alternatives) would need to provide flood damage reduction and/or remove structures from the floodplain. Raising building elevations, filling basements, and dry floodproofing are potential nonstructural alternatives that were analyzed as potential solutions.

The Zoning Alternative involves administrative action to adopt zoning regulations that prevent new development within the projected full build-out 100-year floodplain for the affected reach downstream of the identified site, over 3,000 acres from West Papillion Creek to the confluence with Big Papillion Creek. This alternative includes all land within the floodplain, including agricultural, and could reduce flood risk to new construction but would not address flooding of existing structures. It is assumed that no land would be acquired. Adoption and enforcement of new zoning regulations does not reduce flood risk or limit the expansion of the future conditions floodplain and therefore this alternative does not meet the project purpose and was not carried forward for detailed analysis.

8.3.2.3.2 Floodplain Acquisition Alternative

The Floodplain Acquisition Alternative involves acquiring downstream developed properties along West Papillion Creek within the projected full build-out, 100-year floodplain for the affected reach downstream of the WP-1 project location. This alternative does not include zoning and considers all properties in the downstream 100-year floodplain along West Branch Papillion Creek.

The full build-out, 100-year floodplain contains more than 3,076 acres. The Sponsor would need to acquire land, purchase flooding easements, and use existing public lands. A cost estimate for this alternative includes the following:

- Removing 762 existing permanent structures from the full buildout, 100-year floodplain. Based on Douglas County and Sarpy County assessor structure values, acquiring the existing 762 structures would cost approximately $151.3 million.
- Approximately 1,013 acres of residential land would need to be purchased to remove structures and to prevent future development. At a cost of $60,000 per acre, this would cost approximately $60.8 million.
- Approximately 493 acres of commercial land would need to be purchased to remove structures from the full build-out, 100-year flood plain with an additional 98 acres requiring purchase due to the properties being inundated by more than 50 percent. At a cost of $60,000 per acre, these purchases would cost $29.6 million and $5.9 million, respectively.
- Easements would be required on all agricultural land based on the percentage inundated, as well as commercial land that would be inundated by less than 50 percent. The approximately 45 inundated acres of commercial land that would require an easement at $60,000 per acre would cost $2.7 million.
- The flooding easement for 1,095 acres of agricultural land would cost approximately $35,000 per acre, for a total of $38.3 million.

The Floodplain Acquisition Alternative is exorbitantly expensive at approximately $288.6 million and was therefore removed from detailed study.

8.3.2.3.3 Current Conservation Measures Alternative

The Current Conservation Measures Alternative involves full implementation of conservation measures on existing agricultural lands within the drainage basin. Conservation measures are typically administered through incentive programs offered by the NRCS. Measures are designed to maximize rainwater infiltration and reduce soil erosion. These include practices such as no-till farming, contouring, strip cropping, terraces, grassed waterways, and similar practices. Water and sediment control basins would not be included as part of this alternative.

It is estimated that a majority of farmland in the drainage basin currently has some type of conservation measure in place based on a review of aerial imagery. Remaining farmland in the basin would be eligible for full implementation of additional conservation measures; however, most of this land is already platted for development and will be removed from agricultural production, hence no longer eligible for federally funded conservation measures.

Implementing the Current Conservation Measures Alternative would require a multiagency effort with federal partners. The alternative would have an unknown effect over the long-term planning horizon due to changes in Congressional appropriations and program implementation. Most conservation measures are designed for the purpose of soil retention; conservation measures alone could not provide the desired level of flood risk reduction. Therefore, this alternative is eliminated from further consideration because it does not meet the purpose and need for Site WP-1.

8.3.2.3.4 Low Impact Development (LID) Alternative

The LID Alternative would require implementation of future conservation methods that are focused on residential and commercial applications, as opposed to agricultural. LID strategies, such as on-site detention ponds or vegetated swales, can be implemented on future developable land as described in Papillion Creek Watershed Management Plan (Management Plan) (PCWP, 2009). One scenario considered the projected 100-year full build-out floodplain with maximum LID (Max LID). This scenario called for construction of on-site detention basins in addition to an assortment of other LID practices to achieve a high reduction of peak flow. Max LID was considered, instead of a conventional LID scenario, because conventional LID practices primarily address water quality issues, as opposed to stormwater runoff reduction to lessen flood risk.

The Management Plan (PCWP, 2009) found that a Max LID strategy could be equally successful at reducing peak flows as would a network of regional detention basins. PCWP (PCWP, 2009) estimates that, at the point of application, the Max LID scenario would allow storm water control and an approximate 90 percent reduction in peak flows through a 100-year storm event based on HEC-1 hydrologic models (P-MRNRD, 2009). Using 2017 aerial images, an estimated 90 percent of the drainage basin remains to be developed. Assuming that the Max LID measures are implemented throughout the remaining 90 percent of the drainage basin, the incremental reduction in peak discharge for the 100-year storm event would be approximately 81 percent. The full build-out, 100-year flood plain peak flow for the watershed is 2,035 cfs. This would drop to 387 cfs with implementation of future conservation measures.

Although a Max LID strategy would successfully reduce peak flows and discharges within the drainage basin, the overall geometry and topography of the Big Papillion Creek Watershed and West Papillion Creek sub-watershed is not conducive to overall peak flow reduction further downstream. Due to north-to-south peak flow timing, peak flow reduction performance on Big Papillion Creek is dependent on the relative success of efforts upstream of NE Highway 36 in Washington County. The implementation horizon for Max LID strategies in Washington County is currently estimated at decades past 2050. During this transition period, the existing risk of flooding along the lower reaches of the Big Papillion Creek Watershed would remain mostly unchanged. Other logistical hurdles with Max LID include sustainability relative to jurisdictional responsibilities, inexperienced local contractors, uncertainty regarding FEMA acceptance of LID for Flood Insurance Rate Map (FIRM) development, and funding dependent on Congressional budget appropriations.

The LID Alternative, although meeting the project purpose for flood risk reduction, would not provide this effect within an acceptable timeframe to keep pace with development. The alternative would require innumerable state and federal permits because waters on multiple private properties would be likely impacted for construction, increasing uncertainty (as future funding is dependent on Congressional budget appropriations) and cost due to economics of scale. Furthermore, the Sponsor does not have legislative authority to require LID practices on private property. This alternative is eliminated from further consideration because it is not considered logistically feasible and does not meet the purpose and need within an acceptable timeframe.

8.3.2.3.5 Created and Restored Wetlands Alternative

The Created and Restored Wetlands Alternative would create or restore wetlands and the floodplain in conjunction with buffers and stream restoration to maximize flood storage. Lands that are conducive to wetland creation or enhancement were identified based on location of hydric soils and hydrology. Wetland storage areas would provide habitat quality improvements and water quality benefits.

Soils with hydric components make up 167 acres of the 852-acre drainage basin and are primarily located along streams and within riparian areas, based on Geographic Information System (GIS) spatial analysis results using the Gridded Soil Survey Geographic database (gSSURGO) (USDA, 2017) and its Potential Wetland Soil Landscapes (PWSL) data. The spatial correlation between hydric soils and hydrology across the drainage basin indicates that areas conducive to wetland creation and/or restoration are present. Wetland creation would be accomplished by constructing a series of structures to impound stream flow, creating shallow pools. The maximum storage of floodwater provided per acre of wetland is approximately 4.5 ac-ft (National Oceanic and Atmospheric Administration [NOAA] and EPA, 2003). To provide the necessary protection for the projected full build-out, 100-year flood plain, 85 acres of wetland functioning at maximum efficiency would be required for adequate flood storage of approximately 379 ac-ft. To establish wetlands along channels, conservatively estimating the channel and riparian zone width throughout the basin is 100 feet, 85 acres of wetlands would require approximately 7 miles of stream length. There are approximately 4 miles of stream channel within this reach.

This alternative is eliminated from consideration because there is not enough wetland storage potential along the stream channels to meet the equivalent flood storage volume needed and therefore did not meet the site purpose. This alternative was considered in conjunction with the Stream Restoration Alternative and others as well and none of these alternatives were carried forward for detailed analysis due to inability to meet purpose.

8.3.2.3.6 Stream Restoration Alternative

The goal of the Stream Restoration Alternative would be to reduce flood flows through stream improvements within the unnamed reaches within the drainage basin. Improvements could include riffle-pool structures, j-hooks or rock veins, or other stream bank improvements that would effectively roughen the stream bed and channel. Roughening a channel slows velocities, increasing the flow area and wetted perimeter of the channel, potentially expanding the spatial extents of flooding. These measures would provide aquatic habitat improvements and water quality benefits.

This alternative is eliminated from further consideration because the existing 4 miles of channel are in the upper reaches of the watershed and do not provide enough stream length to meet the equivalent flood storage volume needed to meet the purpose. This alternative was considered in conjunction with the Created and Stored Wetlands Alternative as well and was not carried forward for detailed analysis due to inability to meet purpose.

8.3.2.3.7 Conveyance Alternative

The Conveyance Alternative would improve flow conveyance by using channel modifications, such as levees and stormwater channels, along the urbanized reach of West Papillion Creek for containment of the projected full build-out 100-year flood event. Such structures increase the capacity of streams to carry floodwaters downstream while reducing flood damage to adjacent property. These types of structural flood control measures are typically utilized in the lower portion of a watershed to prevent peak flows from reaching the same place over a short time period. Because peak flows currently exceed existing channel capacity, the existing levees would need to be moved back for the channel to contain the entire peak flow. The existing levee is about 8 to 10 ft high, with a 15-ft top width, and 3:1 side slopes. The levee is approximately 9 miles in length. The cost to remove and replace the entire levee was estimated in 2008 at $70 million based on levee modifications estimated from the study entitled, West Papillion Levee Restoration Evaluation (P-MRNRD, 2008).

This alternative is eliminated from further consideration due to the exorbitant cost. Also, increasing the capacity of the creek would decrease the travel time of flood flows, placing added pressure on the lower reaches of the watershed and diminish the effectiveness of downstream channels and levees. These types of modifications would likely exacerbate downstream flooding.

8.3.2.3.8 Raise Existing Levees and Bridges Alternative

The Raise Existing Levees and Bridges Alternative would involve raising the existing levees and bridges along West Papillion Creek to allow the levee system to contain the full build-out 100-year flood event and provide 3-ft of freeboard in accordance with FEMA criteria for certification. It is not reasonable to raise the levees less than the height required to provide flood benefits that do

not include this 100-year flood event containment and 3-foot freeboard. Therefore, this alternative uses these criteria as the basis for analysis.

A system of earthen levees currently parallels the lower reach of West Papillion Creek. These levees are not shown as certified on the digital FIRM mapping. During large rain events the floodplain inundates surrounding land and structures. Levees extend from the confluence of Walnut Creek (approximately 96th Street) downstream to approximately 42nd Street on the right bank, and from west of 84th Street downstream to approximately 44th Street on the left bank.

The West Papillion Levee Restoration Evaluation (P-MRNRD, 2008) analyzed three scenarios to raise the levees and bridges for certification. These scenarios compared the required effort and cost with and without additional detention structures within the watershed. In addition, the P-MRNRD (2008) report considered two types of levee improvements. One scenario raised the levee with a flood wall and one raised the levee with earthen fill. The study also evaluated the need to raise bridges at 48th Street, 66th Street, and 84th Street. Costs of the scenarios ranged from $23 million to $141 million, and do not include costs needed to relocate businesses along 84th Street in the City of Papillion, an additional cost of approximately $4.7 million.

The P-MRNRD (2008) report indicated that although raising existing levees and bridges alone, without additional detention structures in the watershed, was the most economical; the alternative provides little flood protection upstream of the confluence of West Papillion Creek with Walnut Creek near 96th Street.

This alternative was eliminated from detailed analysis because it provides flood protection that is limited to the downstream reaches of the West Papillion Creek sub-watershed and therefore does not meet the project purpose.

8.3.2.3.9 Small Detention Dams Alternative

The Small Detention Dams Alternative would involve constructing several smaller detention structures within the watershed to accomplish flood protection while minimizing impacts. These small detention structures would consist of high hazard (based on State of Nebraska dam safety criteria) dry dams along Whispering Ridge Creek and its tributaries. An analysis was completed to determine the size of dry dam structure required, including earthen dam footprint and flood pool extents, and potential locations. Every effort was made to avoid existing infrastructure, including existing developments and roadways.

The drainage basin is 852 acres. Based on existing topography and land use constraints there are only three potential sites for small detention structures. Each has a drainage area between 69 acres and 345, with combined total flood storage of 653 ac-ft. versus 1,164 ac-ft for the one larger site downstream on Whispering Ridge Creek (Alternatives 2-WP1 and 3-WP1, described below).

This alternative was eliminated from consideration because it would not provide adequate flood storage volume and therefore does not meet the Site's purpose and need.

8.3.3 Alternatives Carried Forward for Detailed Analysis

The following section describes the alternatives that were carried forward for detailed analysis. An incremental analysis was considered and analyzed at each site to determine the individual measures included and the formulation process was used to combine these measures into the alternatives detailed below.

8.3.3.1 Alternative 1. No Action/Future Without Project

This alternative is the most likely future condition if none of the action alternatives are selected. The future without project at each site is described below. This alternative does not meet the purpose and need; however, it is carried forward through the analysis as a benchmark condition.

