

DRAFT
LICK CREEK AND DUDLEY MAIN WATERSHED PLAN
and ENVIRONMENTAL ASSESSMENT
including Watershed Agreement

for Flood Damage Reduction

in the LICK CREEK and DUDLEY MAIN DITCH WATERSHED

(Hydrologic Unit 0802020302 and 0802020304)

Stoddard County, Missouri

June 2026



Photo: Erosion on Cypress Ditch, Conservation Works Joint Venture 12/7/2023

PREPARED BY:

NATURAL RESOURCES CONSERVATION SERVICE
601 BUSINESS LOOP W, SUITE 250
COLUMBIA, MO 65203

IN COOPERATION WITH:

STODDARD COUNTY CIRCUIT COURT DRAINAGE DITCH DISTRICT 12
11281 STATE HIGHWAY ZZ
DEXTER, MO 63841



Abstract (Fly Sheet)

DRAFT
Lick Creek and Dudley Main Watershed Plan – Environmental Assessment
for Flood Damage Reduction
in the Lick Creek and Dudley Main Watershed
Stoddard County, Missouri
8th Congressional District

LEAD AGENCY: UNITED STATES DEPARTMENT OF AGRICULTURE-NATURAL RESOURCES CONSERVATION SERVICE (NRCS)

COOPERATING AGENCY: UNITED STATES ARMY CORPS OF ENGINEERS

SPONSORING LOCAL ORGANIZATION: Stoddard County Circuit Court Drainage Ditch District 12, Missouri

AUTHORITY: This Draft Watershed Plan - Environmental Assessment (Plan-EA) is authorized by Public Law No. 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et seq.) 1954

ABSTRACT: Stoddard County Circuit Court Drainage Ditch District 12 (DD12) of Missouri requested that an environmental assessment be prepared for the proposed Flood Control project in the Lick Creek and Dudley Main Watershed. The purpose of the proposed project is to prevent flood damage to agricultural lands and infrastructure. Of the alternative options evaluated, the preferred alternative involves bank and toe armoring for stabilization, rock riffles to stabilize headcutting, armoring pipe outlet locations, removal of sediment from drainage ditches, and spreading/seeding of removed sediment to native grasses, turf reinforcement matting and seeding on exposed banks.

COMMENTS: NRCS has completed this Draft Plan-EA in accordance with the National Environmental Policy Act (NEPA) and NRCS guidelines and standards. Comments and inquiries must be received by July 13, 2026. Submit comments and inquiries to the following contact:

Andrew Rackers – NRCS Acting Assistant State Conservationist for Water Resources and Easements

601 Business Loop 70 West, Ste 250, Columbia, MO 65203

578-876-9376

andrew.rackers@usda.gov



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Watershed Agreement

Lick Creek and Dudley Main Watershed

Watershed Agreement No. 1

**between the
Stoddard County Circuit Court Drainage Ditch District 12, Missouri
(Referred to herein as Sponsors)**

and the

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

Whereas, application has heretofore been made to the Secretary of Agriculture by the Sponsors for assistance in preparing a plan for works of improvement for the Lick Creek and Dudley Main Ditch Watershed, State of Missouri, under the authority of the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Sections 1001 to 1008, 1010, and 1012); and

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

Whereas, there has been developed through the cooperative efforts of the Sponsors and NRCS a watershed project plan and environmental assessment for works of improvement for the Lick Creek and Dudley Main Ditch Watershed, State of Missouri, hereinafter referred to as the watershed project plan or plan, which plan is annexed to and made a part of this agreement;

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

1. **Term.** The term of this agreement is for the installation period and evaluated life of the project (52 years) and does not commit NRCS to assistance of any kind beyond the end of the evaluated life.
2. **Costs.** The costs shown in this plan are preliminary estimates. Final costs to be borne by the parties hereto will be the actual costs incurred in the installation of works of improvement.



3. **Real property.** The 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 item 5 hereof.

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

4. **Uniform Relocation Assistance and Real Property Acquisition Policies Act.** The sponsors hereby agrees to comply with all of the policies and procedures of the Uniform Relocation Assistance and Real Property Acquisition Policies Act (42 U.S.C. Section 4601 et seq. as further implemented through regulations in 49 CFR Part 24 and 7 CFR Part 21) when acquiring real property interests for this federally assisted project. If the sponsors are legally unable to comply with the real property acquisition requirements, it agrees that, before any Federal financial assistance is furnished, it will provide a statement to that effect, supported by an opinion of the chief legal officer of the state containing a full discussion of the facts and law involved. This statement may be accepted as constituting compliance.
5. **Cost-share for Watershed Work Plan.** The following table shows cost-share percentages and amounts for Watershed Work Plan implementation.

**Table W-1. Cost-share for Watershed Work Plan**

Works of Improvement – COMPLETE PROJECT	NRCS	Sponsors	Total
Cost Sharable Items			
Structural Measures, Channel Work (Construction Costs)	\$17,140,600	NA	\$17,140,600
Relocation, Replacement in-kind	\$0	NA	NA
Relocation, Required Decent, Safe, Sanitary	\$0	\$0	\$0
Sponsors Planning Costs	NA	\$0	\$0
Sponsors Engineering Costs	NA	\$0	\$0
Sponsors Project Administration	NA	\$0	\$0
Land Rights Acquisition Cost	NA	\$0	\$0
Subtotal: Cost-Share Costs	\$17,140,600	\$0	\$17,140,600
Cost-Share Percentages	100.00%	0.00%	100.00%
Non Cost-Sharable Items a/			
NRCS Engineering & Project Administration	\$4,285,100	NA	\$4,285,100
Natural Resource Rights	NA	\$0	\$0
Federal, State and Local Permits	NA	\$60,000	\$60,000
Relocation, Beyond Required decent, safe, sanitary	NA	\$0	\$0
Subtotal: Non Cost-Share Costs	\$4,285,100	\$60,000	\$4,345,100
TOTAL	\$21,425,700	\$60,000	\$21,485,700

a/ If actual Non Cost-Sharable item expenditures vary from these figures, the responsible party will bear the change.

1/ Investigation of the watershed project area indicates that no displacements will be involved under present conditions.

However, in the event that displacement becomes necessary at a later date, the cost of relocation assistance and payments will be cost-shared in accordance with the percentages shown.

6. **Land treatment agreements.** The sponsors will obtain agreements from owners of not less than 50 percent of the land above each multiple-purpose and floodwater-retarding structure. These agreements must provide that the owners will carry out farm or ranch conservation plans on their land. The 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.
7. **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. The sponsor is required to have development controls in place below low and significant hazard dams prior to NRCS or the sponsor entering into a construction contract.
8. **Water and mineral rights.** The sponsors will acquire or provide assurance that landowners or resource users have acquired such water, mineral, or other natural resources rights



pursuant to State law as may be needed in the installation and operation of the works of improvement. Any costs incurred must be borne by the sponsors and these costs are not eligible as part of the sponsor's cost-share.

9. **Permits.** The sponsors will obtain and bear the cost for all necessary Federal, State, and local permits required by law, ordinance, or regulation for installation of the works of improvement. These costs are not eligible as part of the sponsors' cost-share.
10. **NRCS assistance.** This agreement is not a fund-obligating document. Financial and other assistance to be furnished by NRCS in carrying out the plan is contingent upon the fulfillment of applicable laws and regulations and the availability of appropriations for this purpose.
11. **Additional agreements.** A separate agreement will be entered into between NRCS and the sponsors before either party initiates work involving funds of the other party. Such agreements will set forth in detail the financial and working arrangements and other conditions that are applicable to the specific works of improvement.
12. **Amendments.** This plan may be amended or revised only by mutual agreement of the parties hereto, except that NRCS may deauthorize or terminate funding at any time it determines that the sponsors have failed to comply with the conditions of this agreement or when the program funding or authority expires. In this case, NRCS must promptly notify the sponsors in writing of the determination and the reasons for the deauthorization of project funding, together with the effective date. Payments made to the sponsors or recoveries by NRCS must be in accordance with the legal rights and liabilities of the parties when project funding has been deauthorized. An amendment to incorporate changes affecting a specific measure may be made by mutual agreement between NRCS and the sponsors having specific responsibilities for the measure involved.
13. **Prohibitions.** No member of or delegate to Congress, or resident commissioner, may be admitted to any share or part of this plan, or to any benefit that may arise therefrom; but this provision may not be construed to extend to this agreement if made with a corporation for its general benefit.
14. **Operation and Maintenance (O&M).** The 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 (50 years). Although the sponsors' responsibility to the Federal Government for O&M ends when the O&M agreement expires upon completion of the evaluated life of measures covered by the agreement, the sponsors acknowledge that continued liabilities and responsibilities associated with works of improvement may exist beyond the evaluated life.



15. 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 the NRCS Title 180, National Operation and Maintenance Manual (NOMM), Part 500, Subpart F, Section 500.52, and meet applicable State agency dam safety requirements. The NRCS will determine that an EAP is prepared prior to the execution of fund obligating documents for construction of the structure. EAPs must be reviewed and updated by the sponsors annually.

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

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotape, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

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

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

17. Certification Regarding Drug-Free Workplace Requirements (7 CFR Part 3021). By signing this Watershed Agreement, the sponsors are providing the certification set out below. If it is later determined that the sponsors knowingly rendered a false certification, or otherwise violated the requirements of the Drug-Free Workplace Act, the NRCS, in addition



to any other remedies available to the Federal Government, may take action authorized under the Drug-Free Workplace Act.

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

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

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

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

Certification:

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

- (1) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition.
- (2) Establishing an ongoing drug-free awareness program to inform employees about—
 - (a) The danger of drug abuse in the workplace;
 - (b) The grantee's policy of maintaining a drug-free workplace;
 - (c) Any available drug counseling, rehabilitation, and employee assistance programs; and
 - (d) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace
- (3) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (1).



(4) Notifying the employee in the statement required by paragraph (1) that, as a condition of employment under the grant, the employee must—

- (a) Abide by the terms of the statement; and
- (b) Notify the employer in writing of his or her conviction for a violation of a criminal drug statute occurring in the workplace no later than five calendar days after such conviction.

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

(6) Taking one of the following actions, within 30 calendar days of receiving notice under paragraph (4) (b), with respect to any employee who is so convicted—

- (a) Taking appropriate personnel action against such an employee, up to and including termination, consistent with the requirements of the Rehabilitation Act of 1973, as amended; or
- (b) Requiring such employee to participate satisfactorily in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency.

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

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

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

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

A. The sponsors certify to the best of their knowledge and belief, that:

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



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

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

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

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

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

- (1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- (2) Have not within a 3-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- (3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph A(2) of this certification; and
- (4) Have not within a 3-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.



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

20. Clean Air and Water Certification.

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

- (1) Any facility to be utilized in the performance of this proposed agreement is (____), is not (X) listed on the Environmental Protection Agency List of Violating Facilities.
- (2) To promptly notify the NRCS-State administrative officer prior to the signing of this agreement by NRCS, of the receipt of any communication from the Director, Office of Federal Activities, U.S. Environmental Protection Agency, indicating that any facility which is proposed for use under this agreement is under consideration to be listed on the Environmental Protection Agency List of Violating Facilities.
- (3) To include substantially this certification, including this subparagraph, in every nonexempt sub-agreement.

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

- (1) To comply with all the requirements of section 114 of the Clean Air Act as amended (42 U.S.C. Section 7414) and section 308 of the Federal Water Pollution Control Act (33 U.S.C. Section 1318), respectively, relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, issued there under before the signing of this agreement by NRCS.
- (2) That no portion of the work required by this agreement will be performed in facilities listed on the USEPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the USEPA eliminates the name of such facility or facilities from such listing.
- (3) To use their best efforts to comply with clean air standards and clean water standards at the facilities in which the agreement is being performed.
- (4) To insert the substance of the provisions of this clause in any nonexempt subagreement.

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

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



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

(3) The term “clean air standards” means any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, or other requirements which are contained in, issued under, or otherwise adopted pursuant to the Air Act or Executive Order 11738, an applicable implementation plan as described in section 110 of the Air Act (42 U.S.C. Section 7414) or an approved implementation procedure under section 112 of the Air Act (42 U.S.C. Section 7412).

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

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

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

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

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

22. Examination of Records. The 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.



23. Signatures.

STODDARD COUNTY CIRCUIT COURT DRAINAGE DITCH DISTRICT 12

The signing of this plan was authorized by a resolution by the Stoddard County Circuit Court Drainage Ditch District 12 governing body and adopted at an official meeting held on

_____, 2026 at Dexter, Missouri.

By:

Date: _____

Davis Minton, Chairman
Stoddard County Circuit Court Drainage Ditch District 12
11281 State Highway ZZ
Dexter, MO 63841

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Approved by:

Date: _____

Nate Goodrich, Acting State Conservationist
Natural Resources Conservation Service
601 Business Loop 70 West
Columbia, Missouri 65203



Table of Contents

Abstract (Fly Sheet)	i
Non-Discrimination Statement	ii
Watershed Agreement.....	iii
Table of Contents	xiv
Acronyms and Abbreviations	xxi
Summary (OMB Fact Sheet)	1
1. Introduction	1
1.1. Planning and Assessment Framework.....	1
1.2. Project Background.....	2
1.3. Affected Resource Area	3
2. Purpose and Need for Action.....	4
2.1. Purpose	4
2.1.1. Objectives	4
2.1.2. Constraints	4
2.2. Need	4
2.2.1. Problems	5
2.2.2. Opportunities.....	5
3. Scope of the Environmental Assessment.....	7
3.1. Purpose of Scoping and Methods.....	7
3.2. Scoping Concerns: Natural Resources and the Human Environment.....	7
3.3. Scoping Concerns: Ecosystem Services.....	11
4. Affected Environment	14
4.1. Planning Evaluation Methods	14
4.2. Project Setting	14
4.2.1. Location	14
4.2.2. Climate.....	14
4.2.3. Topography	14
4.2.4. Geology.....	14
4.2.5. Land Use and Land Cover	15
4.3. Existing Conditions: Natural Resources and the Human Environment	15
4.3.1. Soils.....	15
4.3.2. Water.....	16



4.3.3.	Air	18
4.3.4.	Plants and Animals	18
4.3.5.	Human Environment.....	20
4.4.	Existing Conditions: Ecosystem Services	22
4.4.1.	Provisioning Services: Agricultural Land & Water Resources	22
4.4.2.	Regulating Services: Flood and Disease Control, Water Filtration.....	23
4.4.3.	Cultural Services: Recreational Opportunities.....	23
4.5.	Existing Conditions: Drainage Ditches	23
4.5.1.	Status of Operation and Maintenance	23
4.5.2.	Structural Data	24
4.5.3.	Non-Structural Data	24
5.	Alternatives.....	25
5.1.	Formulation Process	25
5.2.	Alternative 1: No Action – Future without Federal Investment (FWOFI)	25
5.3.	Alternative 2: Structural Alternative	26
5.4.	Alternative 3: Structural Alternative	26
5.5.	Nonstructural Alternative 4: Buyouts	27
5.6.	Locally Preferred Alternative.....	27
5.7.	Alternatives Eliminated from Detailed Analysis	28
5.7.1.	Eliminated Alternative 5	28
5.7.2.	Eliminated Alternative 6	28
5.8.	Alternative Summary and Comparison.....	29
6.	Environmental Consequences.....	52
6.1.	Effects on Existing Conditions.....	52
6.2.	Consequences for Natural Resources and the Human Environment.....	53
6.2.1.	Soils.....	53
6.2.2.	Water.....	54
6.2.3.	Air	57
6.2.4.	Plants and Animals	57
6.2.5.	Human Environment.....	60
6.3.	Consequences for Ecosystem Services	63



6.3.1.	Provisioning Services: Food, Fiber, Biofuel Production, and Potable Water Supply	63
6.3.2.	Regulating Services: Water Use and Management.....	64
6.3.3.	Cultural Services: Recreation Opportunities and Historical and Cultural Resources	64
6.4.	Cumulative Effects	64
7.	Risk and Uncertainty	67
8.	Consultation, Coordination, and Public Participation	68
8.1.	Consultation	68
8.1.1.	Tribal Governments	68
8.1.2.	Federal Agencies.....	69
8.1.3.	State Agencies.....	70
8.1.4.	Local Agencies.....	71
8.1.5.	Delegates	72
8.1.6.	Landowners and Public Meeting Attendees	72
8.2.	Summary of Natural Resources, Cultural Resources, and Tribal Consultations	72
8.3.	Public Meetings.....	73
9.	The Preferred Alternative	74
9.1.	Rationale for the Preferred Alternative	74
9.2.	Measures to be Installed.....	74
9.3.	Mitigation.....	74
9.3.1.	Wetland Mitigation	75
9.3.2.	Stream Mitigation	75
9.4.	Permits and Compliance.....	75
9.5.	Costs and Cost Sharing	76
9.6.	Installation and Financing.....	77
9.7.	Operation, Maintenance, and Replacement.....	78
9.8.	Cost Tables	78
10.	References.....	84
11.	List of Preparers.....	92
12.	Distribution List.....	95

**List of Tables**

Table S-1. Resource Information for Watersheds.....	S-2
Table S-2. Screening Criteria for Completeness, Effectiveness, Efficiency, and Acceptability ..	S-4
Table S-3. Annualized Flood Damages from Hazus Analysis	S-5
Table S-4. Lick Creek – Dudley Main Watershed Ditch Flood Control	S-5
Table S-5. Funds Breakdown for the Preferred Alternative	S-6
Table S-6. Resource Concerns vs. Preferred Alternative.	S-7
Table 3-1. Resource and Human Environmental Concerns Identified During Scoping.....	7
Table 3-2. Crosswalk of Ecosystem Services to Natural Resources and the Human Environment.....	12
Table 5-1. Screening Criteria for PR&G Guiding Principles, Purpose and Need, and Environmental, Economic, and Social Impacts	29
Table 5-2. Screening Criteria for Completeness, Effectiveness, Efficiency, and Acceptability ..	30
Table 5-3. Summary and Comparison of Impacts of Alternatives	31
Table 6-1. Bootheel Region Strategic Goals in Relation to Project Goals	66
Table 8-1. Cultural Resources and Tribal Consultation.....	72
Table 8-2. Environmental/Wildlife Consultation	72
Table 9-1. Economic Table 1 - Estimated Installation Cost [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars] ¹	78
Table 9-2. Economic Table 2 - Estimated Cost Distribution, Preferred Alternative [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars] ¹	80
Table 9-3. Structural Table 3b - Structural Data – Channel Work [Lick Creek and Dudley Main Ditch Watershed], [MO]	81
Table 9-4. Economic Table 4 - Estimated Average Annual NED Costs [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars] ¹	83
Table 9-5. Economic Table 5 - Estimated Average Annual Flood Damage Reduction Benefits [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars] ¹	83
Table 9-6. Economic Table 6 - Comparison of NED Benefits and Costs [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars] ¹	83
Table 11-1. Experience and Qualifications of Report Preparers	92
Table 12-1. Distribution List.....	95

List of Figures

No table of figures entries found.