Site W-5

In this alternative, the Sponsor would not construct grade stabilization structures and the Boston Branch would continue to experience advancing headcuts, resulting in degradation and widening. The Road 29 bridge abutment would likely be impacted by the continued stream instability and headcuts would move into yards and farm fields as gullies as the Boston Branch profile lowered. Human health and safety concerns would steadily increase as stream banks rose higher, especially with the adjacent residential development and potential for children to play near the stream.

Site D-78

In this alternative, the Sponsor would not construct grade stabilization structures and Ridgewood Creek and its unnamed upstream tributaries would continue to widen and degrade. An upstream home would likely be impacted by future stream instability and widening, and surrounding farm fields would not be protected from headcut progression. Additionally, human health and safety concerns would arise as stream banks rise higher.

Site D-2

In this alternative, the Sponsor would not construct grade stabilization structures and Boettger Creek and its upstream tributaries would continue to degrade and widen. The Highway 133 embankment would likely be threatened from stream instability and progressing degradation and surrounding farm fields would not be protected from headcut progressions. Additionally, human health and safety concerns would arise as stream banks degrade and become steeper.

Site S-5

In this alternative, the Sponsor would not restore the stream and the channel would continue to degrade and widen. Power poles, an adjacent sanitary sewer, yards, homes, and roadway embankments would be threatened by continued degradation and erosion. Additionally, human health and safety concerns would remain and worsen due to shear and steep banks, especially with the adjacent residential development and potential for children to play near the stream.

Site S-15

In this alternative, the Sponsor would not construct grade stabilization structures and Westmont Creek and its upstream tributaries would continue to experience advancing headcuts, resulting in degradation and widening. The roadway embankments at two crossings under S 144th will likely be impacted by the continued stream instability. Adjacent properties would likely experience damage due to stream widening

and as gullies as the stream profiles lower. An approximate 10-foot headcut that is progressing from Westmont Creek up the northern tributary that runs adjacent to Highway 370 would continue to move upstream, causing significant channel grade loss and damage along the Highway 370 corridor. Adjacent sanitary sewer lines would also need to be relocated due to the continued degradation. Human health and safety concerns would steadily increase as stream banks rose higher, especially with the nearby residential development and impending development.

Site S-1

In this alternative, the Sponsor would not address sedimentation or construct any grade stabilization and South Papillion Creek and its upstream tributaries would continue to degrade and widen, moving toward the crossing at S 216th Street and the existing home along the channel. This alternative would also not prevent sediment from entering the planned DS-19 Reservoir.

Site WP-1

This alternative is the most likely future condition if none of the action alternatives are selected and there is no expenditure of federal funds. This alternative would involve no implementation of any flood risk reduction structures or measures. The flood damages to cropland, urban areas, and infrastructure would continue. This alternative does not meet the purpose and need; however, it is carried forward through the analysis as a benchmark condition.

8.3.3.2 Alternative 2-Combination 1

This combination of alternatives includes practices at each of the seven identified project sites. Incremental analysis utilizing land and infrastructure benefits and projected stable slope was used at each grade stabilization site to determine the number of practices along each stream reach. An incremental analysis was also used at Site S-1 to determine the optimum sediment retention based on land use, site constraints, and economic benefits. Flood risk reduction was also analyzed using an incremental analysis approach along with watershed-wide considerations, which is described more in depth in Appendix D.

Site W-5

This alternative includes the implementation of eight loose rock structures within the channel and one rigid drop structure to preserve upstream land from future degradation and loss. The structures have two versions of a basic design that are carried out through the site. Both structures grade the banks back to a side slope of 3:1 and line the bank to the 100-year flood water surface elevation with riprap. In areas where a tributary enters the stream at the structure, the tributary will not be graded except as needed to tie into the structure; however, the tributaries will be riprap lined to the 100-year flood water surface elevation. Most of the structures will not change the grade of the stream but the riprap will be placed such that the upstream end is slightly above stream grade to encourage deposition and reduce the stream slope upstream of the structure. One structure will be placed at a drop in the stream and will entail some grading of the stream bottom. This structure includes a flat inlet section, a steeper 4:1 middle section, and a flat outlet section. This alternative would stabilize the streams and protect the adjacent farmland and riparian habitat from degrading due future head cut progressions and stream widening. See Appendix C for the locations of the proposed structures and Appendix D for detailed information on the design of this alternative. Project costs are shown in Table 8-13a. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site D-78

This alternative includes the implementation of 11 loose rock structures within the channel and is estimated to preserve approximately 36 acres of land from future degradation and loss. This alternative would stabilize the streams and protect the adjacent farmland and riparian habitat from degrading due future headcut progressions and stream widening. See Appendix C for the locations of the proposed loose rock structures. Appendix D includes detailed information on the design and costs of this alternative. Total project costs are shown in Table 8-13a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site D-2

This alternative includes the implementation of eight loose rock structures and one rigid drop structure within the channel. This alternative is estimated to preserve approximately 13 acres of adjacent farmland and riparian habitat from degrading due to future headcut progressions and stream widening. See Appendix C for the locations of the proposed loose rock structures and rigid drop structure. The loose rock structures consist of rock riprap and would act as deformable energy dissipation structures. The rigid drop structure would repair an existing 6-foot drop, would function as a low water crossing, and would protect the upstream channel and highway embankment from future erosion. See Appendix D for detailed information behind the design of the loose rock structures and rigid drop structure at Site D-2. Total project costs are included in Table 8-13a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-5

This alternative includes the channel grading within approximately 2,400-feet of Beadle Creek and removal and replacement of the 180th Street culvert with an armored drop structure. The drop structure would protect the upstream channel from a large existing headcut progression and scour hole and prevent further damage downstream of the existing culvert. It will also improve the conveyance capacity, protecting the upstream channel from flooding due to backwater. This alternative will also repair the deeply incised and degraded channel to create a more stable and safer stream by repairing the shear and steep channel banks. See Appendix C for the proposed extents and Appendix D for a detailed description of this alternative. Total project costs are included in Table 8-13a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-15

This alternative includes the implementation of seven loose rock structures and one rigid drop structure within the channel and is estimated to preserve approximately 21 acres of adjacent farmland and riparian habitat from degradation due to future headcut progressions and stream widening. See Appendix C for the locations of the proposed structures. The loose rock structures consist of rock riprap and would act as deformable energy dissipation structures. The rigid drop structure would repair an existing 10-foot drop and protect the upstream channel and highway corridor from future erosion. See Appendix D for detailed information behind the design of the loose rock structures and rigid drop structure at Site S-15. Total project costs are included in Table 8-13a and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site S-1

The planned DS-19 Reservoir was evaluated for economic feasibility and environmental impacts in the Papillion Creek and Tributaries Lakes Final Feasibility Report and Environmental Assessment and was included as part of the Recommended Plan. Detailed watershed analysis was conducted for DS-19 as a flood reduction solution for the Papillion Creek Watershed and construction of the site is reasonably foreseeable. Funding for implementation has been recommended and the Sponsor has begun purchasing land for the site.

This alternative includes the implementation of a sediment basin upstream of the planned DS-19 Reservoir and one rigid drop structure within the channel upstream of the sediment basin's permanent pool. The rigid drop structure location is at an existing channel grade drop and water crossing that frequently washes out. The sediment basin will capture approximately 34 acre-feet of sediment that would otherwise enter the DS-19 Reservoir and therefore extend the life the structure and protect its water quality. It would additionally improve terrestrial and aquatic habitat and provide stream stabilization upstream of the sediment basin. The rigid drop structure would also preserve approximately 3 acres of adjacent farmland and riparian habitat from degrading due to future headcut progressions and stream widening. Total project costs are included in Table 8-13B and unit costs are included in Appendix D. This alternative meets the purpose and need and will be carried forward for detailed analysis.

Site WP-1

The wet dam alternative consists of a high-hazard floodwater retarding dam on Whispering Ridge Creek, a left bank tributary to West Papillion Creek, in Section 5, Township 15 North, Range 11 East, in Douglas County, Nebraska. This location was previously identified in the 1966 Work Plan for grade stabilization and subsequently identified in the *Multi-Reservoir Analysis, Papillion Creek Watershed* (HDR, 2004) and the *Papillion Creek Watershed Management Plan* (HDR, 2009) for flood risk reduction. This alternative would control approximately 852 acres to provide flood damage reduction to agricultural lands, businesses, and residential areas.

Due to the urban location and potential breach path, this site would be designed to NRCS high-hazard classification standards. The structure would include an earthen embankment approximately 900-feet in length and about 40-feet tall. The principal spillway would consist of a 4-foot by 12-foot concrete riser and 48-inch reinforced concrete pressure pipe with an impact basin consistent with NRCS design criteria. A vegetated auxiliary spillway would be located on the left abutment. Appendix D includes detailed information on hydrology and other methodology used for design and detailed structural information can be found in Table 3, Chapter 7.0.

The dam is designed for a 100-year lifespan and would trap approximately 98 acre-feet below the principal spillway riser, which exceeds NRCS sediment-storage design criteria (USDA 2008a). A sediment basin, designed to extend the life of the reservoir and improve water quality, would consist of a berm and culvert structure located upstream of the main dam and downstream of Fort Street. The dam is designed for a 100-year sediment lifespan without the sediment basin, but the sediment basin provides an area of shallow inundation for the purpose of improving water quality and decreasing sediment transfer to the main reservoir. By trapping the sediment, these structures would protect downstream waterbodies from an influx of sediment and nutrients, and therefore improve overall water quality. Whispering Ridge Creek and West Papillion Creek are degraded channels with low functional value, similar to many tributaries and main channels in the region. Although there is the potential that sediment-hungry water flowing out of the

reservoir may increase downstream erosion, reductions in peak flow events and grade control provided upstream of the structure will provide an overall improvement to grade and bank stability of the system. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis.

The dam's permanent pool will provide aquatic habitat, recreation, and grade control within the stream. Wetlands are anticipated to form around and within the shallow regions of the permanent pool as well, improving water quality and providing habitat. Total costs of this alternative are shown in Table 8-13c and detailed cost information is provided in Appendix D.

8.3.3.3 Alternative 3. Combination 2

The formulation process revealed that two alternatives should be carried forward for detailed analysis at Site S-1 and therefore this alternative includes all aspects of Alternative 2 (Combination 1) except for the measures proposed at Site S-1. Site S-1 measures for Alternative 3 (Combination 2) are described below.

Site S-1

Site DS-19 was evaluated for economic feasibility and environmental impacts in the Papillion Creek and Tributaries Lakes Final Feasibility Report and Environmental Assessment and was included as part of the Recommended Plan. Detailed watershed analysis was conducted for DS-19 as a flood reduction solution for the Papillion Creek Watershed and construction of the site is reasonably foreseeable. Funding for implementation has been recommended and the Sponsor has begun purchasing land for the site. The dredging alternative involves allowing the sediment to enter the planned DS-19 Reservoir and subsequently dredging the reservoir to remove the sediment and the three grade control structures upstream of DS-19 as described in Section 4.2.2.3. Dredging costs were assigned utilizing local knowledge of recent dredging and other water resources projects. Unit costs are included in Appendix D. It is assumed that dredging would occur in 16 years based on predicted sedimentation rates and therefore the amortized present value is used for the analysis. Installation of the grade control structures would occur in the same timeline as the other alternatives and therefore the 2022 cost is used for these. Present value costs are shown in Table 8-13b. This alternative meets the purpose and need and will be carried forward for detailed analysis.

8.3.3.4 Alternative 4. Combination 3

The formulation process revealed that two alternatives should be carried forward for detailed analysis at Site WP-1 and therefore this alternative includes all aspects of Alternative 2 (Combination 1) except for the measures proposed at Site WP-1. Site WP-1 measures for Alternative 4 (Combination 3) are described below.

Site WP-1

The Dry Dam Alternative would include construction of an earthen embankment and upstream berm at the same locations as the Wet Dam Alternative with the same footprints and elevations. Due to the urban location and potential breach path, this site would be designed to NRCS high-hazard classification Equivalent flood storage volume would be provided as with the Wet Dam Alternative and therefore potential flood damage to downstream properties and infrastructure would be significantly reduced. Costs for the dry dam alternative are approximately 20 percent higher than the wet dam alternative due to geotechnical engineering requirements and maintenance.

The dam is designed for a 100-year lifespan and would trap approximately 98 acre-feet of sediment. By trapping the sediment, these structures would protect downstream waterbodies from an influx of sediment and nutrients, and therefore improve overall water quality. Whispering Ridge Creek and West Papillion Creek are degraded channels with low functional value, similar to many tributaries and main channels in the region. Although there is the potential that sediment-hungry water flowing out of the reservoir may increase downstream erosion, reductions in peak flow events and grade control provided upstream of the structure will provide an overall improvement to grade and bank stability of the system. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis.

This alternative also offers grade control within streams, which would protect and stabilize existing eroding streams. Because there is no reservoir in a dry dam, the volume of storage per vertical foot is smallest at the bottom of the valley and the rate of flood stage increases significantly during a storm event compared to an embankment with a permanent pool. This causes the type of flash flooding characteristic of desert environments. There are no urban developments or homes within the flood pool of the dam; however, there is a risk of rapid inundation that can pose a safety risk to the landowners. This situation is not ideal in a rapidly developing urban setting as development will likely include residential neighborhoods thereby increasing risk to adjacent landowners. Appendix D includes detailed information on hydrology and other methodology used for the design. Total costs of this alternative are shown in Table 8-13c and detailed cost information is provided in Appendix D.

8.3.4 Alternatives Summary and Comparison

Table 8-14 includes a summary of the groups of alternatives analyzed. Project scoping (see Chapter 2) led to the determination of the number and variety of ecosystem services (or resources of concern) to be considered in the analysis. Information on existing conditions of these resources is provided in Chapter 3, and analysis and discussion of environmental consequences for each resource is provided in Chapter 5. Appropriate metrics were defined for each ecosystem service based on current methodology to quantify impacted services over time. Monetary values were used where appropriate.

To assist in evaluating the trade-offs of the ecosystem services relative to each alternative over time, a symbolic system was developed to show the potential effects. This system and the definitions used to quantify the magnitude of the effects are included below in Table 8-15.

This symbolic summary of the trade-offs is provided in Table 8-16 with details provided in Table 8-17.

Table 8-14. Alternatives Analyzed in Detailed Analysis

Alternative 1. No Action Alternative	Includes the **No Action**/FWOP Alternative at each of the seven sites identified in this Supplemental Plan-EA.
Alternative 2. Combination 1	**Site W-5:** Eight (8) loose rock structures and one (1) rigid rock structure
	Site D-78: Eleven (11) loose rock structures
	Site D-2: Eight (8) loose rock structures and (1) rigid structure
	Site S-5: Channel restoration with downstream drop structure
	Site S-15: Seven (7) loose rock structures and one (1) rigid structure
	Site S-1: Sediment Basin and one (1) rigid structure
	Site WP-1: Regional Detention Basin, Wet Dam

Alternative 3. Combination 2	**Site S-1:** Dredging of DS-19 and three (3) loose rock structures All other Sites are the same as Alternative 2.
Alternative 4. Combination 3	**Site WP-1:** Regional Detention Basin, Dry Dam All other Sites are the same as Alternative 2.

Table 8-15. System for Ecosystem Services Trade-Offs

Symbol	Description
xxx	Alternative will have a major effect on the item or concern. Major impacts include those that are long-term or permanent, result in significant controversy, could result in a loss of life or jeopardize the survival of a sensitive resource, or result in impacts that cannot be mitigated. These also include effects that go directly against the Federal Objective.
xx	Alternative will have a moderate effect on the item or concern. Moderate impacts include those that are short-term or long-term and can be reasonably replaced or restored with mitigation measures.
x	Alternative will have a minor effect on the item or concern. Minor impacts include those that are temporary, short-term, or long-term and do not require mitigation.
--	Alternative will have a negligible impact on the item or concern.
+	Alternative will result in a minor improvement on the item or concern. Minor improvements can include those that are temporary or short-term.
++	Alternative will result in a moderate improvement to the item or concern. Moderate improvements include those that are short-term, long-term, or permanent. These include measurable effects that improve services but are not anticipated to result in a major benefit or life- saving measure.
+++	Alternative will result in a major improvement to the item or concern. Major improvements include those that are long-term or permanent. These include measurable effects that improve services resulting in a designation change or life-saving measure. Examples of a designation change include removing a waterbody from the list of 303(d) impaired waters or significantly improving anticipated survival of a listed species.
Duration of Effects	
Temporary	Brief effects lasting less than 1 year
Short-Term	Effects lasting 1 to 5 years
Long-Term	Effects lasting 5 to 10 years
Permanent	Effects lasting over 10 years

Table 8-16. Summary Comparison of Alternative Plans[1]

Item or Concern		**Alternative 1.** No Action/FWOFI	**Alternative 2.** Combination 1	**Alternative 3.** Combination 2	**Alternative 4.** Combination 3
Installation Cost	Total	$0	$27,925,500	$27,039,900	$29,652,800
Benefits	Net Monetary Benefits (annualized)	$0	$921,700	$868,400	$913,200
PR&G Guiding Principles	Healthy and Resilient Ecosystems*		✓		
	Sustainable Economic Development*		✓		
	Floodplains*		✓	✓	
	Public Safety		✓	✓	
	Environmental Justice	✓	✓	✓	✓
	Watershed Approach		✓		
	**Represents the Federal Objective*				
Alternatives					
Locally Preferred			✓		
Non-Structural		✓			
Ecosystem Service Trade-Offs					
Provisioning Services	Erosion and Sedimentation	XX	**++**	**++**	**++**
	Prime and Unique Farmland	--	--	--	--
	Threatened and Endangered Species	--	--	--	--
	Migratory Birds/Bald and Golden Eagles	--	--	--	--
Regulating Services	Water Quality	--	++	++	++
	Regional Water Management Plans	--	++	+	+
	Floodplain Management	--	+++	--	+++
	Streams and Riparian Habitat	X	++	++	++
	Flood Damages	--	+++	--	+++
	Wetlands	--	++	--	--
	Public Health and Safety	XXX	+++	+	+++
	Climate Change	--	+	+	+
	Land Use	--	--	--	--
	Fish and Wildlife Habitat	X	++	+	+

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Cultural Services	Historic and Cultural Properties	--	--	--	--
	Environmental Justice	--	--	--	--

[1]*See Table 4-5 for a description of the symbols shown in this table.*

Table 8-17. Ecosystem Trade-offs of Alternative Plans

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Provisioning Services	Erosion and Sedimentation	No change in existing condition	Reduction in annual sedimentation rate for the watershed by 4,660 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: Will capture and store 44 acre-feet of sediment over the design life. Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.	Reduction in annual sedimentation rate for the watershed by 3,270 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: No sediment storage on-site.	Reduction in annual sedimentation rate for the watershed by 4,660 tons/year for all sites combined. <u>Sediment Storage:</u> Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.
	Prime and Unique Farmland	Approximately 117,400-acres of prime farmland and farmland of statewide importance are within the subwatershed. There will be a continued risk to prime farmland due to flooding.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 56.2-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 44.5-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.	Will decrease prime and unique farmland lost to stream degradation and widening and will decrease flooding to prime and unique farmland. Will directly convert 35.5-acres and indirectly convert 51.2-acres of prime farmland and farmland of statewide importance. No Farmland Protection Policy Act (FPPA) significant concerns.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Provisioning Services	Threatened and Endangered Species	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts. .	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts. .
	Migratory Birds/Bald and Golden Eagles	No effect.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.	Impacts to species will be discussed in next Chapter. Actions will be described below that would conserve any suitable habitat or try to restore it if impacted by construction efforts.
Regulating Services	Water Quality	No change in existing condition	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 4,630 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: Will capture and store 44 acre-feet of sediment over the design life. Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 3,240 tons/year for all sites combined. <u>Sediment Storage:</u> Site S-1: No sediment storage on-site.	Reduction in annual sedimentation rate and associated influx of nutrients for the watershed by 4,630 tons/year for all sites combined. <u>Sediment Storage:</u> Site WP-1: Will capture and store 101 acre-feet of sediment over the design life.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Regional Water Management Plans	No effect.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Sites WP-1 and DS-19 (downstream of Site S-1) were identified as part of the watershed-wide flood risk reduction strategy that was developed through locally funded watershed management plans for Papillion Creek. The plans strongly recommend implementation of a sediment basin upstream of DS-19 to extend the dam's design life and improve water quality.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Site S-1 does not work in conjunction with the current watershed management plan as a sediment basin is strongly recommended at this site.	Project at all sites align with the goals and objectives of other water resource plans in the watershed, which include improving water quality with stream stabilization and flood risk reduction. Site WP-1 was identified as part of the watershed-wide flood risk reduction strategy that was developed through locally funded watershed management plans for Papillion Creek. The previous studies recommend a wet dam at this site instead of a dry dam due to a wet dam's ability to lower resuspension and turbulence of sediment from incoming flow.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Floodplain Management	No effect.	Grade stabilization sites: No effect Site S-1: The FEMA mapped floodplain ends within the limits of this. 100-year inundation post-project would slightly increase upstream of the embankment. There is no effect downstream of the embankment. Site WP-1: This alternative would ensure that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. This site also works as a system with other flood control measures in the watershed to provide optimum flood reduction benefits.	Site S-1: No effect	Site WP-1: This alternative would ensure that, under full build-out conditions, there is no increase in the extent of the 100-year floodplain as currently mapped by FEMA. This site also works as a system with other flood control measures in the watershed to provide optimum flood reduction benefits.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Streams and Riparian Habitat	No effect.	Overall, streams will improve with this Alternative. Preventing headcut progression and stream degradation and widening will result in an increase in stream function and habitat. Some riprap fill as well as earthen excavation will result from the implementation of the grade stabilization structures. Stream length will be lost due to embankments at Sites S-1 and WP-1. Inundation will create open water in areas that were previously stream length. Stream mitigation will account for stream length lost due to embankments and any overall decrease in stream function at Sites S-1 and WP-1. Total Impacts (fill, excavation, inundation): Ephemeral: 241-feet Intermittent: 10,392-feet Perennial: 3,099-feet See Chapter 5 of the Plan-EA for impact specifics.	Total Impacts (fill, excavation, inundation): Ephemeral: 106-feet Intermittent: 4,207-feet Perennial: 3,099-feet See Chapter 5 of the Plan-EA for impact specifics.	Total Impacts (fill, excavation, inundation): Ephemeral: 106-feet Intermittent: 10,392-feet Perennial: 543-feet See Chapter 5 of the Plan-EA for impact specifics.
	Flood Damages	No effect.	Site WP-1: Construction would result in $98,855 in annual flood reduction benefits. All other sites would have no effect.	No effect at Site S-1.	Site WP-1: Construction would result in $98,855 in annual flood reduction benefits.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Wetlands	Potential for loss of riparian wetlands due to continued stream degradation and widening	Net gain of approximately 37-acres of wetlands for all Sites combined. <u>Loss of Riverine Wetlands:</u> Total: 0.58-acres Site S-1: 0.12-acres (fill), 0.46-acres (inundation) <u>Loss of Depressional Wetlands:</u> Total: 0.40-acres Site S-1: 0.03-acres (fill) Site WP-1: 0.37-acres (depressional) <u>Gain of Lacustrine Wetlands:</u> Total: 37.2-acres Site S-1: 9.7-acres Site WP-1: 28.5-acres	Net gain of approximately 28-acres of wetlands for all Sites combined. No gain or loss of wetlands at Site S-1.	Net gain of approximately 9.1-acres of wetlands for all Sites combined. No gain or loss of wetlands at Site WP-1.
	Public Health and Safety	Continued safety risks due to existing high and unsafe stream banks, stream degradation and widening, and flooding.	Alternative will improve safety and protect infrastructure along stream corridors and downstream of Site WP-1. Site S-1 will be implemented in conjunction with the Sponsor-led construction of DS-19. DS-19 is designed a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach. WP-1 is designed as a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach.	Alternative will improve safety and protect land along stream corridors at Site S-1.	Site WP-1 will reduce flood risk downstream of the dam. The structure is designed as a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Regulating Services	Climate Change	No effect.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.	Climate change in Nebraska could result in an increase in extreme storm events, leading to increased flooding and an increase in stream degradation rate. Alternative would increase climate change resiliency by reducing peak flows and protecting streams from headcut progression and stream degradation.
	Land Use	No effect.	Minor effect on land use within the project area for grade stabilization sites. Site S-1: Land use change from agriculture to open water at sediment basin location. Land use is rapidly urbanizing and is expected to become low density residential at this location within the next 10-years. Site WP-1: Land use change from agriculture to open water/recreation at dam location. Land use is rapidly urbanizing and is expected to become low density residential within the next 10-years.	Minor effect on land use within the project area for grade stabilization sites.	Minor effect on land use within the project area for grade stabilization sites. Site WP-1: Land use change from agriculture to dry basin at project site. Land use is rapidly urbanizing and is expected to become low density residential at this location within the next 10-years.

Item or Concern		Alternative 1. No Action/FWOFI	Alternative 2. Combination 1	Alternative 3. Combination 2	Alternative 4. Combination 3
Cultural Services	Fish and Wildlife Habitat	Streams would continue to degrade and widen, resulting in minor loss of riparian habitat.	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands (cause):</u> All 7 Sites combined: 12.2-acres Site S-1: 2.5 acres (inundation), 0.12 acres (fill) Site WP-1: 0.83-acres (inundation), 1.05 acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 36-acres Site S-1: 16-acres Site WP-1: 20-acres <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: 9.7-acres Site WP-1: 9.7-acres	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands:</u> All 7 Sites combined: 9.72-acres Site S-1: 0.16 acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 20-acres Site S-1: No gain <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: 9.7-acres Site S-1: No gain	Protection of terrestrial and aquatic habitat due to reduction in stream degradation and widening. <u>Loss of woodlands:</u> All 7 Sites combined: 11.37-acres Site WP-1: 1.05-acres (fill) <u>Gain of open water habitat:</u> All 7 Sites combined: 16-acres Site WP-1: No gain <u>Gain of dedicated upland buffer:</u> All 7 Sites combined: No gain Site WP-1: No gain
	Historic and Cultural Properties	No effect.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.	Surveys were performed within the APEs and no properties eligible for listing on the NRHP or other cultural resources were identified.
	Environmental Justice	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.	Alternative would not disproportionately impact minority, Tribal, or low-income populations.