List of Appendices**Appendix A – Comments and Responses**

Consultation Absentee Shawnee 2024.....	A-1
Consultation CR SHPO 2024.....	A-3
Consultation CR SHPO 2025.....	A-5
Consultation Eastern Shawnee 2024.....	A-7
Consultation MODNR	A-9



Watershed Plan-EA

Lick Creek and Dudley Main Ditch Watershed

xviii

June 2026

Consultation Osage Nation 2024	A-16
Consultation Quapaw 20240925	A-18
Consultation Quapaw 20250619	A-20
Consultation Shawnee Tribe 2024	A-25
Consultation TE MODC	A-27
Consultation TE USFWS	A-33
Consultation USEPA	A-43
Consultation USFWS 20250922	A-47
Initial Interagency Meeting Minutes	A-49
Initial Interagency Meeting Sign-In Sheet	A-81
Initial Public Meeting Minutes	A-83
Initial Public Meeting Presentation	A-116
Initial Public Meeting Sign-In Sheet	A-145
Initial Public Meeting Stakeholder Letters	A-147
Initial Public Meeting Stakeholder List	A-480
IPaC_ Lick Creek - Dudley Main Project Area Biological Assessment 20251119	A-481
IPaC_ Lick Creek - Dudley Main Project Area General Project Design Guidelines 20251119	A-507
IPaC_ Lick Creek - Dudley Main Project Area Species List 20251119	A-512
IPaC_ Lick Creek - Dudley Main Project Area Species Survey Guidelines 20251119	A-522
IPaC_ Lick Creek - Dudley Main Project Area Technical Assistance Letter 20251119	A-623
Land Rights Letter DD12	A-364
Memo NRCS and USFWS Consultation	A-365
NB 190-25-8 ECS–Interim Guidance for Executive Orders 14148 and 14173 and NEPA Implementing Procedures	A-636
Second Public Meeting Minutes	A-638
Second Public Meeting Presentation	A-369
Second Public Meeting Sign-In Sheet	A-697
Second Public Meeting Stakeholder Letters	A-699
Second Public Meeting Stakeholder List	A-847

Appendix B – Watershed Project Map

B1 Watershed	B-1
B2 Project Area	B-2

Appendix C – Support Maps

C1 Location ARA	C-1
C2 Topo ARA	C-2
C3a NLCD ARA	C-3
C3b-h NLCD PA Series	C-4
C4a Soils ARA	C-11
C4b-h Soils PA Series	C-12
C5a PrimeFarmland ARA	C-19

Watershed Plan-EA

Lick Creek and Dudley Main Ditch Watershed

xviii

June 2026



C5b-h PrimeFarmland PA Series.....	C-20
C6a-k Floodplain PA Series.....	C-27
C7 WOTUS ARA	C-38
C8 NWI ARA	C-39
C9 Rivers&Streams ARA.....	C-40
C10 303d ARA	C-41
C11 Natural Areas ARA	C-42
C12a-g Land Rights PA Series	C-43
C13a-ab 100 Year Floodplain Comparison Series.....	C-50
C14 Concept Layouts.....	C-78

Appendix D – Investigations and Analysis Report

D1. Introduction.....	D-1
D1.1. Summary of Principles, Requirements, and Guidelines	D-1
D2. Land Use	D-2
D3. Soils.....	D-4
D3.1. Drainage Class and Hydrologic Soil Group	D-4
D3.2. Prime and Unique Farmland and Farmland Soils of Statewide Importance	D-11
D4. Geology.....	D-12
D4.1. Geologic Setting	D-12
D4.2. Geology.....	D-12
D4.3. Geologic Investigations	D-13
D5. Engineering.....	D-14
D5.1. Land Rights Assessment of Project Area	D-14
D5.2. Geotechnical	D-14
D5.2.1. Slope Stability Analyses.....	D-14
D5.3. Conclusions	D-14
D5.4. Hydrology and Hydraulics.....	D-15
D5.4.1. Hydrology and Hydraulic Analyses	D-15
D5.5. Non-Structural	D-17
D5.5.1. Wetland Development	D-17
D6. Biology.....	D-18
D6.1. Waters of the U.S. (Streams, Lakes and Wetlands).....	D-18
D6.2. Surface Water Quality (Clean Water Act).....	D-19
D6.3. Vegetation.....	D-19
D6.4. Threatened and Endangered Species	D-21
D6.5. Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act	D-23
D6.6. Fish and Wildlife Habitat.....	D-25
D6.7. Invasive Species.....	D-25
D7. Economics.....	D-24
D7.1. General.....	D-24
D7.2. Determining Project Damages.....	D-24
D7.2.1. Structural Damages	D-24



Acronyms and Abbreviations

ACS	American Community Survey
AGCP	Atlantic and Gulf Coastal Plain Region
APE	Area of Potential Effect
ARA	Affected Resource Area
B/C	Benefit/Cost Ratio
BCA	Benefit-Cost Analysis
BMP	Best Management Practice
BRPEDC	Bootheel Regional Planning Economic Development Commission
CAA	Clean Air Act
CWA	Clean Water Act
CFR	Code of Federal Regulations
CEQ	Council on Environmental Quality
COA	Conservation Opportunity Areas
DEC	Decennial Census
DD12	Stoddard County Circuit Court Drainage Ditch District 12
ESA	Endangered Species Act
EA	Environmental Assessment
EAP	Emergency Action Plan
EIS	Environmental Impact Statement
EQIP	Environmental Quality Incentives Program
FPPA	Farmland Protection Policy Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FWOFI	Future Without Federal Investment
GIS	Geographic Information System
HEC-RAS	Hydrologic Engineering Center River Analysis System
HSG	Hydrologic Soil Group
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Consultation
LF	Linear Feet
MBTA	Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act
MLRA	Major Land Resource Area
MOCC	Missouri Climate Center
MODA	Missouri Department of Agriculture
MODC	Missouri Department of Conservation
MODNR	Missouri Department of Natural Resources
MOSEMA	Missouri State Emergency Management Agency
MSL	Mean Sea Level
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration



NEPA	National Environmental Policy Act
NHCP	National Handbook of Conservation Practices
NHFL	National Flood Hazard Layer
NHPA	National Historic Preservation Act
NHRR	Natural Heritage Review Report
NLCD	National Land Cover Database
NPS	National Park Service
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NWPM	National Watershed Program Manual
NWI	National Wetlands Inventory
NRCS	Natural Resources Conservation Service
O&M	Operation and Maintenance
PA	Project Area
PIFR	Preliminary Investigation Feasibility Report
Plan -EA	Draft Watershed Plan – Environmental Assessment
PR&G	Principles, Requirements and Guidelines for Water and Land Related Resources Implementation Studies
PL	Public Law
PL 83-566	Watershed Protection and Flood Prevention Act
ROW	Right-of-Way
SHPO	State Historic Preservation Office
SLO	Sponsoring Local Organization
TMDL	Total Maximum Daily Load
T&E	Threatened and Endangered
USACE	U.S. Army Corps of Engineers
USC	United States Code
USCB	U.S. Census Bureau
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEI	Wind Erodibility Index
WFPO	Watershed and Flood Prevention Operations
WOTUS	Waters of the U.S.



Summary (OMB Fact Sheet)

**Lick Creek and Dudley Main Watershed Plan and Environmental Assessment
for Flood Damage Reduction
in the Lick Creek and Dudley Main Ditch Watershed
Stoddard County, Missouri
8th Congressional District**

Authorization:

This Draft Supplemental Watershed Plan – Environmental Assessment (Plan-EA) is authorized by Public Law No. 83-566 Stat. 666 as amended (16 U.S.C. Section 1001 et seq.) 1954.

Sponsoring Local Organization (SLO)

Stoddard County Circuit Court Drainage Ditch District 12, Missouri

Proposed Action

This Proposed Action (Project) consists of flood control operations to implement solutions to better protect the watershed from flood damages, soil erosion, implement use of native vegetation for multiple benefits, remove accumulated sediment to restore the drainage system's capacity to its original design, and develop an overall holistic plan to better manage runoff and drainage.

Purpose and Need for Action

The purpose of the Proposed Action is to implement measures along Lick Creek and Dudley Main watershed drainage ditches and tributaries to provide flood control for agricultural lands and infrastructure in the watershed and downstream areas. The measures are intended to reduce damage from erosion, floodwater, and sediment.

Preferred Alternative

The preferred alternative would include dredging of drainage ditches and improving flood control opportunities. Overall, 14.6 miles of drainage ditches would be armored to restore functionality with some localized dredging to address silt concerns. Additionally, armoring of approximately 50 pipe outlets will address localized erosion throughout the ditches and approximately eight (8) rock riffles will stabilize the head cut at the outlet of Cypress Lateral 1. Dredged sediment would be spread and seeded on land adjacent to these ditches with turf reinforcement matting above any partial-bank riprap protection.

Resource Information

The context of the Project is summarized in **Table S-1** and described below in terms of climate, topography, land use, and demographics. Some attributes are characterized at different scales than others, based on whether data are available and relevant for the Project Area and/or for the overall watershed.

**Table S-1. Resource Information for Watersheds**

Approximate Location	Stoddard County, Missouri	
Hydrologic Unit Code (HUC)	0802020302	0802020304
Watershed Name	Lick Creek Watershed	Dudley Main Watershed
Land Ownership	98 percent privately owned, DD12 maintains easements along the drainage ditches	

Climate and Topography

The climate in southeastern Missouri is generally characterized by hot humid summers and cool wet winters. The variables of temperatures, precipitation, and snowfall can range greatly from one year to the next. In the summer, temperatures exceed 90 degrees while in the winter temperatures typically fall to the 20 degrees. The coldest average temperatures are in January, and the warmest temperatures are in July. Southeastern Missouri's average annual total precipitation is 50 inches, which includes an average annual snowfall of 8 to 12 inches. The average growing season lasts 250 days. Major cyclonic storms occur from March to June, causing regional flooding. Short duration intense storms occur during the growing season, causing severe local flooding.

The topography of the Project Area is a broad, flat floodplain with gentle undulations dissected by drainage ditches. Crowley's Ridge on the eastern portions of the watershed is a significant landscape feature that provides topographic relief. Surface elevations in the watershed are generally below 400 feet mean sea level (msl), though the elevation is as high as 550 msl in some areas on the eastern side of Lick Creek Watershed. The Bootheel Region has the lowest elevations in the state of Missouri.

Land Use

Within the Affected Resource Area (ARA), cultivated crops are the primary land cover type, comprising 60 percent (60,000 acres) of the watershed and is expected to continue in agricultural use. Total grassland and forestland are the second- and third-most prominent land cover types in the watershed at 15 (14,810 acres) and 12 (12,025) percent respectively. Because cropland accounts for over 60 percent of land use in the ARA, the Projects meets the PL 83-566 requirement that agriculture and rural communities must account for at least 20 percent of total project benefits.

The proposed Project Area, at 86 percent cultivated cropland (671 acres) as the NLCD cover type, is comprised of ditch and levee banks with a small buffer of land from the top of the bank slope outward. Scattered trees and small forest stands exist along the Project corridor; however, these areas are fragmented and generally outside of the herbaceous riparian corridor. All land in the Project Area is privately owned.

Population and Demographics

According to the U.S. Census Bureau (USCB) American Community Survey (ACS), completed in 2019, Stoddard County has relatively small population totaling to 28,812. Agriculture, at over 60 percent land use in the watershed, contributes greatly to local county economies. In 2021, agriculture contributed to household income in the county by 77 percent.



Within the counties of the ARA, the average median household income is \$46,052, with 17.2% of households below the poverty level and 18.9% of populations having less than a high school diploma. In comparison, the median household income for Missouri is \$61,847, with 12.7% of households below the poverty level and 8.4% of the population having less than a high school diploma (USCB 2019a-c).

Resource Concerns

Resource concerns that were determined during the scoping process to be relevant include the following. These concerns were addressed as part of describing the Affected Environment and used to evaluate the potential environmental impacts of project alternatives.

- Erosion and Sedimentation
- Prime Farmland and Unique Farmland and Farmland of Statewide Importance
- Floodplain Management
- Waters of the U.S. (Streams, Lakes, and Wetlands)
- Surface Water Quality (CWA)
- Surface Water Quantity
- Groundwater and Sole Source Aquifers
- Air Quality (Clean Air Act)
- Fish and Wildlife Habitat and Conservation
- Threatened and Endangered Species
- Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act
- Invasive Species
- Natural Areas
- Riparian Areas
- Socioeconomic, Social, and Cultural Issues
- Recreation
- Public Health and Safety
- Potable Water Supply
- Historical and Cultural Resources
- Energy

Mitigation

Mitigation actions are necessary to avoid or minimize impacts to endangered species and migratory birds, including felling potential roost trees during the inactive period of Indiana bats (November 15 – March 31) and planning construction activities or site preparations outside of the primary nesting season (May 1 – July 15).

Alternatives Considered

The Project team developed four alternatives: No Action/Future without Federal Investment (FWOFI); a Non-structural Alternative (buyout); and two Structural Alternatives (wetland creation and ditch work). The FWOFI alternative describes the most likely future condition if the NRCS were to take no action which is predicted to include further head cuts and worsening of bank erosion, increasing the threat to the adjacent county road. The Non-structural alternative would involve the buyout of 600 acres of agricultural land that currently are within the 100-year flood event zone. Structural Alternative 2 would include the creation of a permanent wetland with a pump station and six water control structures. Structural Alternative 3 would include bank excavation and stabilization, installation of pipe outlets, and native vegetation seeding on top of the banks. Structural Alternative 3 (ditch work) was identified as the NRCS and Locally Preferred Alternative. The ditch work proposed in the Preferred Alternative is planned for several reaches



within the Project Area that are not immediately adjacent to one another. However, the proposed work is planned to be conducted as a unit rather than in stages because adequate flow through the entire ditch system depends on proper functionality of all the reaches within the system and the ditches are all interconnected. Table S-2 summarizes the primary alternatives considered for controlling floodwater.

Table S-2. Screening Criteria for Completeness, Effectiveness, Efficiency, and Acceptability

Alternative	Completeness ¹	Effectiveness ²	Efficiency ³	Acceptability ⁴	Is it being carried forward?
No Action/FWOFI Alternative 1	Yes	No	No	Yes	Yes
Structural Alternative 2	Yes	Yes	Yes	Yes	Yes
Structural Alternative 3	Yes	Yes	Yes	Yes	Yes
Nonstructural Alternative 4	Yes	Yes	No	No	Yes
¹ Completeness is the extent to which an alternative provides and accounts for all features, investments, and/or other actions necessary to realize the planned effects, including any necessary actions by others. ² Effectiveness is the extent to which an alternative alleviates the specific problems and achieves the specified opportunities. ³ Efficiency is the extent to which an alternative alleviates the specific problems and realizes the specific opportunities at least cost. ⁴ Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies.					

Project Costs and Benefits

This project benefit-cost analysis (BCA) was completed according to Evaluation of Alternatives and Determination of Preferred Alternative within the Project Statement of Work. All economic benefits and costs are provided in 2024 dollars and have been discounted and amortized to average annualized value using the 2024 federal water resources planning rate of 2.75 percent. Two types of damages were used to compute losses for the multiple areas within the project area: structures/infrastructure damages and agricultural damages. For structure/infrastructure losses, the Federal Emergency Management Agency (FEMA) Hazus Flood Assessment Structure Tool (FAST) was utilized to provide an estimate of risk. For the agriculture evaluation, the USDA National Agricultural Statistics Service (NASS) Cropland Data Layer was downloaded (NASS 2024). This data was used in combination with the With Project and Without Project scenario floodplains to develop agricultural grids necessary to calculate damage.

Annualized flood damages from the Hazus FAST analysis are provided in **Table S-3**. The annualized crop damage monetized benefit was determined to be \$714,400.

**Table S-3. Annualized Flood Damages from Hazus Analysis**

RETURN PERIOD	LOSS TYPE	WITH PROJECT	WITHOUT PROJECT (NO ACTION/ FWOFI ALTERNATIVE) 1	BENEFIT
Average Annualized Loss	Total Losses	\$16,053,900	\$22,442,300	\$6,388,400
	Building (Structure) Loss	\$6,592,700	\$8,784,700	\$2,191,900
	Content Loss	\$8,979,700	\$12,948,000	\$3,968,300
	Inventory Loss	\$481,500	\$709,600	\$228,200
	Count of Damaged Structures	991	993	2

Table S-4 describes the Project's cost estimate, based on 2024 dollars. The BCA indicated that the B/C ratio for this proposed project is estimated to be 8.5 for the proposed project life of 50 years with a net annual beneficial of \$6,265,300.

Table S-4. Lick Creek – Dudley Main Watershed Ditch Flood Control Project Alternatives Cost Estimate.

Item	Project Alternatives ¹			
	No Action/Future Without Federal Investment Alternative ²	Alternative 2 (Structural – Wetland Creation)	Alternative 3 (Structural – Channel Work)	Alternative 4 (Non-Structural Buyouts)
Total Construction Cost	-	\$ 7,481,400	\$ 17,140,600	-
NRCS - Construction	-	\$ 2,640,100	\$ 17,140,600	-
Sponsor - Construction	-	-	-	-
NRCS – Conservation Easements	-	\$ 3,128,500		\$ 2,250,000
Sponsor – Conservation Easements	-	\$ 1,042,800	-	\$ 750,000
NRCS - Project Design, Construction Engineering	-	\$ 528,000	\$ 3,428,100	-
Sponsor - Project Design, Construction Engineering	-	-	-	-
Sponsor – Real Property	-	-	-	\$ 150,971,800
NRCS - Project Administration	-	\$ 132,000	\$ 857,000	-
Sponsor - Project Administration	-	-	-	\$ 7,698,600
Federal, State and Local Permits	-	\$ 10,000	\$ 60,000	-
Total Installation Cost	\$62,000	\$ 7,481,400	\$ 21,485,700	\$ 161,670,400

¹ Price base 2024

² All costs are Average Annual Costs (\$62,000). No installation costs are associated with the No Action alternative.

³ Assumes 75% NRCS /25% Sponsor cost share for floodplain conservation easement (share determined by State Conservationist based on comparison with other federal programs.)

Funding Schedule & Cost Sharing

The basis for cost sharing between NRCS and the Sponsor is different and is based on the provisions of the Watershed Protection and Flood Prevention program. Cost sharing for authorized



projects is based on 390-USDA-NRCS, National Watershed Program Manual, Part 500, Subpart E, April 2014. **Table S-5** gives the breakdown between the different funding sources for the total installation cost. Watershed program funds may provide 100% of construction and engineering costs for works of improvement for flood damage.

Table S-5. Funds Breakdown for the Preferred Alternative

Works of Improvement	Unit	Number			Estimated Cost (Dollars) ¹		
		Federal Land	Non-Federal Land	Total	PL 83-566 Funds	Other Funds	Total Estimated Costs
Structural Measures, Channel Work - Area 1	lf	-	10690	10690	\$3,650,178	\$10,000	\$3,660,200
Structural Measures, Channel Work - Area 2	lf	-	11422	11422	\$2,993,126	\$10,000	\$3,003,100
Structural Measures, Channel Work - Area 3a	lf	-	9724	9724	\$2,708,551	\$10,000	\$2,718,600
Structural Measures, Channel Work - Area 4	lf	-	27175	27175	\$7,284,020	\$10,000	\$7,294,000
Structural Measures, Channel Work - Area 5	lf	-	17865	17865	\$4,680,039	\$10,000	\$4,690,000
Structural Measures, Channel Work - Area 6	lf	-	200	200	\$109,786	\$10,000	\$119,800
Total Project	lf	-	77076	77076	\$21,425,700	\$60,000	\$21,485,700

¹ Price Base 2024

December-2024

Works of improvement would be installed over a two-year period following authorization of Federal assistance under the Watershed Protection and Flood Protection Act, PL 83-566. Final design and installation of the works of improvement would commence upon approval of the Plan and allocation of funds. Responsibilities for carrying out a site-specific project would be shared between NRCS and the Sponsor.

Period of Analysis: 52 years (includes 1 year for design and 1 year for construction)

Project Life: 50 years

Environmental Effects

Table S-6 describes the resource concerns identified during the project scoping and summarizes the potential impacts related to the proposed Action.

Table S-6. Resource Concerns vs. Preferred Alternative.