8.4.0 ENVIRONMENTAL CONSEQUENCES

An Environmental Evaluation using NRCS form number NE-CPA-52 was completed during the planning process. This evaluation has identified the potential affected resources within the Affected Resource Areas (ARAs). Chapter 3 'Affected Environment' describes these resources as they currently exist. This chapter describes the environmental consequences and impacts of the alternatives described in Section 4.3. Each resource of concern (or ecosystem service) is grouped into four service categories. These categories are described in Section 3.15.

Alternatives brought forward for detailed study are shown in Table 8-18 below for ease. Prior to field work and additional analyses performed on each resource concern to determine both indirect and direct impacts, Affected Resource Area (ARA) boundaries were drawn for each alternative listed in Table 8-18. These boundaries include the physical, ecological, economic, and social characteristic of the project area that would be impacted by construction if selected as the preferred alternative. Impacts described in this chapter for each resource concern revolve around the ARAs rather than the entire watershed boundary. See Appendix C for ARA maps associated with each alternative outlined in Table 8-18.

Table 8-18. Alternatives Analyzed in Detailed Analysis

Alternative 1. No Action Alternative	Includes the **No Action**/FWOP Alternative at each of the seven sites identified in this Supplemental Plan-EA.
Alternative 2. Combination 1	**Site W-5:** Eight (8) loose rock structures and one (1) rigid rock structure
	Site D-78: Eleven (11) loose rock structures
	Site D-2: Eight (8) loose rock structures and (1) rigid structure
	Site S-5: Channel restoration with downstream drop structure
	Site S-15: Seven (7) loose rock structures and one (1) rigid structure
	Site S-1: Sediment Basin and one (1) rigid structure
	Site WP-1: Regional Detention Basin, Wet Dam
Alternative 3. Combination 2	**Site S-1:** Dredging of DS-19 and three (3) loose rock structures All other Sites are the same as Alternative 2.
Alternative 4. Combination 3	**Site WP-1:** Regional Detention Basin, Dry Dam All other Sites are the same as Alternative 2.

8.4.1 Erosion and Sedimentation

No Action Alternative. This alternative would not prevent sediment from entering streams and water bodies and continue to allow the influx of nutrients to enter water and compromise water quality within the watershed. This alternative would have a permanent moderate adverse effect due to decreases in viable farmland, decreases in the aesthetic value of waterbodies, and decreased water quality.

Alternative 2. This alternative includes channel stabilization at Sites W-5, D-78, D-2, S-5, and S-15; a sediment basin at Site S-1; and a wet dam a Site WP-1. Channel stabilization alternatives will prevent channel erosion upstream of Sites W-5, D-78, D-2, S-5 and the sediment basin and wet dam capture and storage accumulated sediment in the S-1 and WP-1 subwatersheds. Due to the reservoir's trapping of sediment, the floodwater that flows out of the reservoirs may be sediment hungry. It is possible this could increase

erosion downstream, but the effects are expected to be minimal given the existing conditions of the stream. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis. This alternative would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. This alternative also reduces sediment loads transported downstream and reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 244,760 tons per year. This alternative provides a long-term, moderate benefit to the watershed. Decreases in sedimentation and erosion increases viable farmland, improves the aesthetic value of the downstream waterbodies, improves water quality, and benefits aquatic and terrestrial habitat for native species. See Table 8-19 for information about the impacts at each site.

Alternative 3. This alternative includes construction of three loose rock structures at Site S-1 and dredging of downstream Structure S-1. The alternative would result in the prevention of channel erosion upstream of Site S-1 and would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. This alternative reduces the amount of sediment that is transported downstream of Site S-1 and reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 249,310 tons per year. See Table 8-19 for information about the impacts at each site.

Alternative 4. This alternative includes construction of a dry dam at Site WP-1 that would result in the capture and storage of 100-years of accumulated sediment in the WP-1 subwatershed. This would reduce the influx of nutrients from sediment to downstream water bodies, which harms water quality. Due to reservoir's trapping of sediment, the floodwater that flows out of the reservoirs may be sediment hungry. It is possible this could increase erosion downstream, but the effects are expected to be minimal. Sufficient downstream erosion protection would be installed and has been considered in the economic analysis. The Dry Dam Alternative eliminates sediments from being transported downstream in WP-1's subwatershed. All other sites would have the same reduction impacts as Alternative 2. This alternative reduces the annual sedimentation rate for the Papillion Creek Watershed from 249,420 tons per year to 247,090 tons per year. See Table 8-19 for information about the impacts at each site.

Table 8-19. Sediment Transported Downstream by Structure Subwatershed

Site	Sediment Transported Downstream by Structure Subwatershed (tons/year)			
	Alternative 1. No Action/FWOFI	**Alternative 2.** Combination 1	**Alternative 3.** Combination 2	**Alternative 4.** Combination 3
D-2	970	930	930	930
D-78	2,150	2,020	2,020	2,020
S-1	1,500	0	1,390	0
S-5	790	440	440	440
S-15	1,100	900	900	900
WP-1	2,330	0	0	0
W-5	1,240	1,130	1,130	1,130
Subwatershed Total	10,080	5,420	6,810	5,420
Watershed Total	**249,420**	**244,760**	**249,310**	**247,090**

Note: Values rounded to the nearest 10 tons/year
Both dam alternatives will have a negligible amount of sediment transported downstream. Negligible amounts of sediment are reported as zero for this analysis.

8.4.2 Prime and Unique Farmland

No Action Alternative. This alternative would not convert any prime or unique farmland or farmland of statewide importance. Continued flooding and land loss due to stream degradation and widening would threaten existing farmland.

Alternative 2. Implementation of the proposed project will directly convert between 70 acres and 154 acres and indirectly convert 62.8 acres of land. This includes direct and indirect conversion between 96 and 167 acres of prime farmland and between 13 and 14 acres of farmland of statewide importance. See Table 8-20 for a summary of the impacts at each site.

The Nebraska NRCS natural resources inventory specialist completed land evaluation analyses using the Form AD-1006 Farmland Conversion Impact Rating for each Site. Form AD-1006 is based on a point system that has 160 points set as a minimum number of 'total points' that triggers in-depth site reviews. Implementation of this alternative results in each site having a 'total points' score of less than 160 and therefore this alternative is clear of Farmland Protection Policy Act (FPPA) significant concerns. Coordination with the NRCS natural resources inventory specialist indicating that the measures within this alternative are clear of FPPA significant concerns and completed AD-1006 forms for each site are included in Appendix E. This alternative does not have an immediate effect on prime or unique farmland but does provide long-term protection of viable farmland which improves economic sustainability to producers.

Table 8-20. Prime and Unique Farmland, Alternative 2

Site	Area Directly Converted[1] (acres)			Area Within ARA[2] (acres)			Area Indirectly Converted[3] (acres)		
	Prime	Statewide Importance	Total	Prime	Statewide Importance	Total	Prime	Statewide Importance	Total
D-2	0.5	0	0.5	14.7	0	14.7	-	-	-
D-78	0.4	0	0.4	34.8	0.1	34.9	-	-	-
S-15	0.1	0	0.1	7.2	1.1	8.3	-	-	-
W-5	1.3	0	1.3	16.7	0.2	16.9	-	-	-
S-5	11.9	0.1	12.0	-	-	-	-	-	-
S-1	11.8	0.1	11.9	-	-	-	6.9	0.4	7.3
WP-1	28.9	2.4	31.3	-	-	-	34.1	9.8	43.9
Total	**53.6**	**2.6**	**56.2**	**56.7**	**1.2**	**57.9**	**41**	**10.2**	**51.2**

[1]Area within proposed fill, excavation, and/or permanent pool extents
[2]Analyzed for FPPA concerns at sites D-2, D-78, S-15, and W-5 for a conservative analysis
[3]Area within top of dam limits, not including those areas directly converted

Alternative 3. Implementation of this alternative is clear of FPPA significant concerns. Impacts at Site-1 are shown in Table 8-21. Impacts at all other sites are shown in Table 8-20. This alternative does not have an immediate effect on prime or unique farmland but does provide long-term protection of viable farmland which improves economic sustainability to producers.

Table 8-21. Prime and Unique Farmland, Alternative 3

Site	Area Directly Converted[1] (acres)		
	Prime Farmland	Farmland of Statewide Importance	Total
S-1	0.2	0	0.2

[1]Area within proposed fill, excavation, and/or permanent pool extents

Alternative 4. Implementation of this alternative is clear of FPPA significant concerns. Impacts at WP-1 are shown in Table 8-22. Impacts at all other sites are shown in Table 8-20. This alternative does not have an immediate effect on prime or unique farmland.

Table 8-22. Prime and Unique Farmland, Alternative 4

Site	Area Directly Converted[1] (acres)			Area Indirectly Converted[2] (acres)		
	Prime Farmland	Farmland of Statewide Importance	Total	Prime Farmland	Farmland of Statewide Importance	Total
WP-1	7.1	2.2	9.3	34.1	9.8	43.9

[1]Area within proposed fill and/or excavation extents

[2] Area within top of dam limits, not including those areas directly converted

8.4.3 Water Quality

No Action Alternative. This alternative would allow the existing level of sediment and associated nutrients to enter streams and downstream waterbodies. Streams would continue to degrade and widen, and the associated sediment loads would decrease water quality.

Alternative 2. Implementation of this alternative would provide grade control to streams and would consequently reduce stream erosion and the influx of nutrients from sediment to downstream waterbodies. Additionally, the construction of the S-1 sediment basin will protect DS-19's water quality by detaining approximately 44 acre-feet of sediment that would otherwise enter the downstream DS-19. The wet dam at WP-1 will store 98 acre-feet of sediment and the WP-1 sediment basin will store an additional 3 acre-feet of sediment, protecting the water quality of downstream streams and water bodies. This alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

Alternative 3. This alternative would allow 44 acre-feet of sediment to enter DS-19 throughout the 50-year design life, thereby reducing water quality of the pool. However, this alternative would still improve water quality in downstream reaches by capturing the sediment and associated nutrients within the DS-19 pool. This alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

Alternative 4. A dry dam at Site WP-1 would provide grade control along Whispering Ridge Creek, decreasing upland and channel erosion. Implementation would also result in capture and storage of 101 acre-feet of sediment, reducing the influx of nutrients from sediment to downstream water bodies. This alternative provides a long-term, moderate benefit to water quality within the watershed. Decreases in sedimentation and erosion improve water quality and benefits aquatic and therefore terrestrial habitat for native species and human health and wellness.

8.4.4 Regional Watershed Management Plans

No Action Alternative. This alternative would have no impact on regional watershed management plans.

Alternative 2. This alternative includes the construction of a wet dam at WP-1 and a sediment basin upstream of DS-19. DS-19 is a planned structure with 60 percent design complete. Land acquisition and Section 404 permitting have begun. WP-1 and DS-19 are included in the regional watershed management plans described below and therefore this alternative works together with other projects and practices to accomplish the defined goals of the Sponsor and the PCWP within the watershed.

The *Multi-Reservoir Analysis, Papillion Creek Watershed* (2004) details the conceptual design of DS-19 and strongly recommends an upstream sediment basin to extend the dam's design life and improve its water quality. This alternative would actualize the proposed sediment basin upstream of DS-19 described in this analysis. The *Papillion Creek Watershed Management Plan* (2009) and the subsequent *Papillion Creek Watershed Management Plan – March 2014 Update* identifies DS-19 and Site WP-1 (named the West Papillion Creek Watershed – Regional Detention Basin 1, or WP-RB1, in the watershed management plans) as proposed and recommended flood risk reduction structures. This alternative would implement the previously identified WP-RB1 dam which works with other previously constructed and planned flood risk reduction structures as a system to reduce the flood damage risk in the watershed. This alternative has the potential to add Federal construction dollars to local and State funding sources to meet watershed goals thereby reducing the local financial requirements and potentially speeding up the projected schedule for implementation at Site WP-1 and the sediment basin associated with DS-19.

Alternative 3. The *Multi-Reservoir Analysis, Papillion Creek Watershed* (2004) details the conceptual design of DS-19 and strongly recommends an upstream sediment basin to extend the dam's design life and improve its water quality. This alternative would ignore this recommendation and instead implement dredging at DS-19 but would not impact the implementation, schedule, or financial outcome of any regional watershed management plans.

Alternative 4. Site WP-1 is identified as a recommended flood risk reduction structure in the *Papillion Creek Watershed Management Plan* (2009) and *Papillion Creek Watershed Management Plan – March 2014*. These previous studies recommend a wet dam at this site instead of a dry dam due to wet dam's ability to lower resuspension and turbulence of sediment from incoming flow, but implementation of a dry dam would provide the same flood risk reduction benefits and would therefore work with other previously constructed and planned flood risk reduction structures as a system to reduce the flood damage risk in the watershed. This alternative has the potential to add Federal construction dollars to local and State funding sources to meet watershed goals thereby reducing the local financial requirements and potentially speeding up the projected schedule for implementation at Site WP-1.

8.4.5 Floodplains

No Action Alternative. This alternative would have no effect on the 100-year floodplain. Increased development is expected to expand the existing 100-year floodplain within the watershed, as mapped by the future conditions FEMA floodplain.

Alternative 2 and Alternative 4. These alternatives provide major permanent improvements to floodplain management, providing measurable and life-saving measures downstream of Site WP-1.

Sites W-5, D-78, and D-2 are not within the regulatory FEMA floodplain.

Site S-15 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Grade stabilization structures will be placed at existing grade with little fill. What fill may be placed will be mitigated by localized widening of the channel to both promote stability of the structure and to ensure that the structure does not raise water surface elevations at any runoff frequency.

The downstream portion of Site S-5 located within the delineated FEMA Zone AE (includes base flood elevations). Careful consideration was given during design to ensure there would be no rise in the 100-year and 500-year future flood conditions.

A "no-rise" certification for construction within the delineated floodway and flood fringe at Sites S-15 and S-5 would be conducted by taking the effective (current) hydraulic model and adding sufficient detail to represent the proposed changes within the model reach to create a "corrected effective" model. This model would prove that there is not a rise in water surface elevations at the required storm intervals. The model is submitted for review through the local floodplain administrator and, once approved, a floodplain development permit is issued for the work. Floodplain maps are included in Appendix C.

Site WP-1 is not within the delineated FEMA floodplain; however, this alternative would provide a reduction of the 100-year and 500-year floodplain downstream of WP-1 (see figures provided in Appendix C) and will work in conjunction with other flood reduction sites in the watershed to provide floodplain reduction throughout the watershed. It is Nebraska's standard that the flood pool behind all dams that require NDNR approval be mapped as regulatory floodplain and therefore this site will require a Conditional Letter fof Map Revision (CLOMR) and follow up Letter of Map Revision (LOMR). Implementation of Site WP-1 results in a reduction of the 100-year flood extents by 131 acres and a decrease of 90 acres during the 500-year flood event.

The downstream portion of Site S-1 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Site S-1 is not a high-hazard structure and therefore does not technically influence the downstream floodplains. However, this site will be constructed as the sediment basin of the planned downstream flood reduction structure and will also influence the upstream floodplain within the pool extents. Figures of with- and without-project floodplain extents are provided in Appendix C. It is Nebraska's standard that the flood pool behind all dams that require NDNR approval be mapped as regulatory floodplain and therefore this site will require a CLOMR and follow up LOMR.

Floodplain management regulations are described in Section 5.17.

Alternative 3. This alternative would have the same effects as Alternative 2 at Sites W-5, D-78, D-2, S-15 and WP-1.

The downstream portion of Site S-1 is located within Zone AE (includes base flood elevations) and partially within the delineated FEMA floodway. Grade stabilization structures would be placed at existing grade with little fill. What fill may be placed will be mitigated by localized widening of the channel to both promote stability of the structure and to ensure that the structure does not raise water surface elevations at any runoff frequency. A "no-rise" certification for construction within the delineated floodway and flood fringe would be conducted by taking the effective (current) hydraulic model and adding sufficient detail to

represent the proposed changes within the model reach to create a "corrected effective" model. This model would prove that there is not a rise in water surface elevations at the required storm intervals. The model is submitted for review through the local floodplain administrator and once approved, a floodplain development permit is issued for the work. Floodplain maps, which show existing floodplains, are included in Appendix C. Floodplain management regulations are described in Section 5.17.

8.4.6 Wetlands

The extents and types of existing wetlands within each ARA are shown in figures included in Appendix C.

No Action Alternative. No change to existing conditions.

Alternative 2. This alternative has a moderate, long-term beneficial effect to wetlands and associated benefits to water quality and habitat improvements. Wetland impacts of this alternative are shown below in Table 8-23.

Table 8-23. Wetland Impacts of Alternative 2

Site	Cowardin Wetland Classification[1]	Hydrogeomorphic Classification	Type of Impact	Impacts (ac)
D-2	-	-	-	-
D-78	-	-	-	-
S-1	PEMA/C	Depressional	Fill	0.03
S-1	PEMA/C	Riverine	Fill	0.12
S-1	PEMA/C	Riverine	Inundation	0.46
S-5	-	-	-	-
S-15	-	-	-	-
W-5	-	-	-	-
WP-1	PEMA	Depressional	Inundation	0.37
			Total	0.98

[1]*PEMA = Palustrine emergent temporarily flooded*
PEMA/C = Palustrine emergent temporarily/seasonally flooded

A total of 0.15 acres of wetlands are impacted by earthen fill for the S-1 sediment basin embankment. Additionally, 0.83 acres of wetlands will be inundated from the S-1 and WP-1 permanent pools. There will be approximately 1 acre of cumulative wetland impacts.

Approximately 38.2 acres of lacustrine fringe wetlands will be created around the S-1 and WP-1 permanent pools. Wetland vegetation is predicted to establish at 2-feet vertically above and below the permanent pool elevation based on local experience. Wetland vegetation will be planted at 1-foot vertically above the permanent pool as a conservative estimate for wetland establishment due to the large spillway and 2-feet below the permanent pool based on existing topography and proposed grading at the S-1 sediment basin. Lacustrine fringe wetlands established above and below the permanent pool elevations will result in a net gain of 37.2 acres of wetlands for all sites.

Alternative 3. This alternative does not have any wetland impacts at S-1. All impacts at the other sites are the same as listed in Table 8-23 above. This alternative does not create any wetlands at Site S-1 and results

in a net gain of 28.1 acres of wetlands for all sites combined. This alternative would have negligible impacts to wetlands at Site S-1.

Alternative 4. This alternative does not cause any immediate wetland impacts at WP-1 and all impacts at the other sites are the same as listed in Table 8-23 above. This alternative would result in a net gain of 9.1 acres of wetlands for all sites combined. This alternative would have negligible impacts to wetlands at Site WP-1.

8.4.7 Streams and Riparian Habitat

The extents and types of streams within the ARAs are shown in Appendix C.

No Action Alternative. This alternative would not place fill in or inundate any streams. However, the streams within the ARAs are experiencing continual degradation, widening, and erosion. All streams within the ARAs will continue to degrade and widen and stream erosion will continue with this alternative and therefore it has a long-term adverse impact to stream health, habitat, human safety, and property values.

Alternative 2. This alternative has a moderate, long-term beneficial impact to stream and riparian habitat, providing improvements to property values, protection of land and infrastructure, and a reduction in safety risk. A summary of the stream impacts at each site is shown below in Table 8-24. This alternative would provide grade stabilization and headcut progression prevention in the streams and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety. Site WP-1 impacts approximately 543 feet of perennial stream impacts due to fill, which results in a loss of stream functional units (Olsson, 2019) according to the Nebraska Stream Condition Assessment Protocol. Therefore, stream mitigation would be required to account for this loss. Stream inundation caused by the permanent pool is offset by creation of lentic aquatic habitat. The restoration at Site S-5 will greatly improve stream function and quality. Fill associated with the raising of the channel grade is not included in fill quantities as the result is a channel elevation and improvement but not a loss.

Table 8-24. Stream Impacts, Alternative 2

Site	Length of Stream Impacts (feet)			
	Ephemeral	Intermittent	Perennial	Impact Type
D-2	-	782	-	Excavation (earthen)
D-2	-	95	-	Fill (earthen)
D-2	46	401	-	Fill (rock riprap)
D-78	-	488	-	Excavation (earthen)
D-78	-	500	-	Fill (rock riprap)
S-1		66		Excavation (earthen)
S-1	-	291	-	Fill (earthen)
S-1	-	68	-	Fill (rock riprap)
S-1	135	6,027	-	Inundation
S-15	-	242	-	Excavation (earthen)
S-15	-	125	-	Fill (earthen)
S-15	-	369	-	Fill (rock riprap)
W-5	60	938	-	Fill (rock riprap)

Site	Length of Stream Impacts (feet)			
	Ephemeral	Intermittent	Perennial	Impact Type
WP-1	-	-	543	Fill (earthen)
WP-1	-	-	2,556	Inundation
Total Fill	106	2,787	543	Fill (earthen and rock)
Total Inundation	135	6,027	2,556	Inundation
Total Excavation	0	1,578	0	Excavation
Total Impacts	241	10,392	3,099	Fill, Inundation, and Excavation

Alternative 3. This alternative includes 36 feet of rock riprap fill within the intermittent South Papillion Creek and 97 feet of rock riprap fill in an intermittent unnamed tributary at Site S-1. All other stream impacts remain the same as those listed in Table 8-24 above. This alternative would provide grade stabilization and headcut progression prevention and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety.

Alternative 4. This alternative includes 543 feet of rock riprap fill within the perennial channel at Site WP-1 from the dam embankment. All other stream impacts remain the same as those listed in Table 8-24 above. This alternative would provide grade stabilization and headcut progression prevention and therefore improve overall stream function, improving aquatic and terrestrial habitat and human safety. However, this alternative does not provide the same benefit of aquatic and terrestrial habitat improvements as identified at Site WP-1 for the wet dam due to the absence of the permanent pool. This alternative would lead to an overall loss of stream functional units (Olsson, 2019) and would therefore require mitigation.

8.4.8 Threatened and Endangered Species and Fish and Wildlife Coordination Act

Coordination with both USFWS and NGPC was conducted to obtain feedback on the impacts that any of the alternatives had on streams or other bodies of water and what recommendations were offered to minimize impacts (allowing fish passage, de-watering preventatives, etc.) in order to comply with the Fish and Wildlife Coordination Act.

On September 27, 2023, both the USFWS Information for Planning and Consultation (IPaC) Tool and the NGPC Conservation and Environmental Review Tool (CERT) were run again, using the ARA boundaries created for each proposed alternative, to determine the list of species with habitat ranges that intersect the boundaries of the ARAs. Out of the 11 species identified in Chapter 3, (using the entire watershed as the boundary), six of those species (Lake Sturgeon, Sturgeon Chub, American Ginseng, Interior Least Tern, Eastern Black Rail, and the Rufa Red Knot) did not occur on either report using the ARAs as boundaries. These six species do not have suitable habitat that intersect the boundaries of any ARA, and result in a no effect finding.

The reports did list the remaining five species, and suitable habitat could exist within the boundaries of any one of the ARAs. Each species is listed below with a description of how impacts were identified, and what the initial determinations were based off of those findings. Please note that these findings are only associated with determining any significant impacts. that would otherwise prevent the creation and signature of a FONSI. Consultation will need to occur with both USFWS and NGPC, through the creation of

a Biological Assessment, for the preferred alternative selected prior to any construction efforts to ensure impacts are properly avoided, minimized, or mitigated.

Eastern Black Rail
No Action Alternative. This alternative would have no effect on the Eastern black rail.

All Other Alternatives. This is a transient migrant that only uses Nebraska as a stopover site during its spring and fall migrations. Because of this, any proposed alternatives selected as the preferred would not significantly impact the species, and thus have no effect on the Eastern black rail.

Rufa Red Knot
No Action Alternative. This alternative would have no effect on the rufa red knot.

All Other Alternatives. Similar to the eastern black rail, this species is a transient migrant that would only use Nebraska during its bi-annual migration periods. Because of this, any proposed alternatives selected as the preferred would not significantly impact the species, and thus have no effect on the rufa red knot.

Pallid Sturgeon
No Action Alternative. This alternative would have no effect on the pallid sturgeon.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the pallid sturgeon.

Lake Sturgeon
No Action Alternative. This alternative would have no effect on the lake sturgeon.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the lake sturgeon.

Sturgeon Chub
No Action Alternative. This alternative would have no effect on the sturgeon chub.

All Other Alternatives. Though there are perennial streams with retarding structures proposed on them, the watershed does not empty into the Platte River, so no depletions calculations are required to address impacts to this species. Missouri River flows are mostly influenced by upstream reservoir management, and not by small tributaries. Because of this, any proposed alternatives selected as the preferred will have no effect on the sturgeon chub.

Piping Plover
No Action Alternative. This alternative would have no effect on the piping plover.

All Other Alternatives. Site observations, IPaC, and CERT reports all indicate that the species would not have any suitable habitat within the boundaries of any of the ARAs, as the streams lack perennial flows or lack

sandy banks due to erosion and degradation. The other issue associated with this species would be depletions in the Platte River. Any suitable habitat present on the Missouri River is not influenced by small tributaries located in Nebraska. However, the watershed as a whole does not empty into the Platte River, but rather the Missouri River. Because of this, any proposed alternatives selected as the preferred will have no effect on the piping plover.

Interior Least Tern

No Action Alternative. This alternative would have no effect on the interior least tern.

All Other Alternatives. Site observations, IPaC, and CERT reports all indicate that the species would not have any suitable habitat within the boundaries of any of the ARAs, as the streams lack perennial flows or lack sandy banks due to erosion and degradation. The other issue associated with this species would be depletions in the Platte River. Any suitable habitat present on the Missouri River is not influenced by small tributaries located in Nebraska. However, the watershed as a whole does not empty into the Platte River, but rather the Missouri River. Because of this, any proposed alternatives selected as the preferred will have no effect on the interior least tern.

American Ginseng

No Action Alternative. This alternative would have no effect on the American ginseng.

All Other Alternatives. This species lacks suitable within any of the ARAs, as habitat is limited to deciduous forests along the Missouri River, which none of the proposed alternatives are located along the Missouri River bluffs and no high-quality woodlands are present within any of the ARAs. Because of this, any proposed alternatives selected as the preferred will have no effect on the American ginseng.

Northern Long-Eared Bat

No Action Alternative. This alternative would have no effect on the northern long-eared bat (NLEB).

All other alternatives. The northern long-eared bat range is within the ARA limits; however, there are no known hibernacula within the ARAs or within 0.25 miles of one. Northern long-eared bats could conceivably roost underneath bark, in cavities, or in crevices in both live and dead trees that will be cleared.