Alternative:	
3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	
<u>Resource or Concern</u>	<u>Impact on Resource</u>
Provisioning Services	
Soils – Prime and Unique Farmland and Farmland of Statewide Importance	POSITIVE where armored (decreased erosion and headcutting into surrounding land) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3
Regulating Services	
Soils – Erosion and Sedimentation	Same as Prime Farmland.
Rating:	+3
Water – Floodplain Management	POSITIVE where armored (increased function in drainage system managing floodwaters) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3
Water – Waters of the U.S. (Streams, Lakes, and Wetlands)	POSITIVE where armored (decreased sedimentation) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3
Water – Surface Water Quality (Clean Water Act)	POSITIVE where armored (decreased sedimentation) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and increase in nutrient load and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3
Water – Surface Water Quantity	POSITIVE where armored (decreased ponding on surrounding lands) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to continued ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3



Alternative:	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)
<u>Resource or Concern</u>	<u>Impact on Resource</u>
Water – Regional Water Resource Management Plans	No change to the RWRMP.
Rating:	0
Water - Groundwater Quality (no Sole Source Aquifers)	POSITIVE where armored (decreased ponding on surrounding lands) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to increase in nutrient loading from ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	+3
Air – Air Quality (Clean Air Act) (Counties in the Project Area are not in non-attainment zones for AQ)	POSITIVE Long Term (decreased wind erosion and less regular maintenance with equipment) + SLIGHTLY NEGATIVE Short Term (minor due to ditch work and burning to maintain native vegetation).
Rating:	+3
Plants and Animals – Fish and Wildlife Habitat and Conservation	SOMEWHAT POSITIVE for aquatic species (reduced erosion and sedimentation where armor is installed, creation of habitat where riffles are installed) + POSITIVE for pollinators (where ditch banks are planted with native grasses/forbs) + NEGATIVE for riparian species (loss of vegetation-water interface) + SOMEWHAT NEGATIVE (for areas upstream and downstream, whether effects are positive or negative would depend on habitat requirements of a given species. Effects minimized by existing ditch geometry and proposed riprap installation design with riffles).
Rating:	-1



Alternative:	
3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	
<u>Resource or Concern</u>	<u>Impact on Resource</u>
Plants and Animals – Threatened (T) and Endangered (E) Species Potential to occur Indiana bat (E) pink mucket (E) rabbitsfoot (T) tri-colored bat (proposed E) monarch, thoughterfly (candidate) Suitable habitat not present gray bat (E) snuffbox mussel (E) western fanshell (T) alligator snapping turtle (proposed T)	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing bat roost trees along banks).
Rating:	-1
Plants and Animals – Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act (at least 15 sensitive migratory bird species including bald eagle)	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing trees along banks).
Rating:	-1
Plants and Animals – Invasive Species	POSITIVE Long Term where armored (seeding of native species) + SLIGHTLY NEGATIVE Short Term (risk of spreading invasives during construction will be minimized by following BMP).
Rating:	+2
Plants and Animals – Riparian Areas	NEGATIVE (loss of vegetation-water interface where armored, increased sedimentation and erosion on surrounding lands upstream and downstream, though minimized by existing ditch geometry and proposed riprap installation design with riffles)
Rating:	-2
Cultural Services	
Plants and Animals – Natural Areas	No change to Natural Areas.
Rating:	0



Alternative:	
3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	
<u>Resource or Concern</u>	<u>Impact on Resource</u>
Human Environment – Socioeconomic, Social and Cultural Issues	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)
Rating:	+3
Human Environment – Recreation	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)
Rating:	+3
Human Environment – Historic and Cultural Resources	POSITIVE where armored (decreased erosion and sedimentation of Cypress Lateral No. 1, which is eligible for the National Register of Historic Places (NRHP). The proposed improvements were determined to be within the original design and function and will not affect eligibility for NRHP. There will be no adverse effect on historic properties. No tribal culturally significant properties were identified).
Rating:	+3
Human Environment – Scenic and Visual Resources	No change to Scenic and Visual Resources.
Rating:	0
Supporting Services	
Human Environment – Public Health and Safety	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)
Rating:	+3
Human Environment – Potable Water Supply (in the area, this is sourced primarily from groundwater)	Same as Groundwater Quality
Rating:	+3



Alternative:	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)
<u>Resource or Concern</u>	<u>Impact on Resource</u>
Human Environment – Energy	POSITIVE where armored (less regular use of equipment for bank stabilization) + SLIGHTLY NEGATIVE (some continued use of equipment to maintain ditches) + NEGATIVE (use of equipment during installation)..
Rating:	+2
Total Alternative Rating	+38

¹Ecosystem Service Trade-Off Rating Symbology for Impact: 0 = Little to no impact; 1+ = minor benefit, long- or short-term; 1- = minor impact, long- or short-term, not requiring mitigation; 2+ = moderate benefit, temporary or permanent duration, benefit not resulting in major benefit; 2- = moderate impact, long- or short-term duration, replaceable or restorable action with mitigation measure; 3+ = major benefit, long-term or permanent duration, improve service enough to change status [e.g. removing waterbody from the 303(d) list of impaired waters]; 3- = major impact with long-term or permanent effect, significantly controversial action, result in loss of life or unmitigable impact, does not meet Federal Objective.

Major Conclusions

The preferred alternative is to armor drainage ditches with a design life of 50 years. The meets the Purpose in that it provides the surrounding agricultural land and infrastructure with flood control.

Areas of Controversy

No areas of controversy were identified.

Issues to be Resolved

No issues to be resolved were identified.

Evidence of Unusual Congressional or Local Interest

No evidence of unusual congressional or local interest was identified.

Compliance Certification

Is this report in compliance with executive orders, public laws, and other statutes governing the formulation of water resource projects? Yes X No .

1. INTRODUCTION

The Stoddard County Circuit Court Drainage Ditch District 12 (DD12) in Southeast Missouri is proposing a flood prevention project in the Lick Creek and Dudley Main Ditch Watershed. This Proposed Action qualifies as a Watershed and Flood Prevention Operations (WFPO) project under the authority of the Watershed Protection and Flood Prevention Act (Public Law (PL) 83-566). According to the *Preliminary Investigation Feasibility Report (PIFR) for the Lick Creek and Dudley Main Ditch Watershed Project*, prepared by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) in 2022, DD12 has the following specific goals as project Sponsor (NRCS 2022a).

- Protect streambanks in the drainage system in the most vulnerable locations.
- Implement solutions to better protect the watershed from soil erosion.
- Implement the use of native warm season grass and forbs for infrastructure, soil erosion, maintenance, and wildlife benefits.
- Remove accumulated sediment to restore the drainage system's capacity to its original design function.
- Develop a holistic plan to better manage runoff and drainage.

1.1. Planning and Assessment Framework

The purposes of this Draft Watershed Plan – Environmental Assessment (Plan-EA), as required by NRCS's 2018 the *National Watershed Program Manual (NWPM)* and based on the National Environmental Policy Act (NEPA) and other relevant laws, are to:

- Characterize the affected environment by quantifying social, cultural, economic, and environmental conditions;
- Describe all alternative solutions considered;
- Describe and assess the environmental impacts of all alternatives in comparative form;
- Describe the extent to which each alternative achieves the stated purpose and need; and
- Set forth the arrangements and responsibilities for financing, installation, and operation and maintenance.

This Plan-EA also includes evaluation of the Proposed Action under the Principles, Requirements, and Guidelines (PR&G) (USDA 2017) for federal water resource investments, pursuant to the Water Resources Development Act of 2007. The PR&G directs how federal agencies plan and evaluate federal water resource investments by taking into account the following.

- The **Federal Objective** specifies that federal investments in water resources 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** constitute the overarching concepts the Federal government seeks to promote when investing in water resources. The six principles are Healthy and

Resilient Ecosystems, Sustainable Economic Development, Floodplains, Public Safety, and Watershed Approach. Descriptions can be found in **Appendix D, Section 1**.

- The **General Requirements** of the PR&G are intended to support transparency in how public benefits and costs are weighed in the decision-making process. The requirements include using an ecosystem services framework, best available science, and multi-stakeholder collaboration; identifying, describing, and considering areas of risk and uncertainty to include future land use, and adaptive management; accounting for the availability and efficient use of water supplies; and formulating and assessing alternatives to include nonstructural approaches. The General Requirements supplement, but do not replace, requirements that are specified in NEPA and other relevant laws. The NEPA process should be integrated with use of the PR&G to facilitate the production of a single decision document that satisfies both processes.

According to Executive Order 14173, Environmental Justice has been removed from consideration in this Plan-EA and Appendices. Climate change has also been removed from consideration following guidance from NRCS Headquarters.

1.2. Project Background

The DD12 is approximately 10-15 miles long (north to south) by 5 to 15 miles wide (east to west) and resides in Stoddard County, within the “bootheel” region of southeast Missouri. Before the early 1900s, the area received floodwater from the Mississippi River and runoff from the Ozark foothills. Historical flooding events resulted in extensive deposition of nutrient-rich and fertile soil. In pre-settlement U.S., the bootheel was a nearly uninhabitable swamp covered with timber. Missouri acquired the land under the Swamp Land Act of 1850, which provided a vehicle for reverting title of federally owned swamp land to states that agreed to drain the land and convert it into agricultural use (NRCS 2022a).

DD12 was organized in 1909 for the purpose of draining land to provide opportunities for agricultural use. The DD12 drainage project is a series of constructed ditches (nearly 90 miles) built in the early 1900s.

The DD12 has provided many benefits to southeast Missouri’s agriculture. Land, both within and outside of DD12’s jurisdiction, that was once 95-percent covered with floodwater and trees currently accounts for one-third of Missouri’s agricultural income. Many roads developed during construction of the drainage system are now the region’s transportation network. The drainage system continues to play an important role during times of flooding, reducing the risk that farming activities will be interrupted, delayed, or prevented (thereby causing loss of farm income), and lowering the potential for flooded roadways to inhibit commercial activity, emergency services, and residential traffic (NRCS 2022a).

Since the ditches were constructed, however, water from adjacent farmland has been transporting silts, loams, and sands to the DD 12 drainage system. This accumulated sediment has reduced the drainage system’s capacity, thereby diminishing its ability to manage floodwater. In addition to sheet, rill, and gully erosion, the ditch banks have been eroding themselves. The banks of ditches



in the watershed are now steeper than other areas and experiencing erosion from high water flow velocities.

The aging infrastructure of the drainage system poses a risk of failure that could lead to loss of life, property damage, and disruption of public services for communities in the watershed. As the drainage system becomes less effective at managing floodwater, the flooding events themselves continue to degrade the system and contribute to ditch bank slope failures. This risk was realized in 2011 when a breach of the adjacent watershed, Lower Caney Basin, caused flooding that impacted farmland and local infrastructure. Given the importance of agricultural crop production to the region's economy and the increasing intensity of storms, measures are needed to improve ditch infrastructure and protect farming operations.

1.3 Affected Resource Area

An Affected Resource Area (ARA) is defined as the geographic area within which an undertaking may cause direct or indirect impacts on the landscape. The ARA includes the new or rehabilitated watershed infrastructure and associated downstream areas plus any access roads and the areas to be used for construction, borrow, fill, and/or temporary storage.

The ARA for this Project covers the 100,448-acre Lick Creek and Dudley Main watershed, which has a Hydrologic Unit Code (HUC) at the 10-digit level (0802020302 and 0802020304) (**Appendix B, Figure 1-1**). For the purposes of this Plan-EA, these watersheds are hereafter referred to as "the ARA" or simply as "the watershed," unless otherwise noted. DD12's jurisdiction lies with the watershed in Stoddard County.

Within the ARA, the 777-acre Project Area (PA) coincides with the area surrounding the ditches proposed for improvement (**Appendix B, Figure 1-2**).

Within the PA, the Area of Potential Effect (APE) was identified. Engineering and WOTUS/TE site visits looked within the Project Area at ditches owned and operated by the Sponsor for problems to address regarding improving watershed conditions. This method established potential alternative improvement locations, and thus the initial APE. Through National Historic Preservation Act (NHPA) Section 106 consultation, the APE was further refined to 392 acres to include access and staging areas that could be affected by the alternatives, as well as areas considered for potential visual and other effects to cultural resources.

2. PURPOSE AND NEED FOR ACTION

2.1. Purpose

The purpose of the Proposed Action is to implement measures along the Lick Creek and Dudley Main watershed ditches and tributaries to provide flood damage reduction for agricultural lands and infrastructure, including areas downstream of the watershed. The measures are intended to address all three general purposes outlined in Section 1 of PL 83-566 by: (1) reducing damage from erosion, floodwater, and sediment; (2) furthering the utilization and disposal of water; and (3) furthering the conservation and proper utilization of land. The Proposed Action will benefit local farmers as well as landowners and communities within the watershed.

2.1.1. Objectives

Planning objectives reflect the desired outcomes of a watershed planning process. The objectives are determined through the scoping process, which involves consultation with agencies, the public, and other stakeholders (see Section 3).

NRCS and the Sponsor propose to fulfill the Project purpose by identifying the most economically, socially, and environmentally acceptable means of achieving the following objectives.

- Objective 1: reducing damage from erosion, floodwater, and sediment.
- Objective 2: furthering the utilization and disposal of water.
- Objective 3: furthering the conservation and proper utilization of land.
- Objective 4: improving an existing drainage system to serve cropland.

2.1.2. Constraints

Constraints are factors that restrict the ability to achieve the Project's objectives or to meet the Federal Objective. These factors may be environmental, economic, social, or cultural. This Project faces the following constraints.

- Constraint 1: The Project needs to avoid adverse impacts on emergency access and transportation routes.
- Constraint 2: The Project needs to avoid adverse impacts to downstream homes.
- Constraint 3: This Project needs to avoid impacts that would harm agricultural land or cause significant changes in land use.

2.2. Need

The Proposed Action is needed to address flooding and flood damage to an aging infrastructure that is increasing. Water from adjacent farmland has been transporting sediment to the DD12 drainage ditches for around a century. The sediments have accumulated over time and have reduced the drainage system's capacity and ability to prevent flooding. Specifically, the banks of Dudley Main Ditch, Lick Creek Ditch, and Cypress Lateral No. 1 are experiencing erosion from high water flow.

Aging infrastructure poses a risk of failure that could lead to loss of life, property damage, and disruption of public services for communities in the watershed. As the drainage system has aged and become less effective at preventing floods, the flooding events themselves continue to degrade the system, contributing to failures of ditch bank slopes. The drainage ditches overflow and flood adjacent cropland, resulting in harvest interruptions, prevented plant acres, and loss of farm income. Given the importance of agricultural crop production to the region's economy and the increasing intensity of storms due, measures are needed to improve ditch infrastructure and protection of farming operations.

2.2.1. Problems

Soil erosion water quality and management, and flooding are the primary resource concerns for this project. Historically, the native vegetation was removed from the landscape as lumber companies logged the area and sold the undeveloped land. The soils were saturated until drainage infrastructure was installed in the early 1900s. Native vegetation along riparian areas and drainage ditches is lacking and contributes to resource concerns in the area.

Sediment travels to the drainage ditches from sheet and rill erosion off adjacent crop fields, gullies that are formed from elevation differences, and erosion from banks due to stream channelization. This contribution of sediment to the drainage system reduces its capacity to move water effectively offsite. Sediment erosion has caused the accumulation of sediments in the drainage ditches, thereby reducing the water holding capacity and drainage efficiency. The soils of the project area are generally poorly drained, and without effective managed draining can have excessive ponding that reduces plant vigor and productivity. Saturation of drainage banks causes in-channel sloughing that further contributes to sediment contamination.

Sedimentation also impacts the functionality of the drainage system as it reduces the storage capacity and ability to drain water. Aging infrastructure poses a risk of failure that would affect property, public services, and could result in potential loss of life. This risk was realized in an adjacent watershed in 2011 when a breach of the Lower Caney Basin caused flooding.

2.2.2. Opportunities

The Sponsor's goal is to make improvements to the drainage system through renovations of existing infrastructure and investing in new infrastructure in the project area, which will result in benefits to local communities and landowners. Funding from PL 83-566 complements land treatment conservation practices that are offered through other federal initiatives that are currently not addressing the resource concerns. This funding provides the opportunity to address critical concerns with the drainage system at the scale required to be effective.

About 422 acres (54 percent) of the Project Area is classified as Prime Farmland, Prime Farmland if Drained, or Farmland of State Importance. Agriculture, particularly soybean production, is critical to the economy within the area with approximately 673 acres (87 percent) of the Project Area classified as cropland or grassland.

The project provides the opportunity to protect streambanks in vulnerable areas, remove sediment to restore the drainage system to its designed function, and improve flood control



infrastructure. It could also filter overland flow, slow runoff, reduce soil erosion, and improve wildlife habitat. Other opportunities include improving conditions for planting, growing, and harvesting crops, thereby increasing land values through drainage improvements.



3. SCOPE OF THE ENVIRONMENTAL ASSESSMENT

3.1. Purpose of Scoping and Methods

Scoping is used to identify the issues relevant to defining the problems and formulating and evaluating the alternative solutions in an environmental assessment. Significant issues are analyzed in detail in subsequent sections of the Plan-EA. Scoping issues that were considered but determined not to be significant were eliminated from detailed study, as explained below.

The Project planning team conducted scoping efforts to identify economic, environmental, cultural, and social issues of importance in the watershed and areas of potential effect associated with the Proposed Action. Input from the Stoddard County Circuit Court Drainage Ditch District 12, interested agencies, and local residents was collected and documented through correspondence and public meetings. An interdisciplinary planning team with experts in engineering, hydraulics, biology, economics, resource conservation, water quality, soils, archaeology, and geology identified factors that have the potential to affect soil, water, air, plants and animals, and the human environment.

NRCS submitted stakeholder participation letters to pertinent tribal, federal, state, and local officials to request input on the Project and announce the Project's first interagency meeting on October 26, 2023. The Project's initial public participation meeting was held on the same date. Notice of the public meeting was published twice in the *Dexter Statesman*. The objective of the meetings was to discuss the problems and opportunities associated with the Project and solicit feedback to identify topics and specific concerns to be investigated during the Plan-EA development.

NRCS sent a second round of stakeholder participation letters on September 10, 2024, to announce the second public meeting, held on September 30, 2024. Notice of the public meeting was also published twice in the *Dexter Statesman*. The purpose of the meeting was to provide details of the flood reduction alternatives under consideration.

3.2. Scoping Concerns: Natural Resources and the Human Environment

Table 3-1 summarizes the results of the scoping process for this Project. The table is organized according to the standard NRCS list of scoping considerations in five categories: soil, water, air, plants and animals, and the human environment. The concerns indicated in the table as 'Relevant to Proposed Action = Yes' are addressed more fully in Section 4 (Affected Environment). Concerns where 'Relevant to Proposed Action = No' are not discussed further.

Table 3-1. Resource and Human Environmental Concerns Identified During Scoping

Concern	Relevant to Proposed Action?	Rationale
Soils		
Erosion and Sedimentation	Yes	Sedimentation of drainage ditches has been documented, as ditch banks are sloughing and previously removed sediment is eroding into

Concern	Relevant to Proposed Action?	Rationale
		ditches leading to deposition of sediment in the ditches and areas downstream.
Prime and Unique Farmland and Farmland of Statewide Importance	Yes	The current floodwater management leads to ditch bank erosion which head-cuts into and threatens prime and unique farmland and farmland of statewide importance.
Water		
Floodplain Management	Yes	The ditches in the Project Area are in Federal Emergency Management Agency flood hazard zone A, within the 100-year floodplain. The system's ability to lessen the effects of flooding on adjacent farmland and communities is negatively affected by sediment accumulating in ditches.
Waters of the U.S. (Streams, Lakes, and Wetlands)	Yes	Streams (ditches) are negatively impacted by sedimentation from uplands and ditch banks. Project Area contains streams (ditches) and wetlands.
Surface Water Quality (CWA)	Yes	Surface water quality is affected by sedimentation in ditches from uplands and ditch banks. Good or unknown condition; none are listed on Missouri's 2020 303(d) list of impaired waters.
Surface Water Quantity	Yes	The Project Area is subject to excess surface water and requires ditch functioning drainage ditches to minimize flooding concerns.
Groundwater and Sole Source Aquifers	Yes	Although the water table and groundwater levels are regionally stable, groundwater quality is negatively affected by excess surface water from flooding, which leads to ponding in crop fields and increased transportation of nutrients/pathogens into shallow groundwater. Sole source aquifers were not identified in the watershed.
Regional Watershed Management Plans	Yes	The state Missouri Water Resources Plan includes information and strategies for the region in which the Project is located.
Wild and Scenic Rivers	No	Wild and scenic rivers are not present in the watershed.
Coastal Zone Management Areas	No	The Project Area is not located in a coastal zone management area.