As of March 31, 2023, the re-classification of this species was finalized, listing it as a federally and state endangered species. Currently, updated conservation conditions and other requirements are being discussed and have not been finalized. Because construction efforts are not anticipated prior to April 1, 2024, the Interim Consultation Framework does not apply. New guidance to avoid adverse impacts to NLEB will be issued in April of 2024. Once known, the newest conservation conditions will be implemented as necessary to avoid adverse impacts to the species. Current field observations, IPaC report, and CERT reports have identified there is suitable habitat, in the form of roosting trees, within the ARAs and no tree removal will occur during the active season or prior to new guidance scheduled to be released April 2024. The initial determination is that any proposed alternatives selected as the preferred are not likely to adversely affect the NLEB. However, due to the guidance changes associated with this species, additional coordination and consultation will be required prior to implementation of any alternatives.

Western Prairie Fringed Orchid

No Action Alternative. This alternative would have no effect on the Western prairie fringed orchid.

All Other Alternatives. The Western prairie fringed orchid range is within ARA limits. Current field observations, IPaC report, and CERT reports have identified there is potential suitable habitat, in the form of sporadic wetlands and sandy channels, within the ARAs but the proposed alternatives should not result in any significant impact to the species. Though current conditions of the landscape would suggest a lack of suitable habitat for the species (historic cropping or degraded vegetation within wet meadows), no official surveys have been conducted in any of the ARAs. Because of this, additional consultation with USFWS and NGPC will be required prior to any construction efforts. The initial determination is that any proposed alternatives selected as the preferred are not likely to adversely affect the Western prairie fringed orchid.

Monarch Butterfly

No Action Alternative. This alternative would have no effect on the monarch butterfly.

All Other Alternatives. The monarch butterfly range is within ARA limits. There is the potential for milkweed species to inhabit many areas with the ARA limits and therefore, there is the potential for suitable habitat for the monarch butterfly. The monarch butterfly is currently a candidate species. If the monarch butterfly becomes listed prior to construction, consultation with USFWS would occur and avoidance measures would be followed. Conservation measures will be taken to include milkweed species into any seeding plan to increase forage availability for the species.

8.4.9 Fish and Wildlife Habitat

No Action Alternative. No change in existing conditions.

Alternative 2. This alternative would impact approximately 12 acres of woodlands, as shown in Table 8-25 below. It would provide grade control along streams, enhancing overall stream function and consequently improve in-stream fish habitat. Existing streams at grade stabilization sites are actively incising and large headcuts frequently cut off fish passage within the watershed. The proposed loose rock structures will be placed at-grade and will launch as headcuts progress upstream toward the structures, resulting in a ramp. These structures will improve stream connectivity by reducing the chance of severe, vertical drops frequently found within the watershed that are a result of unchecked stream degradation. Proposed rigid ramp structures are being placed at existing vertical drops and will improve stream connectivity and wildlife passage.

The permanent pools at Sites WP-1 and S-1 will provide approximately 36-acres of additional fish habitat. The WP-1 Reservoir will provide 20 acres of the fish habitat and has a watershed to lake ratio of approximately 45, which is slightly higher but relatively close to the preferred watershed to lake ratio of 30:1 for desirable fish habitat. Overall, this alternative improves fish habitat and results in minimal impact to woodland and agricultural wildlife habitats.

Table 8-25. Woodland Impacts, Alternative 2

Site	Inundation	Tree Removal	Total (acres)
D2	0	1.0	1.0
D78	0	0.5	0.5
S1	2.5	0.1	2.6
S15	0	1.3	1.3
S5	0	3.2	3.2

Site	Inundation	Tree Removal	Total (acres)
W5	0	1.7	1.7
WP1	0.8	1.1	1.9
		Total	12.2

Alternative 3. This alternative would impact 0.2 acres of woodlands at Site S-1. Impacts at the other sites would be the same as shown in Table 8-25 above and therefore this alternative results in a total woodland impact of 9.7 acres and a gain in 20 acres of open water habitat. Providing grade stabilization along South Papillion Creek and the unnamed tributary would enhance overall stream function and improve aquatic and terrestrial habitat. Sediment entering downstream DS-19 would decrease water quality and aquatic habitat within the DS-19 permanent pool. This alternative would improve habitat and have negligible impacts to woodlands and other fish and wildlife habitat.

Alternative 4. This alternative would impact 0.8 acres of woodlands at WP-1 with construction of the embankment and an additional 0.8 acres as the structure fills with sediment over time. Impacts at the other sites would be the same as shown in Table 8-25 above and therefore results in an immediate impact of 11.4 acres of woodlands and a gain of 16 acres of open water habitat. The dry dam would reduce sedimentation and associated nutrients from moving downstream and would therefore improve aquatic habitat downstream. However, this alternative would fill the existing upstream reach with sediment over the project design life and does not create any additional wetland or stream habitat. Overall, this alternative improves fish and wildlife habitat at the other six sites but has a negative impact on fish and wildlife habitat at Site WP-1.

8.4.10 Migratory Birds and Eagles

No Action Alternative. This alternative would have no impact on migratory birds or eagles.

All Other Alternatives. Based off of IPaC report ran on ARAs, 13 total species of migratory birds can potentially nest in this area ad are listed below.

List of Migratory Birds within the range of any one ARA:

- American Golden-plover (*Pluvialis dominica*)
- Bobolink (*Dolichonyx oryzirorus*)
- Cerulean Warbler (*Dendroica cerulea*)
- Chimney Swift (*Chaetura pelagica*)
- Henslow's Sparrow (*Ammodramus henslowii*)
- Hudsonian Godwit (*Limosa haemastica*)
- Lesser Yellowlegs (*Tringa flavipes*)
- Prothonotary Warbler (*Protonotaria citrea*)
- Red-headed Woodpecker (*Melanerpes erythrocephalus*)
- Rusty Blackbird (*Euphagus carolinus*)
- Short-billed Dowitcher (*Limnodromus griseus*)
- Upland Sandpiper (*Bartramia longicauda*)
- Wood Thrush (*Hylocichla mustelina*)

Because of the species listed above, any alternative selected as the preferred would have to avoid any habitat destruction during the nesting and breeding season for the species present. If any type of habitat destruction must occur during these times, bird surveys would be conducted (5 days prior to scheduled construction activities) to ensure compliance with the Migratory Bird Treaty Act. Conservation measures will also be implemented during the construction phase to limit impacts to habitat such as re-establishing vegetation cover, use of erosion blankets, watering down soil to prevent erosion, manage artificial lighting, etc.

Based off of results gathered from the IPaC report, bald eagles are known to occur within any one of the ARAs. Eagle surveys will be conducted within 0.5 miles of each alternative selected as the preferred during the leaf-off (dormant season), prior to construction. If bald eagles are nesting in the area, consultation with USFWS and NGPC will take place prior to any construction efforts. These alternatives are not likely to adversely impact migratory birds or bald eagles.

8.4.11 Flood Damages

No Action Alternative and Alternative 3. Frequent flooding and subsequent damages would continue at the existing rates.

Alternative 2 and Alternative 4. Site WP-1 is the only site that provides flood damage reduction and would provide the same reduction with a wet or dry dam. An economic analysis using the 2022 federal discount rate of 2.25 percent and a design life of 100-years was conducted with construction expected to occur in 1 year. Construction of this alternative would result in over $100,000 of annual flood reduction benefits.

8.4.12 Historic and Cultural Properties

Section 106 of the NHPA [54 U.S.C. § 306108] and its implementing regulations, "Protection of Historic Properties" [36 CFR part 800] requires Federal agencies to determine whether their undertakings will have an adverse impact on historic properties that are listed on or are eligible for listing on the National Register of Historic Places and to afford the Advisory Council on Historic Preservation a reasonable opportunity to provide comment. In compliance with Section 106 of the NHPA, consulting parties including Indian Tribes were identified and contacted to identify the presence of properties of historic, religious, and cultural significance within the study area. For a list of Tribes contacted see Table 8-26. The public was afforded an opportunity to provide input on cultural resources during the July 24th, 2019, and March 23rd, 2020 public meetings.

After the preferred alternative was identified, the area of potential effect (APE) for each proposed site was surveyed for the presence of historic properties by a professional consultant who meets the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. Cultural resources investigations were completed in late October and early November 2019.

No Action Alternative. There would be no immediate change to the surrounding lands. There will be a continued threat to historic and cultural properties due to streambank erosion.

All Other Alternatives. One cultural resource was identified during the archeological survey. This resource consists of a segment of a cut-off rail line constructed by the C, B, & Q Railroad between 1914 and 1917. This rail line does not meet the criteria for National Register of Historic Places eligibility. No other cultural resources were identified. Based on the results of the cultural resource inventory, NRCS determined that

no historic properties would be affected by the proposed watershed plan improvements. NRCS consulted with the Nebraska State Historic Preservation Office and the Tribal governments identified in Table 8-26 (and included in Appendix A) on the results of the cultural resource inventory and its determination of effect in letters dated September 10, 2020. The Nebraska State Historic Preservation Office concurred that no historic properties would be affected in a letter received September 18, 2020 (Appendix A). The Pawnee Nation of Oklahoma concurred with the determination of no historic properties affected in a letter received October 14, 2020 (Appendix A). The Otoe-Missouria Tribe of Indians concurred with the no historic properties affected determination in a letter received November 23, 2020 (Appendix A). There was no response received from other Tribes.

It is possible that construction activities could result in disturbance to unknown cultural resources through accidental discovery depending on the extent of the resources and their proximity to structures and access roads. If cultural resources are inadvertently discovered during construction, a stop work order will be issued until the resources can be evaluated by a professional archeologist. NRCS will notify the State Historic Preservation Officer, consulting tribal governments, and the Advisory Council on the Historic Preservation. NRCS will act as prescribed in NRCS GM 420, Part 401, to protect or recover any significant cultural resources discovered during construction.

8.4.13 Social and Demographic Data

No Action Alternative. This alternative would not adversely impact minority groups.

All Other Alternatives. This alternative will not adversely impact any known minority groups or individuals living in poverty. No private property will be taken without just compensation and no relocations are anticipated for this alternative. The community and landowners will benefit from stream stabilization and flood damage reduction.

8.4.14 Public Health and Safety

No Action Alternative. Risks to public safety from high and eroding stream banks will continue and likely worsen as stream banks continue to degrade and widen. High and steep stream banks, especially near developments, pose a risk to loss of life. If the streams continue to degrade to the predicted stable slope in the watershed, major infrastructure including state highways, county roads, residential roads, sanitary sewers, and power transmission lines will be at risk. Residential properties and homes near Sites S-5 and W-5 will also be susceptible to encroachment and damage. Additionally, the potential for risk to loss of life, property, and essential public services due to flooding downstream of Site WP-1 will remain and likely increase with predicted future development.

Alternative 2 and Alternative 4. This alternative would stabilize the stream banks within the ARAs to minimize degradation and erosion and therefore improving public safety in and near the streams within and upstream of the project areas. This alternative also involves restoration of an existing stream at Site S-5, which will reduce the current risks associated from the steep banks and erosion and provide infrastructure protection. Implementation of the flood reduction dam at WP-1 would decrease flood damages and reduce risks to the public health and safety. Utility protection is expected to be $42,000 annually for the 50-year lifespan of the grade control structures. In addition, protection to roadway embankments, power infrastructure, agricultural land, and homes are expected. A breach analysis was completed for Sites WP-1 and the sediment basin at Site S-1 and figures are included in Appendix C. Site WP-1 is a high-hazard dam and an

emergency action plan (EAP) will be developed prior to implementation. The breach path for Site S-1 is contained within the flood pool of the Sponsor-led DS-19 site, which is a high-hazard structure. An EAP will be in place to address potential risks due to the unlikely event of a sudden breach. Overall, this alternative has a permanent, major beneficial effect to public health and safety.

Alternative 3. This alternative would provide a minor, long-term improvement to safety and protect land along stream corridors at Site S-1.

8.4.15 Indirect Effects

Indirect effects are those that are caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (40 CFR 1508.8). These can be positive or negative and can include effects to the human socioeconomic environment and/or the natural environment. An indirect effect of the no action alternative would be continued stream degradation, resulting in increased bank instability and channel widening. This would also result in loss of land, loss of production, and increased maintenance costs for producers. Another indirect effect could be an increase to the floodplain and continued flood risk. An indirect effect of Alternative 2 could be increased residential properties due to the recreation benefits of the permanent pool at Site WP-1 and open space and increased property values around the pools of Site WP-1 and S-1. Development is occurring throughout the watershed, and this will likely ultimately preserve open space and habitat as opposed to decreasing it.

8.4.16 Cumulative Impacts

Cumulative impacts are defined by the Council on Environmental Quality (CEQ) as:

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

These impacts include both the direct and indirect impacts of the proposed project with any other projects that have happened in the past or could reasonably happen in the future. Reasonably foreseeable actions must have progressed far enough through planning or design so that they are likely to be carried out. The framework provided in CEQ's "Considering Cumulative Effects under the National Environmental Policy Act" was consulted for this analysis. As is discussed in the aforementioned framework, a method to discern cumulative impacts is to assess potential resources affected by the proposed action, to look at other past or future projects that could also impact those resources, and to analyze the locations and timeframes of those actions to determine if cumulative impacts are present.