Concern	Relevant to Proposed Action?	Rationale
Air		
Air Quality (Clean Air Act)	Yes	No counties within the Project Area are listed as nonattainment areas for air quality (for 2015 standard). The ditch dredging can lead to short-term negative effects on air quality.
Plants and Animals		
Fish and Wildlife Habitat and Conservation	Yes	The watershed does not contain Essential Fish Habitat. The potential for fish and wildlife habitat within the Project Area is very limited as the area is already highly disturbed by normal ditch maintenance.
Threatened and Endangered Species	Yes	Seven federal and seven state listed species have the potential to occur within the Project Area, according to the U.S. Fish and Wildlife Service (USFWS) and the Missouri Department of Natural Resources (MODNR).
Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act	Yes	The Project is within the Mississippi Flyway, and migratory birds and bald eagles have been observed in the Project Area. Because the Project Area currently provides very limited wildlife habitat, potential disturbance of wildlife will be a minor issue.
Invasive Species	Yes	At least two invasive plant species were identified in field visits.
Natural Areas	Yes	MODNR has identified 2 Conservation Areas and 2 Conservation Opportunity Areas within the watershed.
Riparian Areas	Yes	Riparian areas along the ditches are minimal and highly disturbed by normal ditch management.
Coral Reefs	No	Coral reefs do not exist in the watershed.
Human Environment		
Socioeconomic Issues	Yes	Flooding damages agricultural lands and impacts communities socially and economically by disrupting access to essential services and roadways during flood events.
Recreation	Yes	Seasonal hunting occurs within the watershed primarily on Conservation Areas. Flooding caused by the current level of sediment in the

Concern	Relevant to Proposed Action?	Rationale
		ditches negatively affects seasonal hunting activities and other recreation.
Public Health and Safety	Yes	The current infrastructure is vulnerable to failure, and poses a risk of property damage, disruption of public services, and potential loss of life. Ponding, flooding, and other drainage challenges also lead to mosquito production, increasing the vectors for mosquito-borne illnesses.
Potable Water Supply	No	The Project Area includes 2 drinking water wells, 3 tanks, and no intakes.
Historic and Cultural Resources	Yes	The architectural site, 23SO1657, consists of Cypress Lateral No. 1. NRCS Missouri determined that this site is eligible for listing on the NRHP under Criterion A for its importance to agriculture, community planning and development, and social history. The ditch was constructed around 1915 and is part of the extensive drainage system of southeast Missouri, which is considered an engineering feat. The period of significance for 23SO1657 is 1915-1974. Phase I Archaeological Survey of the ditches were negative for the presence of cultural materials or historical or archaeological sites. Therefore, the survey did not identify any historic properties aside from ditch system (23SO1657) itself. Actions associated with this undertaking represent a continuation of historical activities related to the general upkeep of the drainage ditch system. Therefore, this undertaking will not pose an adverse effect on the significance or integrity of the system. Due to the purpose of the ditch and continuation of functional activities associated with the present undertaking, the NRCS recommends a finding of No Adverse Effect to Historic Properties for the proposed project, per 36 CFR 800.5. This finding has been presented to the Missouri SHPO, the Quapaw Nation, the Osage Nation, Absentee-

Concern	Relevant to Proposed Action?	Rationale
		Shawnee Tribe of Oklahoma and Eastern Shawnee Tribe of Oklahoma; with the Missouri SHPO and Quapaw Nation in concurrence with the finding.
Energy	Yes	Irrigation in the watershed is primarily gravity fed, but pumps are used to bring water to the surface and also to remove excess water from crop fields when necessary. Water resources in the watershed are not used to generate energy for human use. Energy efficiency is not part of the Project.
Scenic and Visual Resources	No	Not applicable as the Project Area possesses little scenic or visual resources identified during scoping.

3.3. Scoping Concerns: Ecosystem Services

Environmental assessment has traditionally been approached from the perspective of impacts on specific resources, as in **Table 3-1**. More recently, the concept of ecosystem services has emerged as a way of framing impact assessment. An ecosystem is made up of plants, animals, and other organisms that interact with components of their physical environment (i.e., resources), including soil, air, and water. An ecosystem services framework simply reframes the assessment by considering: (a) how the combination of resources relevant to a particular environment provides benefits to people; (b) how those benefits will be impacted by a proposed action; and (c) how negative impacts can be minimized.

The benefits that ecosystems provide to people are generally grouped into four categories (MEA 2005).

1. **Provisioning** services provide tangible goods that humans use and consume, such as food, fiber, water, timber, and biomass.
2. **Regulating** services maintain a world in which it is possible for people to live, providing critical benefits such as flood and disease control, water filtration, and crop pollination.
3. **Cultural** services provide non-material intangible benefits that support well-being of communities and the quality of life through opportunities for recreation, spirituality, scenic views, and other ways of connecting with nature.
4. **Supporting** services refer to the underlying processes maintaining conditions for life on Earth, including nutrient cycling, soil formation, and primary production.

The Proposed Action affects or is affected by ecosystem services in all four categories. Provisioning, Regulating, Cultural and Supporting services are addressed more fully in Section 4 (Affected Environment). Supporting services are not discussed further; this category underpins the other three and does not contribute any unique considerations relevant to the Project.

Table 3-2 shows how the relevant concerns from **Table 3-1** relate to the three categories of ecosystem services carried forward for discussion. Changes in ecosystem services as a result of the Proposed Action can be positive or negative.

Table 3-2. Crosswalk of Ecosystem Services to Natural Resources and the Human Environment

Ecosystem Services Category	Specific Ecosystem Services Involved in the Project	Related Concerns from Table 3-1
Provisioning	Food and fiber production occur in the watershed and could be impacted by changes in flood management. Water is a critical need and concern for agriculture, which is the majority land use in the watershed and Project Area.	Soil: Food and fiber production depend on suitable farmland, for which Prime Farmland and Farmland of Statewide Importance are designators. Erosion and Sedimentation affect and are affected by agricultural activities.
		Water: Waters of the U.S., Surface Water Quality, and Surface Water Quantity are all involved in water use and management as it relates to food, fiber, and biofuel production
Regulating	Flood control is the main purpose of the Proposed Action.	Soil: Erosion and Sedimentation are documented issues, and addressing their role in flooding is part of the Project purpose.
		Water: Waters of the U.S., Surface Water Quality, Surface Water Quantity, Floodplain Management, and Groundwater are all inherently involved in flood control. Regional Water Resource Management Planning also plays a role.
		Air: Air Quality may be temporarily impacted by the Proposed Action.
		Plants and Animals: Vegetated areas play different roles in flood control, depending on their characteristics. Flood regimes, in turn, impact plant and animal habitats. Invasive species affect habitat quality. Accordingly, Habitat – especially for pollinators, where vegetation may also play a role in flood control – as well as Threatened and Endangered Species, Migratory Birds, Invasive Species, and



Ecosystem Services Category	Specific Ecosystem Services Involved in the Project	Related Concerns from Table 3-1
		Riparian Areas all have a potential connection to flood control.
		Human Environment: Socioeconomic Issues, and Public Health and Safety are all considerations in flood control planning. Increasing storm intensity is affecting the need for and methods of flood control. Potable Water Supply may be affected by flooding.
Cultural Provisioning	The ditch and surrounding area provide non-material intangible benefits to the local community through opportunities for recreation such as hunting. Food and fiber production occurs in the watershed and could be impacted by changes in flood management. Water is a critical need and concern for agriculture, which is the majority land use in the watershed and Project Area.	Human Environment: Recreation would be affected by the Proposed Action. The drainage system's history is connected to Historic and Cultural Resources.
		Soil: Food and fiber production depend on suitable farmland, for which Prime Farmland and Farmland of Statewide Importance are designators. Erosion and Sedimentation affect and are affected by agricultural activities.

4. AFFECTED ENVIRONMENT

4.1. Planning Evaluation Methods

The planning team reviewed geological, engineering, and flood-related reports and conducted engineering analysis, GIS analysis, biological surveys, cultural resource reviews, and economic analysis to characterize the existing environment. The first selections below describe elements of the Project setting that were not introduced in Section 3 (Scoping). Following Section 4.2 (Project Setting), existing conditions for Natural Resources and the Human Environment are described in Section 4.3 (in order corresponding to **Table 3-1**) and for Ecosystem Services in Section 4.4 (in order corresponding to **Table 3-2**).

4.2. Project Setting

4.2.1. Location

The watershed, at 10 to 15 miles long (north to south) and 5 to 15 miles wide (east to west) includes about 75% agricultural lands and stretches across Stoddard County in southeastern Missouri. The center of the watershed, near Dexter, MO is about 125 miles south of St Louis, MO, about 185 miles east of Springfield, MO, about 115 miles north of Memphis, TN and about 185 miles west of Nashville, TN (**Appendix C, Figure 1**).

4.2.2. Climate

The climate in southeastern Missouri is generally characterized by hot humid summers and cool wet winters. The variables of temperatures, precipitation, and snowfall can range greatly from one year to the next. In the summer, temperatures reach 90 or more degrees Fahrenheit; in the winter, temperatures typically fall as far as 20 degrees Fahrenheit. The coldest average temperatures are in January, and the warmest temperatures are in July. Southeastern Missouri's average annual total precipitation is 50 inches, which includes an average annual snowfall of 8 to 12 inches. The average growing season lasts 250 days. Major cyclonic storms occur from March to June, causing regional flooding. Short-duration intense storms occur during the growing season, causing severe local flooding (MOCC 2024).

4.2.3. Topography

The topography of the Project Area is a broad, flat floodplain with gentle undulations dissected by drainage ditches. Crowley's Ridge on the eastern portions of the watershed is a significant landscape feature that provides topographic relief. Surface elevations in the watershed are generally below 400 feet mean sea level (msl), though the elevation is as high as 550 msl in some areas on Crowley's Ridge (MODNR 2002, MODNR 2024b) (**Appendix C, Figure 2**).

4.2.4. Geology

Bedrock in the watershed generally ranges from 25-200 feet deep (MODNR 2023). Most of the surficial geologic composition of the watershed is either alluvium or loess. The alluvium is comprised of clay, silt, sand, and gravel of the Quaternary System of the Holocene Series while the loess is comprised of various sands, clays or gravels of the Tertiary System of either the Pliocene, Eocene or Paleocene Series (Middendorf 2003). The classification system describes the Land Resource Region in which the watershed is located as the South Atlantic and Gulf Slope Cash Crops, Forest, and Livestock Land Resource Region and consists of the Southern

Mississippi Valley Loess Major Land Resource Areas. Below the loess mantle, which can be up to 75 feet thick in places, are Tertiary and Quaternary fluvial deposits on top of marine sediments (NRCS 2022b).

4.2.5. Land Use and Land Cover

Land use and land cover within the watershed and Project Area were estimated using the U.S. Geological Survey (USGS) National Land Cover Database (NLCD) (USGS 2021), aerial photography, and field observations. Acres and percentages are in **Appendix D, Table D2-1**.

Within the ARA, cultivated crops are the primary NLCD cover type, comprising 60 percent of the watershed and are expected to continue in agricultural use. Hay/pastureland and deciduous forest are the second- and third-most prominent cover types in the watershed (14.7 and 10.5 percent respectively). Because cropland accounts for 60 percent of land use in the ARA, the Project meets the PL 83-566 requirement that agriculture and rural communities must account for at least 20 percent of total project benefits (NRCS 2018). The remaining cover types include developed land and woody wetlands (**Appendix C, Figure 3a**).

The proposed Project Area, at 86 percent cultivated cropland as the NLCD cover type, is comprised of ditch and levee banks with a small buffer of land from the top of the bank slope outward (**Appendix C, Figure 3b**). Scattered trees and small forest stands exist along the Project corridor; however, these areas are generally outside of the herbaceous riparian corridor.

4.3. Existing Conditions: Natural Resources and the Human Environment

The following section describes the existing conditions of natural resources and aspects of the human environment that were identified as relevant during scoping (see **Table 3-1**).

4.3.1. Soils

The dominant soils in the region are Alfisols (suborder Udalfs), Vertisols (suborder Aquerts), and Entisols (suborder Aquents). These soil orders and suborders were generally derived under forest vegetation and are characterized by periods of prolonged saturation and poor drainage.

Most of the soils in the project area have a silty alluvium, alluvium, or clayey alluvium parent material. The soils are very deep, dominantly poorly drained, somewhat poorly drained, and dominantly loamy or clayey. Without managed drainage, both in individual fields and the regional system, excess water ponding and flooding results (NRCS 2022a). See **Appendix D, Table D3-2** for soils information and **Appendix C, Figure 4** for mapping.

Erosion and Sedimentation

Erosion and sedimentation of drainage ditches is occurring from within the channel and overland flow and has been a prominent issue in the ARA since the ditches were built. Water is the primary erosive force on the soils in the watershed. However, wind erosion is rated at moderate levels for most of the soils in the ARA (NRCS 2024a to 2024c). Wind Erodibility Index (WEI) values range from 48 to 56 for the soils in the watershed, except for a minor inclusion of Bosket, Lilbourn and Deanburg that have a WEI of 86 and Eustis-Memphis complex that has a WEI of 250.

Many soils in the Project Area including Amagon, Falaya, Zachary and Levees-Borrow Pits Complex are rated as high to very high runoff class meaning they are prone to the sheet and rill erosion evidenced on the landscape (NRCS 2024a to 2024c). Additionally, as water flows to the ditches from crop fields and off the bank areas piled with previously removed ditch sediment, the banks become saturated and slough into the channel. Where concentrated runoff occurs from these flows, gully head cuts are forming as the crop fields meet the edge of the drainage ditch and increase erosion. The lack of conservation practices such as reduced tillage, cover cropping, riparian buffers, and introducing crops with higher conservation value contributes to erosion concerns as there is more exposed soil in the farming systems and less ability of the landscape to filter the erosion that is occurring. This erosion causes sedimentation in the drainage system, which reduces its drainage capacity and transfers sediments downstream (NRCS 2022a).

Prime and Unique Farmland and Farmland Soils of Statewide Importance

NRCS classifies soil map units based on soil characteristics that are best suited to growing food, feed, fiber, forage, and oilseed crops. Of the 100,448 acres in the ARA, 51 percent are classified as prime farmland, prime farmland (if drained), and farmland of statewide importance (**Appendix C, Figure 5a through h and Appendix D, Table D3-4**).

4.3.2. Water

Floodplain Management

The Project Area is mapped as flood hazard zones A by FEMA. ‘A’ are high risk areas and at the greatest risk of flooding, mudflow or flood-related erosion with at least a 1 in 4 chance of flooding during a 30-year mortgage (FEMA 2024) (**Appendix C, Figure 6a through k**).

Waters of the U.S. (Streams, Lakes, and Wetlands)

The Project Area includes over 83,564 linear feet (LF) of streams (drainage ditches) and tributaries (**Appendix C, Figure 7 and Appendix D, Table D6-1 and D6-2**). No lakes are in the Project Area, but 73 acres of wetlands are in the Project Area (**Appendix C, Figure 8**).

The ditches flow generally from north to south, starting near the center of the north border of the ARA. Tributary ditches flow generally from west to east or east to west to join the main ditches. Downstream of the ARA, the ditches ultimately join with the St. Francis River and continue into Arkansas before eventually flowing into the Mississippi River (**Appendix C, Figure 9**).

Surface Water Quality (CWA)

Current water quality conditions of the ditches in the Project Area were reviewed through Missouri Department of Natural Resources (MODNR 2020b and MODNR 2022) and U.S. Environmental Protection Agency (USEPA 2024a) resources. The water quality of the ditches is currently either in good or unknown condition. None of the ditches are listed on Missouri’s 2020 303(d) list of impaired waters, though there are several 303d listed waters adjacent to the watershed (**Appendix C, Figure 10**). Given this information, individual review of the project by the Missouri Department of Natural Resources (MODNR) will not likely be necessary for acquisition of the project’s Section 401 Water Quality Certification.

Surface Water Quantity

The Project Area is subject to excess surface water and requires management to minimize flooding concerns. Ponding and flooding are common in the Project Area because poorly drained clay layers within the soil profile cause slow infiltration into subsoil aquifers without well-managed drainage systems (NRCS 2022a).

Overall precipitation is generally adequate but not necessarily in the amounts and at the times needed for agriculture. Managed drainage is required to move excess water, and irrigation is often required to supplement rainfall for crop production to ensure timely moisture availability. According to 2023 data from the USDA Farm Service Agency, approximately 79 percent of all acres planted to annual crops in Stoddard County were irrigated (FSA 2023).

Groundwater and Sole Source Aquifers

The Project is in the Southeastern Lowlands Groundwater Province. The three main aquifers in this region are the Alluvial Aquifer (0-250 feet), Wilcox Aquifer (0-1,400 feet) and McNairy Aquifer (0-600 feet). The Alluvial Aquifer is the primary source for water uses in the region. It has generally good water quality but can have higher concentrations of iron than underlying aquifers. Irrigation pumping from high-capacity wells can have a local drawdown affect, but generally does not lower the water table. This aquifer is easily recharged from the Mississippi River and from precipitation. The Wilcox Aquifer contains more iron and manganese than the McNairy Aquifer, but less than the Alluvial Aquifer. The McNairy Aquifer has high quality water, and wells drilled into this layer are often artesian (MODNR 2021).

Few environmental concerns related to groundwater have been reported in the Southeastern Lowlands Groundwater Province, but contamination from agricultural inputs is a potential threat to consider (MODNR 2021). Uncontrolled flooding leads to ponding in crop fields and increased transportation of nutrients and pathogens into ground water. No Sole Source Aquifers are located within the project watershed (USEPA 2024c).

Regional Watershed Management Plans

There are no regional watershed management plans developed for the Project Area. The MODNR does maintain the Missouri Water Resources Plan. This state plan provides an assessment of water resources for each major region of the state, including physical setting, water use forecast, water supply, drinking water and wastewater funding options, and developing options for future water needs. The Project Area falls within the Southeastern Missouri Region and the Lower Mississippi-St. Francis Subregion (MODNR 2020a).

The Missouri Resources Water Plan notes that water resources in the Southeastern Missouri Region are generally not limiting. Nearly 50 percent of all water consumption in the state occurs in this region. Currently, sources of recharge are greater than consumption. However, groundwater declines have been observed in the Mississippi Delta region in Arkansas. Demands for groundwater are expected to increase 17 percent by 2060 in the Southeastern Missouri Region. The Plan recommends long-term monitoring in Missouri to support ongoing water planning. Additionally, infrastructure is aging, and investment in new infrastructure will be critical to support future growth in the area (MODNR 2020a).

4.3.3. Air

Air Quality (Clean Air Act)

The Clean Air Act (42 USC §§ 7401–7671, as amended) provides authority to the USEPA for the establishment of nationwide air quality standards to protect public health and welfare. National Ambient Air Quality Standards for six pollutants that cause harm to public health and the environment have been established (USEPA 2024b and 2024f). These monitored pollutants are carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), particulate matter (PM), sulfur dioxide (SO₂), and lead (Pb).

The MODNR operates ambient air monitors and reports the data to the USEPA Air Quality System database. The Project site is situated in a largely rural community of cropland and scattered farmsteads. Stoddard County is currently attaining all criteria (i.e., meeting the standards) for air quality regarding particulate matter, greenhouse gases, ozone, and reactive nitrogen (MODNR 2024a). No non-attainment areas have been designated for any of the six pollutants within the Project Area (USEPA 2024e).

4.3.4. Plants and Animals

Fish and Wildlife Habitat and Conservation

Due to extensive historical alteration of land in the watershed, there is far less habitat for wildlife than before the drainage system converted the original extensive swamp system into farmable land. The area does, however, continue to support wildlife including white-tailed deer, coyote, rabbit, gray squirrel, water turtles, water snakes, frogs, otters, beavers, wild turkey, mourning doves, ducks, and geese. The area is also used by migrating birds, especially waterfowl, as an important migratory flyway (the Mississippi Flyway). Fishing is still available but restricted to oxbow lakes, rivers, and bayous. Fish caught in the area include largemouth bass, smallmouth bass, catfish, drum, bluegill, gar, and yellow perch (NRCS 2022a).

Scattered trees in the Project Area exhibit characteristics of potentially suitable summer roosting habitat for the three T&E listed bat species. Should trees exhibiting potential bat habitat need to be cleared as part of the final alternatives, conservation measures should be incorporated by removing these trees in the winter months of November 1 through March 31 (USFWS 2024d).

The St. Francis River, into which the ARA drains, is considered a critical habitat near the Project watershed according to the Missouri Natural Heritage Review Report. The St. Francis River and tributaries is important to several aquatic species of concern, many of which are indicators of overall ditch health and water quality. These species of concern are presumed to occur in suitable habitats in the St. Francis River and tributaries.