Actions occurring within the Papillion Creek Watershed were considered for this analysis. Flood damage reduction and impacts to stream stability, wetlands, and streams were identified as the primary resources to consider. This Plan-EA is the only NRCS watershed plan for the area and therefore no other new NRCS structures are planned in the foreseeable future. Foreseeable actions within the watershed impacting stream stability and flood damage reduction include other flood damage reduction structures previously studied and recommended in the watershed (see Sections 3.4, 5.4). Cumulative impacts could include loss

of stream length and potential degradation downstream due to sediment-hungry water. Other planned flood reduction structures within the watershed will work in conjunction with WP-1 and the previously implemented flood reduction measures to reduce current and future floodplains and bring needed flood damage reduction to the watershed. Reduced floodplain downstream of WP-1 and in conjunction with the other flood reduction structures could increase developments downstream of the site and within the watershed. Residential development around the WP-1 top of dam could also increase due to the recreation amenities provided.

Any additional stream stabilization projects will provide an overall benefit to watershed streams and surrounding land.

8.4.18 Possible Conflicts with Plans and Policies

No potential conflicts between land use plans, regional water resource management plans, policies, or controls for the area were identified.

8.4.19 Risk and Uncertainty

Each alternative contains risk factors and uncertainty values that could involve changes in costs and benefits. Costs, structural data, and benefits were based on an evaluated life of 50 years for grade stabilization structures and 100-years for the flood risk reduction dam (Site WP-1). Sedimentation rates were calculated using existing land use and conditions. Land use could change and therefore increase or decrease these rates and urbanization can cause a rapid influx of sediment into the basin. Costs, including land values, were determined by engineer estimates for project implementation and were based on local experience and engineering judgement. All estimated costs and benefits are subject to change due to local, regional, or world economics. These uncertainties were not considered for this analysis.

8.4.19.1 Climate Change

Climate change In Nebraska could result in an increase in extreme storm events (UNL, 2014), leading to increased flooding and an increase in stream degradation rates. All regulations were followed in the design of Site WP-1 as a high-hazard classification dam. In addition, stream banks at the grade stabilization structures are protected up to the 100-year flood event. Overall, all alternatives brought forward for detailed analysis increase climate change resiliency within the watershed by reducing peak flows and protecting streams from headcut progression and stream degradation.

8.4.19.2 Land Use

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

8.4.19.3 Adaptive Management

Adaptive management can be a useful tool to reduce uncertainty and maximize goals. Stream grades can change and headcuts can form and migrate quickly, especially with extreme events or in response to a human-induced change. Grade stabilization alternatives were analyzed with an understanding that these changes could occur between the planning process and final design and implementation. ARAs were determined and kept broad enough for individual grade stabilization structure locations to adjust to

potential changes and resource impacts were determined and analyzed conservatively. Uncontrollable changes to stream profile and banks during the implantation timeline as well as survey completed during the final design phase may modify the planned design and footprint at grade stabilization sites. For example, sheet pile may be needed at some sites to protect the structure but not at others and some planned locations may shift within their respective ARAs. These changes are expected due to the fluid nature of stream dynamics and are not anticipated to impact the outcome of the included environmental assessment or economic analysis.

8.5.20 Precedent for Future Actions with Significant Impacts

Implementation of the proposed action does not set a precedent for future actions with significant impacts. Future projects would be analyzed by their own circumstances and evaluated for effects based on resources of concern identified during the scoping process.

8.5.21 Controversy

There have been no areas of controversy identified. The planning process included public meetings, coordination with interested agencies and groups, and printed public information to raise issues, resolve conflicts, and recommend the most desirable plan features. Comments were generally in-favor at all project sites and landowner recommendations and preferences were considered and utilized when possible. The Plan-EA's preferred alternative is also the locally preferred alternative.

8.6.0 List of Persons and Agencies Consulted

Table 8-26. Agency and Tribal Mailing List

Agency / Tribe	Position	Name	Address
U.S. Fish and Wildlife Service	Wildlife Biologist (Consultation)	Carrie Allison	9325 South Alda Road Wood River, NE 68883
U.S. Fish and Wildlife Service	Wildlife Biologist (Consultation)	Santiago Martin	9325 South Alda Road Wood River, NE 68883
U.S. Fish and Wildlife Service	Field Supervisor	Lee Andrews	9325 South Alda Road Wood River, NE 68883
U.S. Fish and Wildlife Service	Field Supervisor	Mark Porath	9325 South Alda Road Wood River, NE 68883
Nebraska Game and Parks Commission		Carey Grell	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Assistant Division Administrator	Melissa Marinovich	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Wetlands Biologist	Jessica Tapp	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Douglas County Conservation Officer	Rich Berggren	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Washington County Conservation Officer	Jon Reeves	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Sarpy County Conservation Officer	Dan Evasco	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	Commissioner at Large	Scott Cassels	2200 N. 33rd Street P.O. Box 30370 Lincoln, NE 68503
Nebraska Game and Parks Commission	District #1 Commissioner	Dan Kreitman	1689 County Road E Wahoo, NE 68066
Nebraska Game and Parks Commission	District #2 Commissioner	Dick Bell	9960 Bloomfield Drive Omaha, NE 68114
Nebraska Game and Parks Commission	District #3 Commissioner	Jim Ernst	11 Wildwood Drive Columbus, NE 68601
United States Army Corps of Engineers		John Moeschen	Nebraska Regulatory Office 8901 South 154th Street Omaha, NE 68138
United States Army Corps of Engineers		Jeremy Grauf	Nebraska Regulatory Office 8901 South 154th Street Omaha, NE 68138

Agency / Tribe	Position	Name	Address
United States Army Corps of Engineers		Matthew Wray	Nebraska Regulatory Office 8901 South 154th Street Omaha, NE 68138
U.S. Environmental Protection Agency	Region 7 NEPA Reviewer	Larry Shepard	National Environmental Policy Act 11201 Renner Blvd. Lenexa, KS 66219
Nebraska Department of Environmental Quality	Nonpoint Source Pollution Management Program contact	Carla McCullough	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Management Division Deputy Director	Steve Goans	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Quality Division Administrator	Marty Link	1200 N. Street Suite 400 Lincoln, NE 68509
Nebraska Department of Environmental Quality	Water Permits Division Administrator	Shelley Schneider	1200 N. Street Suite 400 Lincoln, NE 68509
Office of the Governor	Governor	Pete Rickets	P.O. Box 94848 Lincoln, NE 68509
Office of the Governor	Governor	Jim Pillen	P.O. Box 94848 Lincoln, NE 68509
City of Blair	Mayor	Richard Hansen	2323 Colfax Street Blair, NE 68008
City of Bennington	Mayor	Matt John	15505 Warehouse Street Bennington, NE 68007
Bennington Public Works		John Bohrer	PO Box 221 Bennington, NE 68007
City of Omaha	Mayor	Jean Stothert	1819 Farnam Street Omaha, NE 68183
Omaha Public Works	Public Works Director	Robert G. Stubbe	1819 Farnam Street Omaha, NE 68183
City of Gretna	Mayor	Jim Timmerman	204 N McKenna Ave P.O. Box 69 Blair, NE 68028
City of Gretna	Public Works Director	Kris Faris	Public Works Building 20090 Husker Drive Gretna, NE 68028
Washington County/Blair Public Works	Director	Al Schoemaker	218 South 16th Street Blair, NE 68008
Washington County Planning and Zoning	Administrator and Planning/Zoning	Ryan Sullivan	1555 Colfax Street Blair, NE 68008

Agency / Tribe	Position	Name	Address
Washington County	Board of Supervisors: District #3	Bob Frahm	1133 Park Street Blair, NE 68008
Douglas County Planning and Zoning	Planning Commission Member	Murray McArdle	P.O. Box 501 Eklhorn, NE 68022
Douglas County	Board of Supervisors: District #7	Clare Duda	1819 Farnam St. Omaha, NE 68183
Douglas County	Engineer	Tom Doyle	15505 W Maple Rd Omaha, NE 68116
Douglas County	Planning/Zoning	Doug Cook	3015 Menke Circle Omaha, NE 68134
Sarpy County Planning and Zoning	Planning and Building Director	Bruce Fountain	1210 Golden Gate Drive Suite #1240 Papillion, NE 68046
Sarpy County	Board of Supervisors: District #5	Jim Warren	1210 Golden Gate Dr #1250 Papillion, NE 68046
Sarpy County	Board of Supervisors: District #2	David Klug	1210 Golden Gate Dr #1250 Papillion, NE 68046
Sarpy County	Engineer	Denny Wilson	15100 S 84th Street Papillion, NE 68046
OPPD	Chair of the Board	Anne McGuire	444 S 16th Street Mall Omaha, NE 68102
OPPD	Chief Executive Officer President	Timothy J. Burke	444 S 16th Street Mall Omaha, NE 68102
Metropolitan Utilities District	Board Chairperson & Subdivision 4 Board Member	Tim Cavanaugh	1723 Harney Street Omaha, NE 68102
Metropolitan Utilities District	Compensation Manager & Subdivision 1 Board Member	James Begley	1723 Harney Street Omaha, NE 68102
Metropolitan Utilities District	Real Estate & Subdivision 7 Board Member	Jack Frost	1723 Harney Street Omaha, NE 68102
Federal Emergency Management Agency Region VII	Director, Flood Insurance and Mitigation Division	Michael Scott	9221 Ward Parkway Kansas City, MO 64114
Federal Emergency Management Agency Region VII	Regional Administrator	Paul Taylor	9221 Ward Parkway Kansas City, MO 64114
Nebraska State Historical Society	Director and SHPO	Trevor Jones	1500 R Street P.O. Box 82554 Lincoln, NE 68501
Nebraska State Historical Society	Deputy State Historic Preservation Officer	Jill Dolberg	1500 R Street P.O. Box 82554

Agency / Tribe	Position	Name	Address
			Lincoln, NE 68501
Nebraska State Historical Society		John Rissetto	1500 R Street P.O. Box 82554 Lincoln, NE 68501
Iowa Tribe of Kansas and Nebraska	Chairman	Timothy Rhodd	3345 B Thrasher Rd. White Cloud, KS 66094
Iowa Tribe of Oklahoma	Chairman	Edgar B. Kent, Jr.	335588 E. 750 Road Perkins, OK 74059
Otoe-Missouria Tribe of Indians	Chairman	John R. Shotton	8151 Highway 177 Red Rock, OK 74651
Omaha Tribe of Nebraska	Chairman	Isaac Sherman	PO Box 368 Macy, NE 68039
Pawnee Nation of Oklahoma	President	Walter R. Echo-Hawk	881 Little Dee Drive Pawnee, OK 74058
Pawnee Nation of Oklahoma	President	Misty Nuttle	881 Little Dee Drive Pawnee, OK 74058
Ponca Tribe of Nebraska	Chairman	Larry Wright, Jr.	2523 Woodbine Street P.O. BOX 288 Niobrara NE 68760
Ponca Tribe of Indians of Oklahoma	Chairman	Oliver Little Cook	20 White Eagle Drive Ponca City, OK 74601
Sac and Fox Nation of Missouri in Kansas and Nebraska	Chairwoman	Tiauna Carnes	305 North Main Reserve, Kansas 66434
Sac & Fox Tribe of the Mississippi in Iowa	Chairwoman	Judith Bender	349 Meskwaki Road Tama, IA 52339
Sac & Fox Nation, Oklahoma	Chief	Justin Freeland Wood	920883 S Highway 99 Building A Stroud, Oklahoma 74079

8.6.1.1 Public Scoping Meeting (July 24, 2019)

A public scoping meeting was held on July 24, 2019, from 5:30 – 7:30pm in the P-MRNRD conference room in Omaha, Nebraska. This meeting was held after business hours to accommodate the public. Letters about the meeting were mailed to the potentially impacted and nearby landowners and a notice about the meeting was posted in the Omaha World Herald. This public meeting included an open house and presentation to provide an overview of the Supplemental Plan-EA, discuss any concerns, and begin an open line of communication with the public. An overview of the project was presented and included information about the project history, the NEPA planning process, preliminary site locations, and types of projects being considered at each project site. Time was allotted for the public to ask questions and to address concerns from the public. An information sheet, a Resources of Concern questionnaire, and comment cards were available to provide information and receive feedback from the public. Posters of the preliminary ARAs were available to provide close-up views of potential project extents.

8.6.1.2 Agency Scoping Meeting (July 24, 2019)

An agency scoping meeting for the Supplemental Plan-EA was held on July 24, 2019, from 3:30pm – 4:30pm in the P-MRNRD conference room in Omaha, Nebraska. This meeting was held during business hours to accommodate agency staff. Letters and a project location figure were sent to the agency members in Table 10-1. The Sponsor, state NRCS staff, engineering consultants, and representatives from USACE Regulatory and NGPC were in attendance. An overview and history of the project and the planning schedule were presented. An informational sheet, Resources of Concern questionnaire, and comment cards were available to provide information and receive feedback about the project. Posters of the preliminary ARAs were available to provide close-up views of potential project extents.

8.6.2 Public and Agency Meetings

The Sponsor additionally planned pubic and agency meetings for March 23, 2020. Adhering to the Centers for Disease Control Prevention (CDC) recommendation to cancel large gatherings due to the Coronavirus Disease 2019 (COVID-19), the in-person public and agency meetings were canceled, and the information was moved online. The planned presentation and site-specific posters detailing the proposed work were posted on the project website for the public to view. The public and agencies were notified of the online presentation and paper copies of the information as well as additional project information was made available upon request.