Threatened and Endangered Species

An official species list was obtained from the U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool on November 19, 2025 to identify federally threatened, endangered, proposed, and candidate species that may occur in the area. The watershed and Project Area were queried separately. The IPaC results were the same for both queries including three bats (gray, Indiana and tricolored), alligator snapping turtle, two

mussels (snuffbox, and western fanshell) and monarch butterfly. All of the species are Endangered, except for one of the bats (tri-colored, Proposed Endangered), the turtle (Proposed Threatened), and the monarch (a Candidate species and not legally protected). More details on the official species list are in **Appendix D, Tables D6-5 and D6-6**. There were no areas of officially designated Critical Habitat for any species in the IPaC results (see **Appendix A**).

The Missouri Department of Conservation (MODC) provided a Natural Heritage Review Report (NHRR) for the watershed on October 5, 2023. The NHRR indicates that the alligator snapping turtle is located less than one mile from the watershed. In addition, the report specifies that although Indiana and Northern Long-eared bats are not known to occur in the project area, these species should be assumed present wherever suitable habitat occurs (USFWS 2024). The NHRR also noted that two species of state-listed endangered freshwater mussels have been identified near the project site: the pink mucket within three miles, and the rabbitsfoot within two miles. The report also shows that the state-listed endangered American Bittern has been identified within one mile of the project site. The full list of species identified in the NHRR report are detailed in **Appendix D, Tables D6-5 and D6-6**. The NHRR reports are also included in **Appendix A**.

A brief field assessment of potentially suitable habitat for listed species within the Project Area was conducted by a qualified biologist in November of 2023 and described in **Appendix D, Section 5**. Trees exhibiting characteristics of potentially suitable habitat for Indiana, northern long-eared and tricolored bat species were observed within the project area.

Migratory Birds Treaty Act and Bald and Golden Eagle Protection Act

Where applicable, the USFWS IPaC report identifies Birds of Conservation Concern and indicates whether bald or golden eagles may occur in a project area, due to protection of these species under the Bald and Golden Eagle Protection Act. According to the USFWS IPaC report, bald and golden eagles are both known to exist in the watershed. Several bald eagles were noted during field surveys (location undisclosed to protect the species). Other migratory birds protected under the Migratory Bird Treaty Act were identified as potentially occurring in the watershed. See **Appendix D, Table D6-7** for the IPaC list of migratory birds potentially occurring in the watershed.

Invasive Species

A comprehensive list of all invasive species that have the potential to occur in the watershed is difficult to compile, because there are hundreds of species, they involve multiple taxa (e.g., plants vs. aquatic animals), and the designation of “invasive” varies by source. Invasive species have been observed within the Project site during the November 2023 field assessment conducted by a qualified biologist, including at least two of the twelve species designated by the Missouri Department of Agriculture as “noxious weeds” (MODA 2024). For a list of the vegetation observed during the field assessment, including invasive species, see **Appendix D, Table D6-4**.

Natural Areas

MODC and conservation partners have identified priority landscapes and areas that are important for wildlife populations and ecological systems associated with those populations. These areas have been termed Conservation Areas and Conservation Opportunity Areas (COAs) by MODC(2024a). There were four such areas noted in or near the Project Area in an MODNR consultation letter dated October 30, 2023 (**Appendix A**):

- Oak Ridge Conservation Area
- Fisk COA
- Otter Slough Conservation Area
- Otter Slough COA

Natural areas in the watershed are mapped in **Appendix C, Figure 11**.

Riparian Areas

The area of transition between terrestrial and aquatic ecosystems is also known as the riparian area. This Project will focus on riparian floodplains and streambanks (ditches). Historically, the landscape has been heavily altered from a swampy, bottomland hardwood forest to a landscape lacking native riparian vegetation (NRCS 2022a).

4.3.5. Human Environment

Socioeconomic Issues

According to the U.S. Census Bureau (USCB) American Community Survey (ACS), completed in 2019, Stoddard County has a relatively small population totaling to 28,812. Agriculture, at over 80 percent land use in the county, contributes greatly to the Stoddard County economy (USGS 2021). In 2021, agriculture contributed to household income in Stoddard County by 74 percent (MODA 2021, USCB 2022a).

Within Stoddard County, which encompasses the ARA, the average median household income is \$46,052, with 17.2% of households below the poverty level and 18.9% of populations having less than a high school diploma. In comparison, the median household income for Missouri is \$61,847, with 12.7% of households below the poverty level and 8.4% of the population having less than a high school diploma (USCB 2024a-f).

Tables in **Appendix D (Tables D9-1 to D9-6)** provide regional socioeconomic data.

Recreation

The Conservation Areas within or adjacent to the Project watershed include Oak Ridge and Otter Slough. MODC leases or owns these areas for public access. Management objectives include fishing and hunting, and plant communities and wildlife conservation. Recreation areas in the watershed are mapped in **Appendix C, Figure 11**.

Public Health and Safety

Several towns are in proximity to the Project Area. These towns include Dudley, Dexter and Bloomfield. Between these towns there is a network of roads crossing the Project Area. Some of these roads, such as U.S. Highway 60, serve the region as major thoroughfares. Residents in the region depend on these thoroughfares to get to and from schools, jobs, medical appointments,

grocery stores, and other locations providing essential services. During flood events, driving on flooded roads presents a safety hazard to drivers and a health risk to people in need of emergency medical care, due to the potential for delayed response times for emergency medical personnel (NRCS 2022a).

Potable Water Supply

The Project Area includes 2 drinking water wells, 3 tanks, and no intakes. Public Drinking Water Districts in the watershed include (MODNR 2024b):

- Stoddard Co. Public Water Supply Districts #1, #4, and #6

The water table and groundwater levels are regionally stable even through high water usage times, due to recharge from precipitation and the nearby Mississippi River. Wells located near high-capacity irrigation wells may be locally affected during high usage seasons. The groundwater in the alluvial aquifer generally meets the criteria for potable water, but sometimes needs treatment as it contains calcium, iron, sulfate, sodium, and manganese (MODNR 2024c). The Project Area does not include any Sole Source Aquifers (USEPA 2024c).

Historic and Cultural Resources

In December 2023, archival and historical research was conducted for the project area. An archaeological review of literature was conducted to determine if National Register of Historic Properties (NRHP), NRHP districts, or archaeological sites had already been documented in the APE or if any recent disturbances had occurred that may have affected cultural resources. Two archaeological sites have been documented within the APE and an additional eleven sites within the 250-ft radius of the APE. The two sites within the APE included a historic surface scatter and a prehistoric isolated find, but no eligibility determination was on file for either site. A reconnaissance-level historic resources survey was also conducted for historic-age buildings, structures, and site features within the APE. No previously recorded historic structures were identified within or near the Area of Potential Effect (APE). However, one architectural resource, Cypress Lateral No. 1 ditch (23SO1657), was identified and documented during cultural resources investigations for the proposed undertaking.

Cypress Lateral No. 1 (23SO1657) is recommended to be eligible for listing in the **National Register of Historic Places (NRHP)** under **Criterion A** due to its significance in agriculture, community planning and development, and social history. The ditch was originally constructed around 1915 and its period of significance spans from the year of its construction until 1974. It represents part of the larger southeast Missouri drainage system, which is considered an engineering achievement. As such, it may also be eligible under **Criteria C and D**. Since the APE does not encompass the full extent of Cypress Lateral No. 1, Lick Creek, or Dudley Main Ditches, comprehensive surveys required to evaluate these resources under Criteria C and D were beyond the scope of the present investigations.

Undertaking actions of the preferred alternative consist of dredging, armoring existing drop pipe outlets, spreading dredged soils, and broadcast seeding upper levels of ditch and levee with native herbaceous vegetation. These actions are generally considered normal ditch maintenance and would be considered exempt from CWA Section 404 permitting (USACE 2020). However,



USACE would need to review final maintenance plans and concur with this exemption. Any potential ground disturbance impacts will be contained within the existing ditch footprint and will not alter the characteristics that make the ditch a significant cultural feature and eligible to the National Register of Historic Places. Since this undertaking represents a continuation of the regular maintenance that has been required to support the function of Cypress Lateral No. 1 over time and because this maintenance will not significantly change any ditch characteristics, a finding of *No Adverse Effect to Historic Properties* is recommended relative to this resource.

Additionally, Phase I Archaeological Surveys were conducted at the locations of two archaeological sites previously recorded immediately adjacent to the APE. These surveys did not identify cultural materials or features associated with either site within the APE. Based on a visual inspection of the sites' conditions, NRCS recommended that both sites be determined Not Eligible for the NRHP. While the Missouri SHPO agreed that neither site would be affected by the undertaking's actions, they disagreed with the recommendation to find both sites Not Eligible in their concurrence of 6/12/2025.

NRCS completed consultation with Missouri SHPO, the Quapaw Nation, the Osage Nation, Absentee-Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma and Shawnee Tribe. Missouri SHPO concurred with the recommended *No Adverse Effect* finding on 6/12/2025 and the Quapaw Nation provided their concurrence on 6/19/2025. There was no response from the Osage Nation, Absentee-Shawnee Tribe of Oklahoma, Eastern Shawnee Tribe of Oklahoma and Shawnee Tribe.

A summary of the information in the Cultural Resources Report is available in **Appendix D**, while the full report is provided in **Appendix E**.

Energy

Management of water is critical to crop production in the Project Area. Gravity fed irrigation and drainage systems are used when possible, to manage water, but it is not feasible to rely solely on gravity. When gravity fed systems are not sufficient, energy sources are used to pump irrigation water and move excess water from fields (NRCS 2022a).

4.4. Existing Conditions: Ecosystem Services

Table 3-2 showed that scoping concerns from the perspective of natural resources and the human environment can be plugged into the Provisioning, Regulating, and Cultural categories of ecosystem services. The following sections address aspects of the existing conditions for ecosystem services that have not already been addressed in Section 4.3.

4.4.1. Provisioning Services: Agricultural Land & Water Resources

Both food and fiber are produced in the ARA. Soybeans, corn and cotton are among the top commodity crops produced in the watershed, comprising a total of 49 percent of the acres in the watershed in 2023. Corn and soybeans are commonly produced for livestock feed in addition to ethanol and biodiesel. Cotton is produced for human use and some hay for livestock. Rice and specialized crops for direct human consumption are a minor portion of the crops produced in the watershed (NASS 2024).

The drainage infrastructure provides flood protection for nearly 60,000 acres of cropland in the watershed. Farms in the watershed counties average 655 acres in size (NASS 2022).

4.4.2. Regulating Services: Flood and Disease Control, Water Filtration

The watershed ecosystem is not providing effective flood control in the watershed, due to several types of anthropogenic change on the landscape. The primary change has been the large-scale conversion of swampland to agricultural use in the region. The managed drainage system provides some flood control services, but as the infrastructure has aged, it has become less able to regulate water quantities, water flow, erosion, and sedimentation.

Additionally, most of the drainage ditches are devoid of vegetation that helps to filter sediment, nutrients, and agricultural contaminants in runoff from adjacent cropland. The use of soil health practices that improve water filtration (such as cover crops, conservation crops, and reduced tillage) is also not widespread in the watershed.

4.4.3. Cultural Services: Recreational Opportunities

Hunting plays a role in the heritage of Missouri as well as in the economy. According to a grassroots partnership of organizations called Hunting Works for Missouri, over half a million people hunt in the state each year and spend approximately 10 million days doing so (HWMO 2024). Southeast Missouri is particularly known for waterfowl hunting (SMSG 2024). There are four Conservation Areas established by the MODC within or immediately adjacent to the project watershed. Hunting is among the land uses encouraged in these areas, but other forms of recreation such as fishing and hiking are also popular. More information on these areas can be found in **Section 4.3**. Additionally, the City of Dexter maintains Dexter Lake, an 11-acre handicap accessible fishing lake, located in downtown Dexter (City of Dexter, 2024).

4.5. Existing Conditions: Drainage Ditches

The ditches of the DD12 are integral infrastructure within the regional drainage system in support of annually planted cropland agriculture. The level, uniform landscape consists of cultivated crop fields which are highly manipulated with graded field slopes, lateral field ditches feeding main drainage ditches, berms, irrigation infrastructure, and pump systems. The drainage ditches generally have a bottom width of 10-50 feet and a depth of 8-23 feet. Primary crops grown include soybeans, corn, rice, cotton, and peanuts. Farming practices often occur generally to the top edge of the drainage ditches. The Project Area is in the central corridor of the DD12 and is a subunit of this drainage district, involving 14.6 miles of DD12 ditches (NRCS 2022a).

4.5.1. Status of Operation and Maintenance

The DD12 manages this drainage system to ensure agricultural landscape resilience and to benefit downstream watersheds. The DD12 has completed operation and maintenance of ditches within the district since construction completion, including regular inspection of the system, mowing, brush control and bank repair (NRCS 2022a).



4.5.2. Structural Data

Based on visual inspection of the drainage ditches and detailed discussions with the sponsor, several works of improvement are needed to obtain fully functional water conveyance and reduce the risk of future erosion along the ditch banks:

- Stabilization of banks through armoring and appropriate geometry modification.
- Reducing headcutting through grade stabilization along Cypress Lateral 1 for 10,690 linear feet.
- Armoring of pipe outlets.
- Removal of woody vegetation obstructions.

4.5.3. Non-Structural Data

Sediment, nutrients, and pesticides are present in the ditch water due to land use and ditch condition.

- Addition of wetland treatment for upstream flows to maintaining or improving water quality.

5. ALTERNATIVES

5.1. Formulation Process

The NWPM (NRCS 2014) requires that all reasonable alternatives that address the purpose and need for action must be presented in the Plan-EA, including those not within the program authorities of the NRCS and those not preferred by sponsors.

For watershed project plans involving flood control, consideration must be given to nonstructural measures, which reduce susceptibility to flood damage without significantly changing the depth or extent of flooding. Such measure may include:

- floodproofing of structures;
- floodplain regulation and acquisition;
- floodplain warning systems: or
- use of vegetation.

As required by PR&G (USDA 2017), alternative plans were formulated with consideration of the Guiding Principles (see Section 1.1) and the criteria of completeness, effectiveness, efficiency, and acceptability. These criteria are described below.

- *Completeness* is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects. This may require relating the plan to other types of public or private plans if the other plans are crucial to the realization of the contributions to the objective.
- *Effectiveness* is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.
- *Efficiency* is the extent to which an alternative alleviates the specified problems and realizes the specified opportunities at least cost.
- *Acceptability* is the viability and appropriateness of an alternative from the perspective of the general public and consistency with existing Federal laws, authorities, and public policies. It does not include local or regional preferences for particular solutions or political expediency.

The Project team developed four alternatives: a No Action/Future without Federal Investment (FWOFI); two Structural Alternatives; and one Non-structural Alternative. Alternative 3, a Structural Alternative, was identified as the NRCS and Locally Preferred Alternative.

5.2. Alternative 1: No Action – Future without Federal Investment (FWOFI)

The FWOFI alternative describes the most likely future condition if the NRCS were to take no action. It describes what is most likely to happen in the absence of any developed federal alternative or changes in law or public policy. The FWOFI is used to compare other alternatives to determine the magnitude of benefits and adverse effects. Clearly describing the FWOFI condition provides the reference point necessary for evaluating changes caused by the alternatives. The FWOFI alternative may contain flaws, violate a law, or fail to meet the project purpose and need, but it must still be developed as a comparison.

Without federal investment, Lick Creek and Dudley Main and tributary ditches in the more than 100-year-old drainage system would continue to deteriorate and experience reduced capacity for water conveyance and flood control. The Sponsor would continue their annual maintenance activity within the LCDM system of bank mowing.

For the drainage ditches in the Project Area (stretches of Cypress Lateral Number 1, Lick Creek, and Dudley Main Ditch), the banks would continue to erode. Additionally, Cypress Lateral Number 1 would continue to head cut worsening the rate of bank erosion and further threatening the adjacent county road.

5.3. Alternative 2: Structural Alternative

This alternative for area 3b would involve the creation of a permanent wetland from acres previously in row crop production and includes pump station and piping installation for water withdrawal from the Lick Creek ditch, six water control structures to allow for passive inflows from the ditch during high flow events, and seeding the formerly cropped and any newly-disturbed acres with native hydrophilic mixes.

Components of this alternative include the following:

- Mobilization of the work crew;
- Installation of six (6) water control structures;
- Installation of a pump station;
- Installation of approximately 6,150 feet of pipe; and
- Seeding of approximately 300 acres.

The proposed wetland would provide ecological benefit via treatment of ditch water to reduce sediment and nutrient concentrations. Additionally, some frequently-flooded row crop acres would be removed from production, reducing agricultural input losses including nutrients and pesticides while bolstering local wildlife habitat. However, it was found through hydraulic flood frequency modeling to not provide as large a flood reduction benefit as was anticipated.

5.4. Alternative 3: Structural Alternative

This alternative would include the excavation of segments of both banks of the ditches to a minimum slope of 2 horizontal feet to 1 vertical foot to improve bank stability, followed by installation of two layers on the bank side slopes and toe: first, a 6-inch-thick rock bedding layer; and second, a 24-inch-thick rock riprap (Mix No. 4) layer on top. Full-bank riprap armoring would extend up both sides of Cypress Lateral 1 from the confluence with Lick Creek Main Ditch north to County Road 679 (approximately 6,490 feet). For the remainder of Cypress Lateral 1 (4,200 feet), riprap armoring would be limited to toe protection and four (4) feet up the bank slope. Total length of additional ditch segments receiving two-sided toe-protection would include 12.57 miles (66,386 linear feet) for Areas 2, 3a, 4, 5, and 6. Furthermore, Areas 1, 2, 3a, 4, and 5 contain 50 pipe outlets from adjacent channels into the APE that will receive stabilization armoring at the outlets and replacement if necessary due to condition. Additionally, Area 1 would include engineered rock riffles to address head cutting in the channel, and added armoring would extend at pipe locations that outlet into the ditches in Area 1, 2, 3a, 4 and 5.

Prior to spreading the excess material from the excavation, the topsoil from the area to spread on would be stripped and piled temporarily. Excess bank material from the excavation and riprap installation would be spread out with the topsoil on the exposed surface to promote seed germination. The excess material spreading would occur adjacent to the channel with a 10-foot minimum clearance from the top of bank location, maximum width of 50-feet from top of bank, and maximum height of 3-feet. Native grasses would be seeded on the topsoil of all areas disturbed through construction that are not covered with riprap or other stabilizing materials. Turf Reinforced Matting would be included on side slopes to aid seed establishment and bank stability.

Stabilization of sections of Cypress Lateral 1, Lick Creek, and Dudley Main Ditch would improve damaged areas of the drainage ditch, protect against future degradation, and provide a uniform channel configuration that would be easier to maintain.

Components of this alternative would include:

- Mobilization of the work crew;
- Bank excavation to subgrade elevation;
- Installation of the rock bedding layer;
- Installation of the rock riprap;
- Installation of engineered rock riffles;
- Installation of pipe outlet riprap;
- Where necessary- removal and replacement of pipe outlets in accordance with Conservation Practice 410 (Grade Stabilization Structure) and Conservation Practice 587 (Structure for Water Control)
- Spread excess bank material along the top of bank
- Installation of turf reinforced erosion matting (TRM); and
- Seed all disturbed areas with native seed mix;

5.5. Nonstructural Alternative 4: Buyouts

This alternative would involve easement buyouts of agricultural acreage that currently floods in the 100-Yr storm event. This compromises 600 acres in the watershed for agricultural use. The Nonstructural flood plain buyout alternative would have a high cost to achieve land rights buyouts, would somewhat address the purpose and need of the Project to reduce flood damages to agricultural lands and infrastructure, but does not reduce the environmental erosion and damage issues, does not protect road overtopping in flood events, and does not protect the 1 mile of county road that is eroding away, would not be locally acceptable, and has an exorbitant cost share that is not able to be carried by the sponsor.

5.6. Locally Preferred Alternative

The locally preferred alternative is Structural Alternative 3, involving bank and toe armoring for stabilization, rock riffles to stabilize headcutting, armoring pipe outlet locations, removal of sediment from drainage ditches, and spreading/seeding of removed sediment to native grasses, turf reinforcement matting and seeding on exposed banks.



5.7. Alternatives Eliminated from Detailed Analysis

5.7.1. *Eliminated Alternative 5*

Full bank armoring of all drainage ditches – didn't see significant full bank erosion in other drainage ditches requiring this, only Area 1.

5.7.2. *Eliminated Alternative 6*

Channel bottom armoring, didn't see channel bottom cutting except in Area 1 and plan to address with designed riffle structures.



5.8. Alternative Summary and Comparison

Each alternative was evaluated with regard to:

1. PR&G Guiding Principles (which incorporate the Federal Objective; USDA 2017), the Project Purpose and Need (flood damage reduction; see Section 2), and Environmental, Economic, and Social Impacts (**Table 5-1**);
 2. Criteria of Completeness, Effectiveness, Efficiency, and Acceptability (**Table 5-2**);
- and
3. Scoping Concerns of Section 3 (**Table 5-3**).

The last column in **Tables 5-1** and **5-2** denotes whether each alternative passed the screening criteria in those tables and is carried forward to Section 6 (Environmental Consequences) for further evaluation. The No Action/FWOFI alternative is required to be carried forward regardless of screening criteria.

Table 5-1. Screening Criteria for PR&G Guiding Principles, Purpose and Need, and Environmental, Economic, and Social Impacts

Alternative	Does it meet the Guiding Principles? ¹	Does it meet the Project Purpose and Need?	Does it have the potential to meet Environmental, Economic, and Social Goals?	Is it being carried forward?
Alternative 1: No Action/FWOFI	No	No	No	Yes
Alternative 2: Structural	Yes	Yes	Yes	Yes
Alternative 3: Structural	Yes	Yes	Yes	Yes
Alternative 4: Nonstructural	Yes	Yes	No	Yes
¹ The Guiding Principles are: Sustainable Economic Development; Floodplains; Healthy and Resilient Ecosystems; Public Safety; and Watershed Approach (Appendix D, Section 1.1).				

Table 5-2. Screening Criteria for Completeness, Effectiveness, Efficiency, and Acceptability

Alternative	Completeness ¹	Effectiveness ²	Efficiency ³	Acceptability ⁴	Is it being carried forward?
Alternative 1: No Action/FWOFI	No	No	No	Yes	Yes
Alternative 2: Structural	Yes	Yes	Yes	Yes	Yes
Alternative 3: Structural	Yes	Yes	Yes	Yes	Yes
Alternative 4: Nonstructural	Yes	Yes	No	Yes	Yes
¹ Completeness is the extent to which an alternative provides and accounts for all features, investments and/or other actions necessary to realize the planned effects, including necessary actions by others. ² Effectiveness is the extent to which the alternative alleviates the specific problems and achieves the specified opportunities. ³ Efficiency is the extent to which an alternative alleviates the specific problems and realizes the specific opportunities at least cost. ⁴ Acceptability is the viability and appropriateness of an alternative from the perspective of the Nation's general public and consistency with existing Federal laws, authorities, and public policies.					

Based on the screening in Tables 5-1 and 5-2, all alternatives not previously eliminated are being carried forward for further analysis. In Table 5-3, these alternatives are compared based on natural resources and the human environment (see Table 3-1 and Section 4.3) and organized by ecosystem services (see Table 3-2 and Section 4.4). Impacts involve the Project Area, areas downstream of the Project Area, or the entire watershed. Table 5-3 uses a rating system for ecosystem trade-offs. A comparative cost analysis, with Project Benefits and Project Economic Analysis, is provided in Appendix D, Section D.7.

Table 5-3. Summary and Comparison of Impacts of Alternatives

Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Provisioning Services				
Soils – Prime and Unique Farmland and Farmland of Statewide Importance	NEGATIVE (continued erosion and headcutting or an upstream moving wave of erosion, inadequate drainage, and flooding).	SLIGHTLY POSITIVE in and adjacent to wetland creation (decreased ponding on farmlands and slightly less sedimentation in ditches) + NEGATIVE (decrease in farmlands as 300 acres is removed from production) + NEGATIVE elsewhere in PA (continued erosion and headcutting, inadequate drainage, and flooding).	POSITIVE where armored (decreased erosion and headcutting into surrounding land) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding) + NEGATIVE Long Term (decreased farmland as system returns to swampland).
Rating:	-3	-2	+3	-3



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Regulating Services				
Soils – Erosion and Sedimentation	Same as Prime Farmland.	Same as Prime Farmland.	Same as Prime Farmland.	POSITIVE Long Term (decreased erosion as system returns to swampland) + NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding).
Rating:	-3	-2	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Water – Floodplain Management	NEGATIVE (continued flood damage to surrounding lands, property and infrastructure).	POSITIVE in and adjacent to wetland creation (less flood damage to agricultural lands property and infrastructure due to functioning wetlands) + NEGATIVE elsewhere in PA (continued flood damage to agricultural lands, property and infrastructure).	POSITIVE where armored (increased function in drainage system managing floodwaters) + SOMEWHAT NEGATIVE (for areas downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE (decreased flood damage as system returns to swampland).
Rating:	-3	-2	+3	+3



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Water – Waters of the U.S. (Streams, Lakes, and Wetlands)	NEGATIVE (continued sedimentation).	POSITIVE in and adjacent to wetland creation (increase in wetlands by 300 acres) + NEGATIVE elsewhere in PA (continued sedimentation).	POSITIVE where armored (decreased sedimentation) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE Long Term (decreased sedimentation as system returns to swampland) + NEGATIVE Short Term (continued sedimentation).
Rating:	-3	-1	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Water – Surface Water Quality (Clean Water Act)	NEGATIVE (continued sedimentation and increase in nutrient load).	SLIGHTLY POSITIVE in and adjacent to wetland creation (increase in water quality with nutrient cycling and slightly less sedimentation in ditches) + NEGATIVE elsewhere in PA (continued sedimentation and increase in nutrient load).	POSITIVE where armored (decreased sedimentation) + SOMEWHAT NEGATIVE (for areas upstream due to sedimentation and increase in nutrient load and downstream due to scour from riprap installation, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE Long Term (decreased sedimentation and nutrient load as system returns to swampland) + NEGATIVE Short Term (continued sedimentation and increase in nutrient load).
Rating:	-3	-2	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Water – Surface Water Quantity	NEGATIVE (continued ponding on surrounding lands).	SLIGHTLY POSITIVE in and adjacent to wetland creation (decreased ponding on farmlands) + NEGATIVE elsewhere in PA (continued ponding on surrounding lands).	POSITIVE where armored (decreased ponding on surrounding lands) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to continued ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE Long Term (decreased sedimentation and duration of ponding on surrounding lands as system returns to swampland) + NEGATIVE Short Term (continued ponding on surrounding land).
Rating:	-3	-2	+3	+2
Water – Regional Water Resource Management Plans	No change to the RWRMP.	No change to the RWRMP.	No change to the RWRMP.	No change to the RWRMP.
Rating:	0	0	0	0



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Water - Groundwater Quality (no Sole Source Aquifers)	NEGATIVE (increase in nutrient loading from ponding on surrounding lands).	SLIGHTLY POSITIVE in and adjacent to wetland creation (decreased nutrient loading from ponding, decrease in farmlands as land is converted to wetlands) + NEGATIVE elsewhere in PA (increased nutrient loading from ponding on surrounding lands).	POSITIVE where armored (decreased ponding on surrounding lands) + SOMEWHAT NEGATIVE (for areas upstream and downstream due to increase in nutrient loading from ponding on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE Long Term (nutrient cycling increases on surrounding lands as system returns to swampland) + NEGATIVE Short Term (for areas upstream and downstream due to increase in nutrient loading from ponding on surrounding lands).
Rating:	-3	-2	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Air – Air Quality (Clean Air Act) (Counties in the Project Area are not in non-attainment zones for AQ)	No change to Air Quality.	SLIGHTLY POSITIVE Long Term in and adjacent to wetland creation (decrease in air particulates after construction on former agricultural field) + SLIGHTLY NEGATIVE Short Term in and adjacent to wetland creation (increase in air particulates during construction).	POSITIVE Long Term (decreased wind erosion and less regular maintenance with equipment) + SLIGHTLY NEGATIVE Short Term (minor due to ditch work and burning to maintain native vegetation).	POSITIVE Long Term (decreased wind erosion as system returns to swampland) + NEGATIVE Short Term (increase in wind erosion leading to increase in air particulates).
Rating:	0	0	+3	+2



Plants and Animals – Fish and Wildlife Habitat and Conservation	SLIGHTLY POSITIVE for species like waterfowl or others that utilize ephemeral water sources (where ponding continues) + NEGATIVE for aquatic species (where erosion and sedimentation continue).	POSITIVE for species like waterfowl or others that utilize ephemeral water sources and wetlands (where ponding continues and wetland is created) + NEGATIVE for aquatic species (where erosion and sedimentation continue elsewhere in PA).	SOMEWHAT POSITIVE for aquatic species (reduced erosion and sedimentation where armor is installed, creation of habitat where riffles are installed) + POSITIVE for pollinators (where ditch banks are planted with native grasses/forbs) + NEGATIVE for riparian species (loss of vegetation-water interface) + SOMEWHAT NEGATIVE (for areas upstream and downstream, whether effects are positive or negative would depend on habitat requirements of a given species. Effects minimized by existing ditch geometry and proposed riprap installation design with riffles).	POSITIVE Long Term for aquatic species (reduced erosion and sedimentation as system returns to swampland) + NEGATIVE Short Term for aquatic species (where erosion and sedimentation continue).
Rating:	-2	-1	-1	+2



Alternatives

Plants and Animals – Threatened (T) and Endangered (E) Species Potential to occur Indiana bat (E) pink mucket (E) tri-colored bat (proposed E) monarch, thoughterfly (candidate) Suitable habitat not present gray bat (E) snuffbox mussel (E) western fanshell (T) alligator snapping turtle (proposed T)	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of bat roost trees along banks as erosion continues and loss of pollinator habitat as ditch banks continue to be planted with nonnative grasses).	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of bat roost trees along banks as erosion continues and loss of pollinator habitat as ditch banks continue to be planted with nonnative grasses).	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing bat roost trees along banks).	Same as Fish and Wildlife Habitat and Conservation + POSITIVE Long Term (increase in bat roost trees, water quality and native plants as system returns to swamplands) + NEGATIVE Short Term (loss of bat roost trees along banks as erosion continues).
Rating:	-3	-1	-1	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Plants and Animals – Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act (at least 15 sensitive migratory bird species including bald eagle)	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of trees along banks as erosion continues).	Same as Fish and Wildlife Habitat and Conservation + NEGATIVE (loss of trees along banks as erosion continues).	Same as Fish and Wildlife Habitat and Conservation + POSITIVE (securing trees along banks).	Same as Fish and Wildlife Habitat and Conservation + POSITIVE Long Term (increase in nest trees as system returns to swamplands) + NEGATIVE Short Term (loss of trees along banks as erosion continues).
Rating:	-3	-1	-1	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Plants and Animals – Invasive Species	NEGATIVE (continued erosion and colonization by invasives).	NEGATIVE (continued erosion and colonization by invasives).	POSITIVE Long Term where armored (seeding of native species) + SLIGHTLY NEGATIVE Short Term (risk of spreading invasives during construction will be minimized by following BMP).	POSITIVE Long Term (decreased erosion and renewal of native species as system returns to swampland) + SLIGHTLY NEGATIVE Short Term (continued erosion and colonization by invasives).
Rating:	-3	-3	+2	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Plants and Animals – Riparian Areas	NEGATIVE (continued erosion, sedimentation, and headcutting)	NEGATIVE (continued erosion, sedimentation, and headcutting)	NEGATIVE (loss of vegetation-water interface where armored, increased sedimentation and erosion on surrounding lands upstream and downstream, though minimized by existing ditch geometry and proposed riprap installation design with riffles)	POSITIVE Long Term (decreased erosion and sedimentation as system returns to swampland) + NEGATIVE Short Term (continued erosion, sedimentation, and headcutting).
Rating:	-3	-3	-2	+2
Cultural Services				
Plants and Animals – Natural Areas	No change to Natural Areas.	No change to Natural Areas.	No change to Natural Areas.	No change to Natural Areas.
Rating:	0	0	0	0



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Socioeconomic, Social and Cultural Issues	NEGATIVE (risk of drainage system failure that could interfere with agricultural production and lead to loss of life, property damage, and disruption of public services)	SLIGHTLY POSITIVE in and adjacent to wetland creation (decreased flood damage to agricultural land) + NEGATIVE (decrease in farmlands as land is converted to wetlands) + NEGATIVE elsewhere in PA (risk of drainage system failure that could interfere with agricultural production and lead to loss of life, property damage, and disruption of public services)	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)	SLIGHTLY POSITIVE (landowners are no longer vulnerable to flooding) + NEGATIVE Short Term (landowners who sell their land having to relocate) + NEGATIVE Long Term (reduced land availability for agriculture and development as system returns to swampland)
Rating:	-3	-2	+3	-2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Recreation	SLIGHTLY POSITIVE (waterfowl use of ponded areas during the hunting season) + NEGATIVE (risk of drainage system failure that could interfere with hunting and other recreational activities)	SLIGHTLY POSITIVE in and adjacent to wetland creation (waterfowl use of ponded areas and wetlands during the hunting season, decrease in farmlands as land is converted to wetlands) + NEGATIVE elsewhere in PA (risk of drainage system failure that could interfere with hunting and other recreational activities)	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)	POSITIVE Long Term (increased habitat for wildlife - and thus enhanced opportunities for hunting, wildlife viewing, etc. - as system returns to swampland)
Rating:	-2	-1	+3	+3



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Historic and Cultural Resources	NEGATIVE (continued erosion and headcutting, inadequate drainage, and flooding of Cypress Lateral No. 1).	NEGATIVE (continued erosion and headcutting, inadequate drainage, and flooding of Cypress Lateral No. 1).	POSITIVE where armored (decreased erosion and sedimentation of Cypress Lateral No. 1, which is eligible for the National Register of Historic Places (NRHP). The proposed improvements were determined to be within the original design and function and will not affect eligibility for NRHP. There would be no adverse effect to historic properties. No tribal culturally significant properties were identified).	NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding of Cypress Lateral No. 1) + NEGATIVE Long Term (Cypress Lateral No. 1 would completely fail as system returns to swampland).
Rating:	-3	-3	+3	-3



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Scenic and Visual Resources	No change to Scenic and Visual Resources.	No change to Scenic and Visual Resources.	No change to Scenic and Visual Resources.	No change to Scenic and Visual Resources.
Rating:	0	0	0	0
Supporting Services				



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Public Health and Safety	NEGATIVE (risk of drainage system failure that could interfere with agricultural production and lead to loss of life, property damage, and disruption of public services)	SLIGHTLY POSITIVE in and adjacent to wetland creation (decreased flood damage to agricultural land) + NEGATIVE elsewhere in PA (risk of drainage system failure that could interfere with agricultural production and lead to loss of life, property damage, and disruption of public services)	POSITIVE where armored (reduced erosion and sedimentation allowing the drainage system to function more effectively and thus reduce flood risk) + SLIGHTLY NEGATIVE (for areas upstream and downstream due to increase sedimentation and erosion on surrounding lands, though minimized by existing ditch geometry and proposed riprap installation design with riffles)	POSITIVE (landowners are no longer vulnerable to flooding) + NEGATIVE Short Term (continued erosion and headcutting, inadequate drainage, and flooding)
Rating:	-3	-2	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Potable Water Supply (in the area, this is sourced primarily from groundwater)	Same as Groundwater Quality	Same as Groundwater Quality	Same as Groundwater Quality	Same as Groundwater Quality
Rating:	-3	-2	+3	+2



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>
Human Environment – Energy	NEGATIVE (increase in use of equipment to maintain ditches and recover landuse/transportation/utilities from the effects of flooding).	SLIGHTLY POSITIVE (decrease in farmlands as lands are converted to wetlands results in less use of equipment to maintain farmlands) + NEGATIVE (increase in use of equipment to create wetlands and maintain ditches and recover landuse/transportation/utilities from the effects of flooding).	POSITIVE where armored (less regular use of equipment for bank stabilization) + SLIGHTLY NEGATIVE (some continued use of equipment to maintain ditches and/or during installation).	POSITIVE (decreased use of equipment to maintain ditches as system returns to swampland).
Rating:	-3	-2	+2	+3
Total Alternative Rating	-52	-34	+38	+27



Alternative:	1: No Action/ FWOFI	2: Wetland Creation	3: Full Bank, Half Bank and Pipe Outlet Armoring with Rock Bedding + Riprap (with some pipe outlet replacement, some rock riffles, and spreading and seeding of newly removed sediment)	4: Buyouts
<u>Resource or Concern</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>	<u>Impact on Resource</u>

¹Ecosystem Service Trade-Off Rating Symbolology for Impact: 0 = Little to no impact; 1+ = minor benefit, long- or short-term; 1- = minor impact, long- or short-term, not requiring mitigation; 2+ = moderate benefit, temporary or permanent duration, benefit not resulting in major benefit; 2- = moderate impact, long- or short-term duration, replaceable or restorable action with mitigation measure; 3+ = major benefit, long-term or permanent duration, improve service enough to change status [e.g. removing waterbody from the 303(d) list of impaired waters]; 3- = major impact with long-term or permanent effect, significantly controversial action, result in loss of life or unmitigable impact, does not meet Federal Objective.

6. ENVIRONMENTAL CONSEQUENCES

6.1. Effects on Existing Conditions

This section describes the economic, environmental, and social effects of the alternatives. Effects can be categorized into the following three types.

- **Direct** effects are caused by the Proposed Action, at a similar time and location where the action is implemented.
- **Indirect** effects are also caused by the Proposed Action, but it is reasonably foreseeable that they could occur later in time or farther removed in distance.
- **Cumulative** effects result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions (regardless of whether it is a federal agency or another entity that undertakes the actions).

Given the scale of the Proposed Action, impacts may vary throughout the broader watershed but are generally direct. Where long-term effects may occur, these would still originate in the direct impacts occurring at the time of Project construction and implementation. Impacts of the Proposed Action alternatives would result primarily from the effects of proposed riprap installation along drainage ditches that have been maintained for over 100 years from their creation for agricultural purposes and the effects of the proposed spreading and seeding of excess bank material from the excavation and riprap installation.

- Spreading and seeding has straightforward benefits except for very temporary negative effects on air quality and energy use during spreading, as long as seed mixes are selected and established properly.
- Riprap has the potential for both positive and negative effects.
 - It has long been used effectively in reducing bank erosion in riparian systems. Reduced erosion benefits the system overall by reducing sedimentation in the water, but the reduction in erosion is limited to the areas where the riprap is installed. Outside of those areas, where banks are vulnerable, erosion will continue.
 - Riprap can have other adverse impacts on areas outside riprapped sections by leading to sediment deposition upstream of a riprapped section or scouring of the riverbed downstream of it. These upstream and downstream impacts can be result from changes in water flow, sediment transport, or other processes in the system caused by the riprap (USACE 2003).
 - In Cypress Lateral 1 the planned energy dissipation riprap technique of engineered rock riffle structures is intended to create upstream sedimentation and would use plunge pool riprap on the downstream side to prevent unintended scour as a means of addressing the existing headcut in the bottom of this section of ditch and thus it's an intended positive effect for this section of ditch.
 - The negative effects of riprap will be minimized in this project due to the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements. Because these drainage ditches have already been dredged and channelized along much of their length, the negative effects of riprap will be much less than in a natural riparian system. Also, the

riprap installation will be designed to minimize negative upstream and downstream effects of riprap.

In short, the use of riprap has tradeoffs that need to be considered when evaluating where to install it. The particulars of spreading, seeding, and riprap impacts are discussed by resource concern below. Impacts from riprap apply to the sections of ditch where the riprap would be installed, rather than upstream or downstream, unless otherwise noted.

Below, Section 6.2 (Consequences for Natural Resources and the Human Environment) is organized in parallel to Section 4.3 (Existing Conditions: Natural Resources and the Human Environment).

Section 6.3 (Consequences for Ecosystem Services) parallels Section 4.4 (Existing Conditions: Ecosystem Services). As in 4.4, 6.3 takes the approach of considering how the natural resources and human environment items plug into the Provisioning, Regulating, and Cultural categories of ecosystem services. Section 6.3 addresses aspects of ecosystem services that have not already been addressed in Section 6.2. Section 6 concludes with 6.4 (Cumulative Effects).

6.2. Consequences for Natural Resources and the Human Environment

This section discusses how alternatives would impact the natural resources and aspects of the human environment that were identified as relevant in the initial scoping table (**Table 3-1**) and described in Section 4.3.