9.0 REFERENCES

Applied Weather Associates, LLC. December 2008. Site-Specific Probable Maximum Precipitation (PMP) Study for Nebraska.

Collins, S., & Larry, E. October 2007. United States Forest Service (USFS), Pacific Northwest Research Station. Caring for Our Natural Assets: An Ecosystem Services Perspective.

Cowardin, Lewis. 1979. NWI Wetlands and Deepwater Map Code Diagram. Fish and Wildlife Service. https://www.fws.gov/wetlands/documents/NWI_Wetlands_and_Deepwater_Map_Code_Diagram.pdf

Environmental Protection Agency (EPA). EJSCREEN: Environmental Justice Screening and Mapping Tool. Download EJSCREEN Data. 2019 State Percentile geodatabase. https://www.epa.gov/ejscreen/download-ejscreen-data

FYRA Engineering. October 2018. Papillion Creek Watershed Hydrologic Analysis (FYRA 2018).

Natural Resources Conservation Service (NRCS). August 2007. United States Department of Agriculture. Chapter 10: Two-Stage Channel Design. Part 654 Stream Restoration Design, National Engineering Handbook (NRCS 2007).

Natural Resources Conservation Service (NRCS). March 2019. Technical Release 210-60 Earth Dams and Reservoirs.

Nebraska Dept. of Environmental Quality. April 2018. Water Quality Integrated Report (NDEQ 2018).

Nebraska Dept. of Environmental Quality. Title 117 – Nebraska Surface Water Quality Standards. Revised: April 2012.

Nebraska Department of Natural Resources (NDNR). Classification of Dams - Dam Safety Section. Updated March 2013. https://dnr.nebraska.gov/sites/dnr.nebraska.gov/files/doc/dam-safety/resources/Classification-Dams.pdf

Nebraska Game and Parks Commission (NGPG). Endangered and Threatened Species Listing Action. http://outdoornebraska.gov/listingaction/

Nebraska Game and Parks Commission (NGPG). Nebraska Fishing. https://maps.outdoornebraska.gov/fishing/. Accessed November 2019.

Nebraska Game and Parks Commission (NGPC). Threatened and Endangered Species. Range Maps for At-risk Species. http://outdoornebraska.gov/endangeredspecies/

Nebraska Wildlife Rehab, Inc. Wildlife Help. https://nebraskawildliferehab.org/wildlife-help/

NOAA National Weather Service. NOAA Atlas 14 Point Precipitation Frequency Estimates: NE. https://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ne

Office of Management and Budget (OMB). Circular A-4. Regulatory Analysis. September 2003. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A4/a-4.pdf

Office of Management and Budget (OMB). Circular A-94. Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs. October 1992. https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/circulars/A94/a094.pdf

Papillion Creek Watershed Partnership. September 2004. Multi-Reservoir Analysis Papillion Creek Watershed. http://papiopartnership.org/wp-content/uploads/2017/11/multi_reservoir_analysis_papillion_creek_watershed.pdf

Papillion Creek Watershed Partnership. April 2009. Papillion Creek Watershed Management Plan. https://www.papionrd.org/wp-content/uploads/2017/01/2009-Papillion-Creek-Watershed-Plan.pdf

Papillion Creek Watershed Partnership. March 2014. Papillion Creek Watershed Management Plan, March 2014 Update. https://www.papionrd.org/wp-content/uploads/2016/08/20140328_Final_2014_Papio_Watershed_Update_Executive-Summary.pdf

Papio-Missouri River Natural Resources District (P-MRNRD). June 2018. Papio-Missouri River Basin Water Quality Management Plan. http://papiopartnership.org/wp-content/uploads/2019/04/P-MR-Basin-Water-Quality-Management-Plan_FINAL.pdf

P-MRNRD. 2008. West Papillion Levee Restoration Evaluation. Papio-Missouri River Natural Resources District. Omaha, NE.

Sarpy County, Nebraska. 2016 Eastern Nebraska Urban Area LiDAR. Available online. https://gis.sarpy.com/datasets/fd49c0b1d6414828b4034187ff63c6fe

Soil Science Division Staff. 2017. Soil survey manual. C. Ditzler, K. Scheffe, and H.C. Monger (eds.). USDA Handbook 18. Government Printing Office, Washington, D.C. (SSM 2017).

Steinauer, G. and S. Rolfsmeier. 2010. Terrestrial Ecological Systems and Natural Communities of Nebraska. Nebraska Game and Parks Commission, Lincoln, NE. (NGPC 2010)

United States Army Corps of Engineers (USACE). September 2013. Institute for Water Resources (IWR). Using Information on Ecosystem Goods and Services in Corps Planning: An Examination of Authorities, Policies, Guidance, and Practices. (2013-R-07).

United States Army Corps of Engineers (USACE). 2021. Papillion Creek and Tributaries Lakes, Nebraska. Final Feasibility Report and Environmental Assessment.

United States Army Corps of Engineers (USACE), 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region (Version 2.0).

United States Census Bureau. American Fact Finder Advanced Search. Accessed Online. https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t

United States Department of Agriculture (USDA). June 1986. Urban Hydrology for Small Watersheds TR-55. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1044171.pdf

United States Department of Agriculture (USDA), National Agricultural Statistics Service. 2012 Census of Agriculture – County Data. 242 Nebraska.

United States Department of Agriculture (USDA). Natural Resources and Environment. January 2017. Guidance for Conducting Analyses Under the Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies and Federal Water Resource Investments (DM 9500-013).

United States Geological Service (USGS), National Agricultural Statistics Service. 2018 Cropland Data Layer.

United States Geological Service (USGS). National Hydrography Dataset (NHD). https://www.usgs.gov/core-science-systems/ngp/national-hydrography

United States Geological Service (USGS). National Land Cover Dataset 2011. Multi-Resolution Land Characteristics Consortium. https://www.mrlc.gov/data/legends/national-land-cover-database-2011-nlcd2011-legend.

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). National Engineering Handbook (NEH), Part 650 – Engineering Field Handbook. Amend. 48 – January 2012. https://directives.sc.egov.usda.gov/viewerFS.aspx?hid=21429

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). National Engineering Handbook (NEH), Part 654 - Stream Restoration Design. Issued August 2007. (210-VI-NEH, August 2007).

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). National Engineering Handbook (NEH), Part 654. Grade Control Structures in Western Iowa Streams. Case Study 12. Issued August 2007.

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). Upper Mud Creek Watershed Plan. n.d. Referenced on 10/02/23.

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). January 2020. Title 180 – National Planning Procedures Handbook (NPPH), Amendment 7.

United States Department of Agriculture (USDA). National Resources Conservation Service (NRCS). June 2017. Title 210 - National Engineering Manual (NEM), Part 510 – Planning. 4th Ed.

United States Department of Homeland Security. FEMA Flood Map Service Center. Available online. https://msc.fema.gov/portal/home

United States. Environmental Protection Agency (EPA). EJScreen Tool. EPA's Environmental Justice Screening and Mapping Tool (Version 2018). Available Online. https://ejscreen.epa.gov/mapper/

United States. Environmental Protection Agency (EPA). September 2015. Title 117 – Nebraska Surface Water Quality Standards.

University of Nebraska-Lincoln. September 2014. Understanding and Assessing Climate Change: Implications for Nebraska. A Synthesis Report to Support Decision Making and Natural Resource Management in a Changing Climate.

U.S. Department of Commerce. May 1961. Technical Paper No. 40. Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years.

U.S. Department of Commerce. October 1964. Technical Paper No. 49. Two- to Ten-Day Precipitation for Return Periods of 2 to 10 Years in the Contiguous United States.

U.S. Fish & Wildlife Service (USFWS). ECOS Environmental Conservation Online System. Threatened and Endangered Species. https://ecos.fws.gov/ecp/

U.S. Fish and Wildlife Service (USFWS). National Wetlands Inventory. NE Wetlands East. Last updated October 2018.

U.S. Water Resources Council. March 1983. Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G).

U.S. Water Resources Council. March 2013. Principles and Requirements for Federal Investments in Water Resources.
https://obamawhitehouse.archives.gov/sites/default/files/final_principles_and_requirements_march_2013.pdf

U.S. Water Resources Council. 2014. Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies. (PR&G)

Wetland Training Institute, Inc. 2017. Pocket Guide to Hydric Soil Field Indicators.

Zapotocny, C.M. and S. F. Byrd, 2002: An Examination of the Eastern Nebraska and Western Iowa Flash Flood Events of 6-7 August 1999. *National Weather Review,* 26, 1-2.

10.0 LIST OF PREPARERS

The document was prepared by those listed in Table 9-1 with review and guidance throughout the development of this document from those listed in Table 9-2.

Table 9-1. List of Preparers

Name	Present Title	Experience	Years of Experience	Other
Mike Sotak	Civil Engineer	BS Civil Engineering, 1992 MS Business Administration, 2001	30	PE registration (NE, IA, KS, MO, AZ, SD)
Janel Kaufman	Environmental Engineer	BS Civil Engineering, 2005 MS Civil & Environmental Engineering, 2006	14	PE registration (SC)
Bob Gregalunas	Water Resources Engineer	BS Civil Engineering, 2005	16	PE registration (NE)
Anna Petrow	Environmental Engineer	BS Biological Systems Engineering, 2017	5	EI registration
Connor Kelley	Civil Engineer	BS Civil Engineering, 2017	5	EI registration
Timothy Haakenstad	Civil Engineer	BS Civil Engineering, 1983	35	PE registration (NE)
Robert Lutz	Civil Engineer	BS Civil Engineering, 2004	16	PE registration (NE, KS)
Adriana Valcu-Lisman	Economist	BS Finance, Insurance, Banking and Capital Markets, 2003 MS Financial Management and Capital Markets, 2005 PhD Economics, 2013	14	

Table 9-2. List of Reviewers

Name	Title	Organization
Allen Gehring	State Conservation Engineer	USDA NRCS
Arlis Plummer	Hydraulic Engineer	USDA NRCS Contract Employee
Elisha Mackling	Cultural Resources Specialist	USDA NRCS
Melissa Baier	Archaeologist	USDA NRCS
Richard Vaughn	Watershed Planning Coordinator - Nebraska	USDA NRCS
Ritch Nelson	State Wildlife Biologist, Forester	USDA NRCS
Ted Huscher	Geologist	USDA NRCS
Doug Christensen	Economist	USDA NRCS Contract Employee

11.0 DISTRIBUTION LIST

The Final Supplemental Plan-EA was submitted to the following federal, state, and local agencies.

Distribution List

- USFWS
- USACE
- NGPC
- NDEE
- NeDNR
- EPA
- Office of the Governor
- City of Blair
- City of Bennington
- City of Omaha
- Omaha Public Works
- City of Gretna
- Washington County/Blair Public Works
- Washington County Planning and Zoning

12.0 INDEX

Table 12-1 includes topics and associated page numbers that may be of interest to the reader.

Table 12-1. Index

Topic	Page Numbers
Historic Properties and Cultural Resources	3, 15, 17, 37, 38, 91, 95, 109, 127, 128, 129, 133, 182, 196, 197, 199
Threatened and Endangered Species	3, 6, 16, 17, 31, 40, 69, 71, 86, 102, 129, 136, 160, 162, 177, 192, 195, 197
Streams	5, 6, 7, 8, 14, 15, 16, 17, 19, 22, 23, 25, 26, 27, 29, 33, 34, 35, 36, 40, 43, 50, 52, 54, 55, 59, 60, 63, 67, 74, 76, 78, 81, 85, 86, 87, 88, 89, 92, 93, 94, 97, 106, 107, 122, 124, 125, 126
Wetlands	2, 3, 4, 6, 16, 27, 28, 29, 41, 46, 59, 60, 65, 69, 75, 84, 128, 129, 136, 141, 150, 151, 157, 160, 166, 175, 191, 195, 197
Installation Cost	iv, 5, 69, 111, 112, 115, 118, 160, 197

12.1 List of Acronyms

ACS	American Community Survey
APE	Area of potential effect
ARA	Affected Resource Area
BGEPA	Bald and Golden Eagle Protection Act
CEQ	Council on Environmental Quality
CERT	Conservation and Environmental Review Tool
CLOMR	Conditional Letter of Map Revision
CWA	Clean Water Act
EA	Environmental Assessment
EAP	Emergency Action Plan
EO	Executive Order
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
IR	Integrated Report
LID	Low Impact Development
LOMR	Letter of Map Revision
Max LID	Maximum Low Impact Development

MBTA	Migratory Bird Treaty Act
NDEE	Nebraska Department of Environment and Energy
NDEQ	Nebraska Department of Environmental Quality
NeDNR	Nebraska Department of Natural Resources
NED	National Economic Development
NEH	National Engineering Handbook
NEPA	National Environmental Policy Act
NeSCAP	Nebraska Stream Condition Assessment Procedure
NGPC	Nebraska Game and Parks Commission
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
NWPM	National Watershed Program Manual
OHWM	Ordinary High Water Mark
PCWP	Papillion Creek Watershed Partnership
PEM	Palustrine emergent
P-MRNRD	Papio-Missouri River Natural Resources District
PR&G	Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G)
RCPP	Regional Conservation Partnership Program
SAIPE	Small Area Income and Poverty Estimates
SHPO	State Historic Preservation Office
SLO	Sponsor Local Organization
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WFPO	Watershed Flood Prevention Operations
WOTUS	Waters of the United States