6.2.1. Soils

Erosion and Sedimentation

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Ditch banks would continue to erode back into fields and become more undercut, sediment would continue to fill up the ditches and be transported downstream.

Structural Alternative 2: For this alternative, an unimproved wetland that is eroded during rain events and periodically flooded would be plugged and allowed to return to a permanent wetland. Material eroded during rain events would remain within the wetland, not be transported downstream and deposited elsewhere.

Structural Alternative 3: Erosion and sedimentation would decrease in the riprapped sections as native vegetation is established on ditch banks and graded sediment, maintaining the integrity of the ditch banks during flood events and resulting in less sediment deposition in ditches and downstream areas. This Alternative would involve full bank armoring on both sides of the south end of Cypress Lateral 1 (approximately 1.2 miles) with rock bedding and riprap. The remaining 13.4 miles of ditches receive toe and 4 feet of bank armoring with rock bedding and riprap on both sides. To further stabilize the headcut developing along the full length of Cypress Lateral 1 (2.0 miles), engineered rock riffles will be installed. Additional riprap at pipe outlets will address localized erosion. A native grass/forb mix would be seeded above partial-bank armoring and along the top of bank for a maximum width of 50 feet to stabilize the channel and placed sediment. Riprap could also have negative effects, however, as introduction of riprap into the system may induce sediment deposition upstream and scour downstream of the riprapped section. These negative effects would be minimized by the existing ditch geometry and the

planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: This alternative would have a similar impact as FWOFI Alternative 1 in the short-term. In the long-term, erosion would decrease as the system returns to swamplands.

Prime Farmland and Farmland of Statewide Importance

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Maintenance activities within the DD12 system but outside the Project Area would continue, impacting some drainage of the Project Area. Over time, ditch banks would erode back into fields and become more undercut, leading to sedimentation and flooding of prime farmland adjacent to ditches and downstream. Natural and applied nutrients would erode with the soil, decreasing soil health, disrupting nutrient cycling and decreasing water quality. After flooding events, standing water would continue to pool on prime farmland due to the degradation of drainage infrastructure.

Structural Alternative 2: For this alternative, 300 acres of prime farmland (if drained) would be converted to wetlands.

Structural Alternative 3: Approximately 14.6 miles of drainage ditches would be armored and seeded with native grasses, reducing erosion during rain events. This would protect prime farmland, maintain nutrient cycling and improve water quality in the riprapped sections. Riprap could also have negative effects, however, as introduction of riprap into the system can induce sediment deposition upstream and scour downstream of the riprapped section. Sedimentation upstream could reduce drainage from adjacent farmlands increasing the duration of ponding that follows from storm events. Scour downstream of the riprapped section could increase erosion headcuts into adjacent farmland as banks fail and begin to slough into the system. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, ditch banks would erode back into fields and become more undercut, leading to sedimentation and flooding of land adjacent to ditches and downstream. Natural and applied nutrients would be lost with the soil, decreasing soil health, disrupting nutrient cycling and decreasing water quality. After flooding events, standing water would continue to pool on land due to the degradation of drainage infrastructure. In the long-term, there would be a loss of 300 acres of farmland and reduced flood damages to lands as the system returned to swamplands.

6.2.2. Water

Floodplain Management

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. The sponsor would continue to monitor conditions and complete current maintenance activities to prolong the service life of the ditches. Flooding events would continue to cause damage to agricultural land, property and infrastructure.

Structural Alternative 2: Through this alternative, floodwaters would drain somewhat more quickly through the drainage system, positively affecting agricultural land, property and roads through less ponding in fields, erosion of soils and sedimentation in waterways, though to a lesser degree than Alternative 3.

Structural Alternative 3: Through this alternative, floodwaters would move more quickly through the drainage system, providing benefits to agricultural land, property, and roads by decreasing bank erosion, sedimentation in streams (ditches), and the duration of ponding in fields in the sections where riprap would be installed. Riprap could also have negative effects outside of the riprapped sections, however, as introduction of riprap into the system can induce sediment deposition upstream and scour downstream of riprapped sections. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system. Bottlenecks of surface water in the drainage system can then limit the flow of groundwater from under adjacent lands, thereby limiting infiltration on those lands and increasing the duration of ponding. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, flood events will cause increased damage to surrounding lands and infrastructure. In the long-term, there would be reduced flood damages to lands as the system returned to swamplands.

Waters of the U.S. (Streams, Lakes, and Wetlands)

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. After flood events, ditch banks would erode into streams (ditches), wetlands and ponds, impacting water quality and increasing ponding on agricultural fields and roads.

Structural Alternative 2: For this alternative, 300 acres of farmland would be converted to wetlands, increasing wetlands in the area and leading to increased water quality in streams (ditches) adjacent and downstream of the wetlands, though to a lesser degree than Alternative 3.

Structural Alternative 3: This alternative would significantly improve the condition of streams (ditches), improving water quality and movement of water through the drainage system in the section where riprap would be installed. Riprap could also have negative effects, however, as introduction of riprap into the system would induce sediment deposition upstream and scour downstream of the riprapped section, leading to reduced water quality as solids and nutrients are suspended in the water column. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would have a similar impact as FWOFI Alternative 1. In the long-term, there would be reduced negative impact on waters of the U.S. as the system returned to swamplands.

Surface Water Quality (Clean Water Act)

No Action Alternative/FWOFI Alternative 1: No change to existing conditions; ditches are not listed on the Missouri 2020 303(d) list of impaired waters. Continued and exacerbated erosion would impact turbidity and nutrient cycling as more soil erodes into streams (ditches). Sedimentation in ditches would create small pools of standing water.

Structural Alternative 2: For this alternative, 300 acres of farmland would be converted to wetlands, increasing wetlands in the area and leading to increased water quality in streams (ditches) adjacent and downstream of the wetlands, though to a lesser degree than Alternative 3.

Structural Alternative 3: This alternative would reduce the amount of sediment and pesticides entering the ditch. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of the riprapped section, leading to reduced water quality as solids and nutrients are suspended in the water column. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would have a similar impact as FWOFI Alternative 1. In the long-term, there would be reduced impact on water quality as sediment and nutrient load decreases with the system returned to swamplands.

Surface Water Quantity

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Floodwater would continue to pond on agricultural fields and roads due to inadequate drainage.

Sedimentation would restrict flow in the ditch, creating small pools of standing water.

Structural Alternative 2: This alternative would increase flow through the drainage system, decreasing ponding on agricultural fields and roads, though to a lesser degree than Alternative 3.

Structural Alternative 3: This alternative would increase flow through the drainage system, decreasing ponding on agricultural fields and roads where riprap is installed. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of riprapped sections. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system. Bottlenecks of surface water in the drainage system can then limit the flow of groundwater from under adjacent lands, thereby limiting infiltration on those lands and increasing the quantity of water ponding on these lands. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would have a similar impact as FWOFI Alternative 1. In the long-term, there would be reduced impact on water quantity as the system returned to swamplands.

Groundwater Quality and Sole Source Aquifers

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Ponding floodwater would increase transport of nutrients and pollutants into groundwater, impacting water quality. No sole source aquifer exists.

Structural Alternative 2: This alternative would increase flow through the drainage system somewhat, decreasing ponding on agricultural fields and roads thereby decreasing transport of nutrients and chemicals into groundwater, though to a lesser degree than Alternative 3.

Structural Alternative 3: This alternative would increase flow through the drainage system, decreasing ponding on agricultural fields and roads which would decrease transport of nutrients and chemicals into groundwater in the riprapped sections. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of the riprapped section, leading to decreased flow in these section of the ditch, which could lead to increased nutrients in groundwater in adjacent lands as ponding increases in duration following floods. These negative effects would be minimized by

the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would have a similar impact as FWOFI Alternative 1. In the long-term, there would be reduced impact on groundwater quality as the system returned to swamplands.

Regional Water Resource Management Plans

No Action Alternative/FWOFI Alternative 1: No change to existing conditions.

Structural Alternative 2: No change to existing conditions.

Structural Alternative 3: No change to existing conditions.

Nonstructural Alternative 4: No change to existing conditions.

6.2.3. Air

Air Quality (Clean Air Act)

No Action Alternative/FWOFI Alternative 1: No change to existing condition; counties in Project Area are not within non-attainment zones for NAAQS. Since no action will not protect the ditch banks with rock or vegetation, heavy equipment would be needed more often to address erosion from flood events. There would be temporary increases in pollutants released from heavy equipment to repair damages from future flooding events.

Structural Alternative 2: This alternative would create a temporary increase of pollutants from heavy equipment during installation. Afterwards, there would be an increase in air quality as native vegetation reduces wind erosion of farmland soils, though to a lesser degree than Alternative 3.

Structural Alternative 3: This alternative would create a temporary increase of pollutants from heavy equipment during installation. Afterwards, there would be an increase in air quality as native vegetation and bank stabilization reduced wind erosion of bank soils. Riprap could also have positive long-term effects on air quality, as it would lead to decreased use of heavy equipment in regular maintenance of eroding ditch banks. Prescribed burning to maintain the native vegetation would have a temporary negative effect on air quality.

Nonstructural Alternative 4: In the short-term, this alternative would impact air quality as banks deteriorated and became subject to wind erosion. In the long-term, there would be reduced impact on air quality as the system returned to swamplands.

6.2.4. Plants and Animals

Fish and Wildlife Habitat and Conservation

No Action Alternative/FWOFI Alternative 1: No change to existing condition. Habitat for fish and wildlife would continue to degrade as ditch banks slough into the drainage system, impacting water quality and turbidity. Little pollinator habitat would exist as banks are planted to nonnative grasses. Sedimentation would block flow in ditches, creating small pools of standing water and impacting water transport down the ditch. Available habitat types would shift as there is less flowing water.

Structural Alternative 2: The planting of native grasses and 300-acre wetland creation would greatly increase the quality of fish and wildlife habitat.

Structural Alternative 3: Riprap could negatively affect fish and wildlife habitat by disrupting the bank vegetation-water interface, which is an important element of aquatic habitat.

Additionally, the absence of vegetation could result in less shading, higher water temperature, and lower dissolved oxygen for aquatic organisms. Riprap could also have positive effects, however, by reducing erosion and thus increasing water quality. Whether effects are positive or negative would depend on the habitat requirements of a given species. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1

Nonstructural Alternative 4: In the short-term, this alternative would impact habitat as banks deteriorated and sloughed into ditches. In the long-term, there would be a positive impact via increased native habitat as the system returned to swamplands.

Threatened and Endangered Species

No Action Alternative/FWOFI Alternative 1: No change to existing condition. Bat roost trees would be impacted as ditch banks slough into the ditch, taking any existing roost trees with them.

Structural Alternative 2: The planting of native grasses and 300 acre- wetland creation would greatly increase the quality of fish and wildlife habitat for threatened and endangered species, especially the American Bittern.

Structural Alternative 3: Riprap could negatively affect threatened and endangered species habitat by encroaching on vegetated portions of ditch banks and surface water. Riprap could have positive effects, however, by reducing erosion and sedimentation and thus preventing vegetated portions of ditch banks from eroding further and uprooting potential bat roost trees into ditches. Whether effects are positive or negative would depend on the habitat requirements of a given species. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would impact habitat as banks deteriorated and sloughed into ditches. In the long-term, there would be a positive impact via increased native habitat as the system returned to swamplands.

Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Bank trees would be impacted as the ditch banks slough into the ditch, reducing the amount of habitat available for migratory species.

Structural Alternative 2: This alternative would result in increased wetland wildlife habitat as mentioned.

Structural Alternative 3: Riprap could negatively affect migratory bird habitat by encroaching on vegetated portions of ditch banks and surface water. Riprap could have positive effects, however, by reducing erosion and sedimentation and thus preventing vegetated portions of ditch banks from eroding into the ditches and negatively affecting surface water. Whether effects are positive or negative would depend on the habitat requirements of a given species.. These negative effects would be minimized by the existing ditch geometry and the planned armor and

slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1

Nonstructural Alternative 4: In the short-term, this alternative would impact habitat as banks deteriorated and sloughed into ditches. In the long-term, there would be a positive impact via increased native habitat as the system returned to swamplands.

Invasive Species

No Action Alternative/FWOFI Alternative 1: No change to existing conditions; invasive species would recolonize areas disturbed after flooding events or be transported downstream during flood events, expanding their range.

Structural Alternative 2: Construction activities would result in invasive species being transported in from other sites. By purposefully planting native grasses, invasive species would be less likely to reclaim disturbed construction areas. DD12 would use prescribed burning to maintain the landscape and reduce the risk of colonization by invasive species. The risk of invasive species spreading downstream via floodwater would be reduced, though to a lesser degree than Alternative 3.

Structural Alternative 3: Construction activities could result in invasive species being brought to the site on heavy equipment, though the risk can be reduced by cleaning and inspecting equipment before coming on-site. By purposefully planting a native grass/forb mix, invasive species would be less likely to reclaim disturbed construction areas. DD12 would use prescribed burning to maintain the landscape and reduce the risk of colonization by invasive species. The risk of invasive species spreading downstream via floodwater would be reduced.

Nonstructural Alternative 4: In the short-term, this alternative would have a similar impact as FWOFI Alternative 1. In the long-term, there would be a positive impact via increased native habitat as the system returned to swamplands.

Natural Areas

No Action Alternative/FWOFI Alternative 1: No change to existing conditions.

Structural Alternative 2: No change to existing conditions. Several natural areas are within the Project Area but would not be affected by wetland work.

Structural Alternative 3: No change to existing conditions. Several natural areas are within the Project Area but would not be affected by ditch work.

Nonstructural Alternative 4: No change to existing conditions.

Riparian Areas

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. The riparian areas would continue to degrade as there is little mechanism in place to reduce ditch bank erosion. Sedimentation would impede the ditches, creating small pools of standing water and reducing flow in the ditches.

Structural Alternative 2: The planting of native grasses and wetland creation would lead to improved water quality and riparian habitat adjacent and downstream of the wetlands, though to a lesser degree than Alternative 3.

Structural Alternative 3: Removing sediment, reshaping the ditches, and planting a native grass/forb mix would enhance the riparian environments along the affected ditch sections. Riprap could negatively affect riparian areas by encroaching on vegetated portions of ditch banks and

surface water. Further, in causing sediment deposition upstream and scouring downstream of the riprapped section, riprap installation could degrade riparian habitat both upstream and downstream of the riprapped section. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1. Riprap could, however, have positive effects on erosion and sedimentation in the section where riprap would be installed, which would prevent vegetated portions of ditch banks from further eroding into ditches and negatively affecting surface water.

Nonstructural Alternative 4: In the short-term, this alternative would impact riparian as banks deteriorated and sloughed into ditches. In the long-term, there would be a positive impact on riparian areas as the system returned to swamplands.

6.2.5. Human Environment

Socioeconomic, Social, and Cultural Issues

No Action Alternative/FWOFI Alternative 1: No change from current conditions. Farmland productivity would continue to degrade as soils become saturated and erode, moving nutrients and sediment downstream during flood events. Farmland inundated with standing floodwater would be less productive. Income generated from crop yield would be impacted. Residents would be forced to alter travel while attending medical appointments, religious activities, shopping, work, and school. Flooded roadways would increase response time for emergency medical services. School buses would be unable to travel through flooded roads, forcing children to miss school and caretakers to potentially miss work to provide childcare.

Structural Alternative 2: Residents would be impacted somewhat due to loss of farmlands to wetland creation. However, the farmlands to be converted are frequently flooded which impacts crop production significantly in these and surrounding acres. Additionally, wetland creation would lead to somewhat less flooding of other farmland and roads, though to a lesser degree than Alternative 3.

Structural Alternative 3: Residents would be less impacted socially and economically by loss of productive farmland after flood events and inability to travel due to flooded roads, as floodwaters would move more quickly through the system. Also, residents would have reduced need to purchase flood insurance or repair flood damage to homes, allowing for reallocation of finances. Emergency medical services would respond without additional delays. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of the riprapped section. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system and off of adjacent lands leading to increased duration of ponding on adjacent lands. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would impact surrounding lands and infrastructure as banks deteriorated and sloughed into ditches. In the long-term, there would be less impact on surrounding land uses after the easement buyouts and as the system returned to swamplands.

Recreation

No Action Alternative/FWOFI Alternative 1: No change from existing conditions. Wildlife viewing and hunting opportunities would be negatively impacted by the degradation of riparian habitat. During flooding events, people would not be able to access recreational opportunities due to ponded floodwater on roads and fields.

Structural Alternative 2: Wildlife viewing and hunting opportunities would increase as wetland habitat is increased, benefiting adjacent riparian habitat, though to a lesser degree than Alternative 3.

Structural Alternative 3: Wildlife viewing and hunting opportunities would increase as riparian habitat is less affected by erosion. People would access more recreational opportunities, because floodwater would be adequately draining off roads and fields. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of the riprapped section. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system and off of adjacent lands leading to increased duration of ponding on adjacent lands. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would negatively impact recreation opportunities as banks deteriorated and sloughed into ditches. In the long-term, there would be a positive impact on recreation opportunities that include use of swamplands as the system returned to swamplands.

Public Health and Safety

No Action Alternative/FWOFI Alternative 1: No change from existing conditions. Standing water from flood events would continue to impact local roads, forcing residents to drive flooded roadways or postpone traveling to medical appointments, grocery stores, work, and school. The response time for emergency medical services would be impacted. School buses would not be able to travel flooded roads, forcing children to miss school and caretakers to potentially miss work to provide childcare. Standing water would create a mosquito habitat, increasing the risk of mosquito-borne illnesses.

Structural Alternative 2: Standing water from flood events would no longer pool on local highways, allowing for residents to safely travel to their destinations, but to a lesser degree than Alternative 3.

Structural Alternative 3: Standing water from flood events would have reduced pooling duration and depth in fields, ditches, and on local highways, allowing for residents to safely travel to their destinations, as floodwaters would move more quickly through the system. The reduction in standing water would cause a reduction in mosquito habitat, decreasing the risk of mosquito-borne illnesses. Riprap could also have negative effects, however, as introduction of riprap into a system can induce sediment deposition upstream and scour downstream of the riprapped section. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system and off of adjacent lands leading to increased duration of ponding on adjacent lands. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the

improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, this alternative would impact public health and safety as flooding would continue to impact infrastructure and mobility. In the long-term, there would be a positive impact following the easement buyouts and rerouting of transportation and utilities as the system returned to swamplands.

Potable Water Supply

No Action Alternative/FWOFI Alternative 1: No change to existing conditions. Ponding floodwater would lead to percolation of nutrients and pollutants into groundwater, impacting the quality for drinking water that is largely drawn from wells in the area.

Structural Alternative 2: Wetland creation would allow floodwater to move through the project area more efficiently, storing stormwater and reducing the amount of floodwater ponding on adjacent farmland. This would decrease the amount of nutrients and pollutants percolating from the surface to ground water, though to a lesser degree than Alternative 3.

Structural Alternative 3: Riprap installation would allow for floodwater to move through the project area more efficiently. Decreasing the ponding of floodwater would decrease the amount of nutrients and pollutants percolating into groundwater. Riprap could also have negative effects, however, as introduction of riprap into the system would induce sediment deposition upstream and scour downstream of the riprapped section. Upstream sediment deposition and downstream scour could, in turn, reduce flow through the drainage system and off of adjacent lands leading to increased duration of ponding on adjacent lands. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1.

Nonstructural Alternative 4: In the short-term, the area would experience a decline in potable water quality. In the long-term, there would be a positive impact on potable water supply following the easement buyouts as the system returned to swamplands.

Historic and Cultural Resources

No Action Alternative/FWOFI Alternative 1: No change to existing conditions at Cypress Lateral No. 1 would represent an adverse effect due to impacts related to erosion over time. Additionally, the ditch would eventually fail to serve as a functional system. If this alternative is chosen, there is a risk of adverse erosional effects upon two previously recorded archaeological sites located within the project area. Head cutting at Cypress Lateral No. 1 would continue, worsening the rate of bank erosion, and threatening the archaeological integrity of adjacent sites.

Structural Alternative 2: Wetland creation would benefit the ditches adjacent and downstream of the wetlands, though to a lesser degree than Alternative 3. By creating a permanent wetland, approximately 300 acres will be inundated with water, which may pose an adverse effect to archaeological sites if present.

Structural Alternative 3: The removal of some bank material during construction could have a short-term negative impact, but riprap installation would provide long-term protection from erosional effects at Cypress Lateral No. 1. Because the NHRP eligibility described in Section 4.3.5 does not restrict DD12's statutory maintenance responsibilities, the proposed work has been evaluated as having no adverse effect on historical and cultural resources. This alternative

would be expected to provide an overall net benefit by ensuring the continuation of Cypress Lateral No. 1 ditch as a functional system well into the future. See section 4.3.5 for further details on No Adverse Effect determination.

Nonstructural Alternative 4: This alternative would have an adverse effect on Cypress Lateral No. 1 because the ditch would no longer be maintained, and its historical significance would be lost as the banks slough, and the system returns to swampland. Additionally, this alternative does not provide erosional protection for archaeological sites within or adjacent to the project area.

Energy Efficiency

No Action Alternative/FWOFI: No change to existing conditions. Energy requirements would not change. The sponsor would continue to use mowing and other heavy equipment to combat erosion and maintain the ditches' shape. Farmers would continue to use pumps to remove water from flooded fields.

Structural Alternative 2: Energy spent on ditch maintenance to reduce erosion would decrease after the initial installation, though to a lesser degree than Alternative 3.

Structural Alternative 3: Energy spent on ditch maintenance to reduce erosion would decrease relative to existing levels after the energy expenditure of the initial riprap installation. If sediment deposition upstream and/or scour downstream of the riprapped section were to occur as a result of the riprap, however, DD12 would potentially need to resume regular ditch maintenance and thus revert to some level of energy expenditure for the use of heavy equipment. These negative effects would be minimized by the existing ditch geometry and the planned armor and slope stabilization riprap techniques for the majority of the improvements and energy dissipation technique with engineered rock riffles in the Cypress Lateral 1. As noted above, the native grass buffers would be maintained using prescribed burning rather than mowing, which would reduce the use of fossil fuels and gravity fed pump systems would not be needed as often to remove floodwater from fields.

Nonstructural Alternative 4: Energy requirements to maintain the drainage system would decrease to zero.

6.3. Consequences for Ecosystem Services

This section addresses aspects of ecosystem services that have not already been addressed in the previous section.

6.3.1. Provisioning Services: Food, Fiber, Biofuel Production, and Potable Water Supply

The potential environmental consequences of the proposed alternatives on agriculture are addressed in Section 6.2.1 from the perspective of soils (erosion and sedimentation as well as Prime and Unique Farmland and Farmland of Statewide Importance). When considering potential impacts on the production of food, fiber, and biofuel more broadly, the analysis quickly gets complex. It would be difficult to quantify the various potential impacts of each of the eight alternatives on the number of agricultural products described in Section 4.4.1. A general conclusion, however, can be drawn based on the key points made throughout Section 6.2: all of the structural alternatives would provide some benefit to agricultural production on land surrounding Ditch No. 1 by reducing erosion of farmland and damages to farmland caused by flooding. The level of benefit to food, fiber, and biofuel provisioning would depend on the crops

grown closest to the sections of ditch to be modified and the overall effectiveness of the chosen alternative(s).

The same is true for potable water supply, as discussed in terms of groundwater in Section 6.2.2. All of the structural alternatives would provide some reduction in transport of nutrients and chemicals to groundwater, which is the primary source of drinking water for wells in the Project Area. The level of reduction for a given well would depend on its relationship to groundwater impacted by actions taken in the Project Area and the overall effectiveness of the chosen alternative(s).

6.3.2. *Regulating Services: Water Use and Management*

The potential environmental consequences of the proposed alternatives on water use and management are addressed in Section 6.2 for soil, water, plants, animals, and the human environment. All of the structural alternatives would provide some benefit to water quality in the drainage system and better management of water flow for flood control and irrigation. More effective water use and management would have far-reaching positive impacts, ranging from reduced erosion and sedimentation to enhancement of other regulating services (such as pollination) to improvements in socioeconomics, public health and safety, and energy use. As with Provisioning Services, given the number of factors involved, the magnitude of the benefits would depend on the resource, the particular location of impact, and the overall effectiveness of the chosen alternative(s).

6.3.3. *Cultural Services: Recreation Opportunities and Historical and Cultural Resources*

The potential environmental consequences of the proposed alternatives on cultural services are addressed in Section 6.2 for hunting, other recreational opportunities, and historic and cultural resources. All of the structural alternatives would provide some benefit to recreation and would not adversely impact historic and cultural resources.

6.4. Cumulative Effects

While recent guidance from the Council on Environmental Quality (develop implementing regs for NEPA) requires removing the consideration of cumulative effects consistent with section 102 of NEPA, PR&G still requires the consideration of cumulative effects (USDA 2017). Cumulative effects, defined above in Section 6.1, can occur when the impacts from an individual action are relatively minor on their own but become significant when combined with other actions. A cumulative effects analysis needs to account for past and present actions as well as those that are reasonably foreseeable in the future, such as actions included in an approved zoning plan, an areawide conservation plan, or other community planning processes. The analysis should address the impacts of the alternatives being evaluated for the proposed action, including the question of what it would mean not to take any action and thus not meet the identified need.

CEQ (1997) recommends that cumulative impacts analysis be narrowed as much as possible to focus on important issues at a national, regional, or local level. Narrowing in the analysis can prove challenging, given the number of factors involved: defining geographic boundaries, determining a suitable time period, and selecting the most important issues for a particular project. The framework for the cumulative effects analysis in this Plan-EA is as follows.

- **Spatial context:** This Plan-EA involves a Proposed Action that is relatively small in scale, affecting 14.6 miles of drainage ditches, but it would also have impacts downstream of the drainage system. The analysis will start with a broad geographic scope for past conditions and then narrow in on the county of the Project Area as a member of the Bootheel Regional Planning and Economic Development Commission (BRPEPC or Commission). The BRPEPC covers six counties in southeastern Missouri, including Stoddard County.
- **Temporal context:** The analysis will look forward approximately five years, the period covered by the Commission's recently published 2024 report entitled Building a Better Bootheel Comprehensive Economic Development Strategy (CEDS) for the Missouri Bootheel. Beyond this time frame, future actions become less reasonably foreseeable.
- **Issues or concerns:** Based on the purpose and need of the Proposed Action and the assessment of environmental consequences above in Sections 6.2 and 6.3, the analysis will place primary emphasis on floodplain management. Fish and wildlife habitat is also considered, and weather patterns are predicted to continue shifting in the coming decades.

Past

With the broad landscape transition from prairie, swamplands and forest to agriculture and urban development over the past few hundred years, floodplains have become one of the most threatened ecosystems. In general, floodplain degradation leads to habitat alteration, species invasions, and loss of biodiversity as well as changes in flow, flood control, and pollution (Tockner and Stanford 2002). In cases like Bootheel (in general), full floodplain restoration is not possible, given the surrounding land uses of agriculture and development. The management of floodwater, however, needs to be and can be improved. The more recent history of the agricultural setting of the Project Area today sets the stage for considering how to improve flood control in the present while also providing an opportunity to increase fish and wildlife habitat, especially for pollinators.

Present

The existing conditions for all relevant natural resources, aspects of the human environment, and ecosystem services are described above in Section 4 (Affected Environment). Because past actions and their effects have contributed to the current condition of a resource, past cumulative effects are generally captured under each resource's Affected Environment section.

Future

BRPEPC's CEDS report outlines six strategic goals (described below) over the next five years. The topic of flood control plays a role in these goals, such that the Commission's strategies provide a useful context for evaluating how the Proposed Action may affect what is reasonably foreseeable in the near future.

According to BRPEPC (2024), population decreased overall in the six member counties between 2010 and 2020. BRPEPC (2024) cited the median household income for 2022, at about 63% of the state average (80% for Stoddard County), as a major reason for concern. They attributed this lower-than-average earnings level in part to availability of jobs.

This demographic and economic picture lays the foundation for the BRPEPC’s efforts. Their vision is to work toward enhancing prosperity and improving quality of place in the region in which the following goals are met (BRPEPC 2024).

- Develop regional partnerships and share ideas that will improve quality of place issues
- Improve regional collaboration and coordination of infrastructure projects
- To focus on business retention and expansion in addition to recruitment
- Improve educational opportunities and potential partnerships in the region
- To expand agricultural opportunities
- To enhance the capacity and resources of the BRPC to more effectively serve the region

Table 6-1 provides an overview of the connection between DD12’s goals as stated in Section 1 of this Plan-EA – to decrease flooding – and the Commission’s goals (BRPEPC 2024), which are an indicator of reasonably foreseeable future efforts, if not specific actions. The BRPEPC goals are presented in the table in an approximate order of how strongly they are connected to this Project’s goals. While the tabular presentation may make the discussion of goals appear distinct or dichotomous, in fact all the goals and strategies are interrelated, including the connections between flood control and public recreation.

Table 6-1. Bootheel Region Strategic Goals in Relation to Project Goals

BRPEPC Strategic Goal	Connection to Flood Control
Public Infrastructure	This goal recognizes that ineffective infrastructure poses a threat to public health and safety.
Agricultural Resiliency	The Commission seeks to improve agricultural opportunities and study their economic impact.
Quality of Place	This goal recognizes the need to improve the bootheel area as a better place to live and work.
Business Development	The Commission noted a weakness in the region regarding business retention and expansion.
Workforce Development	The economics of the region are interrelated with other goals, including quality of life and economic resiliency.
Build Capacity of the BRPEPC	The Commission recognizes that it needs to grow to meet the needs of its citizenry.

This evaluation of the region’s near-future goals, as they relate to flood control, points to a largely beneficial suite of cumulative effects that would come from implementation of the Locally Preferred alternative described in this Plan-EA (a combination of the non-structural alternative and structural alternative). The No Action/FWOFI alternative and Nonstructural buyout alternative, by contrast, leave the need for flood control unaddressed. The factor of continued flooding, combined with the adverse impacts on community growth and prosperity that other past actions have had, would contribute to an overall negative set of cumulative effects.

7. RISK AND UNCERTAINTY

Shifting weather pattern risk affects the best modeling on future peak storm events. Shifting weather patterns increases the uncertainty of the rainfall depths that are currently published as Probable Maximum Precipitation (PMP) values or those published for statistical storms such as the 100-year event. The most up to date published data was used for all storm events. Risk and uncertainty may involve increased costs or reduced benefits through adjustments in design related to this modeling. This affects all proposed ditch improvement alternatives equally. Regarding the proposed wetland area, extended periods of dry weather due to Shifting weather patterns may affect the long-term survival of typical wetland species. The wetland site contains existing irrigation wells that may be used to maintain vegetation if necessary, but additional infrastructure will be required. Thus, shifting weather pattern risk does not affect the overall decision in this Plan.

Future land use can be a risk. At the time of this document, no proposed development is known in the watershed or downstream of the structure. While adjacent urban locations and undeveloped watershed suggest a risk for urbanization into the watershed, the area is not currently experiencing much development and is expected to remain in agricultural use.

8. CONSULTATION, COORDINATION, AND PUBLIC PARTICIPATION

The Project team developed a Public Participation Plan, including a comprehensive mailing list of agencies, groups, and individual stakeholders, in consultation with the Sponsor and NRCS. The Public Participation Plan complied with NRCS General Title 400, Part 400 – Public Participation Policy.

The team used the mailing list (Section 12 below and **Appendix A**) for soliciting input and announcing when public meetings would be held. The mailing list included tribal, federal, state, and local government representatives and agencies; elected officials; environmental and public interest groups; other interested parties; and newspapers. This list also included affected landowners who are potential right-of-way grantors, whose property may be used temporarily for Project purposes, or who own homes within certain distances of the Project, and anyone who submits comments on the Project. The mailing list was updated as the analysis proceeded.

Additional internal consultation and coordination took place between NRCS and the Sponsor throughout the planning process. DD12 routinely interacts with the public. The DD12 Board of Supervisors is made up of landowners who are elected by their fellow landowners to serve five-year terms. The DD12 Board meets monthly to conduct business and provide an open forum for landowners to attend. The DD12 Board actively accepts input and oversees the function/operation of the drainage district. Each year the Board holds an annual Board of Supervisors meeting to provide an update of the previous year's maintenance activities, to provide a fiscal year financial summary. Membership on the Board of Supervisors is a voluntary unpaid position typically held by a civically minded individual. Following the annual landowners meeting an annual report is sent to all landowners outlining the previous year's maintenance activities, financial statement, and the minutes from the Board of Supervisors open meeting (NRCS 2022a). Findings and discussions during these monthly meeting have enhanced the scoping for this Project by narrowing down the areas where flood damage reduction and erosion control are most needed and most likely to improve current conditions in the watershed.

8.1. Consultation

8.1.1. Tribal Governments

NRCS solicited input from the Tribal governments listed below during the development of the Plan-EA. Federally recognized Tribal lands, as defined in the NHPA, do not occur in Missouri. The invitation to participate as a consulting party was requested pursuant to requirements of Section 106 of the National Historic Preservation Act of 1966, as amended, (54 U.S.C. §300101 et. seq.) and the Protection of Historic Properties (36 CFR Part 800) in letters dated September 25, 2023 and September 30, 2024 (see Stakeholder Letters in Appendix A). Five tribes were identified as having tribal interests in Stoddard County (MODOT 2026). The five tribes include Absentee-Shawnee Tribe of Indians of Oklahoma, Eastern Shawnee Tribe of Oklahoma, Osage Nation, Quapaw Nation, and Shawnee Tribe. The Osage Nation responded on October 19, 2022 with a request for a cultural resources survey report of the project. The Quapaw Nation responded on October 10, 2023 and Sept 25, 2024, stating the project would have “no effect” to known properties of cultural or sacred significance to the Quapaw Nation. There was no response from the remaining Tribes.

The Section 106 was initiated on October 16, 2024 with consultation package containing project information, APE, identification efforts and finding of effect. All five tribes were sent Section 106 project review packages and Consultation letters on October 16, 2024, which are also included in Appendix A. The Quapaw Nation was the only respondent, (June 19, 2025) stating that the project would have “no effect” to known properties of cultural or sacred significance to the Quapaw Nation. No Tribal comments indicated that the Proposed Action would have adverse effects on historic properties, which include Traditional Cultural Properties, Places of Religious and Cultural Significance, Indian Sacred Sites, or culturally sensitive resources based on the alternatives presented in this document and based on consultation with the relevant Tribal entities about these alternatives. Below is the list of Tribes who were identified by NRCS as having a potential interest whose name is followed by reference and are filed in **Appendix A**. NRCS served as the tribal liaison for the project.

- Absentee-Shawnee Tribe of Indians of Oklahoma
- Eastern Shawnee Tribe of Oklahoma
- Osage Nation– requested to review the Cultural Resource report on 9/15/2022, but did not respond to NRCS letter about this report from 10/16/2024
- Quapaw Nation- NRCS notified the Quapaw Nation about the Preliminary Investigation Feasibility Reports (PIFR) for this project on 5/12/23 and 5/22/23. The Quapaw Nation stated there would be No Effect on 9/25/2024 and then concurred with No Effect to cultural resources determination on 6/19/2025.
- Shawnee Tribe

8.1.2. *Federal Agencies*

The planning team coordinated technical submissions and drafts of the Plan-EA and associated technical documents with NRCS. Technical review comments from NRCS were incorporated into the documents. NRCS served as the lead federal agency.

Additional input was solicited from the following federal agencies.

- U.S. Army Corps of Engineers (Cooperating Federal Agency)
 - USACE was a cooperating agency throughout the project including monthly meetings and 401/404 permitting consultation. These permits will not be applied for until the design stage of the project.
- U.S. Environmental Protection Agency
 - The USEPA’s letter in Appendix A provided recommendations on:
 - Water Quality – no 303(d) CWA Impaired Water Bodies in project area
 - Wetlands and Aquatic Resources - wetlands in project area, streams (ditches) are exempt from section 404 permitting, first avoid, minimize then mitigate impacts
 - Air Quality Strategies - impacts during construction will be minimized
 - Resiliency - The drainage system’s ability to withstand effects of increased storm frequency and intensity will be increased
 - Demolition Debris and Contamination – no contaminated materials will be involved in the construction process

- Energy Efficiency – such vehicles will be used, if possible, during construction
- Pollinators and Native Plant Species – ditch buffers will be replanted with native grass and forb species.
- Consultation Records – will be maintained as a part of the Plan EA including correspondence from SHPO (historic and cultural resources), USACE (wetlands and streams), USFWS (federal threatened and endangered species), and MODNR (state threatened and endangered species),
- Federal Emergency Management Agency
- U.S. Fish and Wildlife Service
 - The updated Official Biological Assessment, Species List, Resource List and Technical Assistance Letter obtained from the USFWS on November 19, 2025 are in **Appendix A** and were described in **Appendix D, Tables D6-5 and D6-6**. NRCS followed up the Technical Assistance letter with a consultation request on December 8, 2025. The USFWS responded on December 23, 2025 with concurrence of the NRCS finding of May Affect – Not Likely to Adversely Affect for T&E species in the Project Area.
- U.S. Geological Survey
- USDA Farm Service Agency
- USDA Forest Service
- USDA Rural Development

8.1.3. *State Agencies*

Input was solicited from the following state agencies.

- Missouri Association of Soil and Water Conservation Districts
- Missouri Levee and Drainage District Association
- Missouri Department of Conservation
 - The findings of the consultation inquiry are in **Appendix A** and were described above in Section 4.3.4.
- Missouri Department of Natural Resources
 - The MODNR's letter in Appendix A provided recommendations on
 - Karst Topography – use caution as this geology acts as direct conduits of pollution to groundwater (ground disturbance will be limited to currently disturbed land and minimized)
 - Wells – hazardous waste impacts to numerous shallow wells are possible (project will minimize use of fuels and associated vehicle fluids during construction)
 - Public Lands – 4 conservation areas and conservation opportunity areas were identified near the project area
 - Water Protection – Best Management Practices will be utilized during construction
 - Public Drinking Water – construction activities will take surface and groundwater resources into consideration

- Water Bodies with Specific Designated Uses and General Uses – construction activities will take water body uses into consideration. Wetlands have been identified near the project area
- 303(d) Impaired and 305(b) Threatened Waters – none in the project area
- Waters with TMDL's – none in the project area
- CWA Section 401 and 404 – permits may be necessary from the USACE
- Mitigation – requirement to follow Missouri Wetland Mitigation Method for wetlands impacts (wetlands in the project area) and requirement to follow Missouri Stream Mitigation Method for stream impacts (likely to be exempt as work will involve maintaining previously constructed ditches)
- Land Disturbance – construction will only involve previously disturbed land
- Hazardous Waste – no demolition will occur with the construction, all removed sediment will be spread and planted on DD12 lands
- Air Pollution – will be minimized during construction activities and no open burning will be necessary for the project
- Historic Preservation – ditches will be maintained in this project are of historical significance
- Floodplain – coordinate with the state Emergency Management Agency, Floodplain Management and Mitigation Branch as necessary
- Endangered Species – coordinate with Missouri Department of Conservation
 - MODNR attended interagency meetings and had no additional input.
- Missouri State Emergency Management Agency (SEMA)
 - USDA NRCS is particularly appreciative of data provided by MOSEMA. This cooperation saved considerable cost and time in developing the Plan-EA.
- Missouri State Floodplain Administrators
- Missouri State Historic Preservation Office
 - USDA NRCS contacted SHPO on 8/20/2024 and 11/15/2024 regarding the Cultural Resources Report and Findings and received a response on 6/12/2025 concurring that there would be no adverse effect on historic properties. Copies of these letters can be found in **Appendix A**.
- Missouri Department of Agriculture
- Missouri Department of Transportation

8.1.4. Local Agencies

Input was solicited from the following local agencies.

- Stoddard County Commission
- Stoddard County Soil and Water Conservation District
- City of Bloomfield
- City of Dexter
- City of Dudley



8.1.5. Delegates

Input was solicited from the following governmental entities.

- Governor of Missouri
- US Congress – Senate
- US Congress – House, 8th Congressional District
- Missouri State Senate – Senate District 25
- Missouri State Representative – House District 151

8.1.6. Landowners and Public Meeting Attendees

Input was solicited from landowners during the public scoping meetings noted in section 8.3.

8.2. Summary of Natural Resources, Cultural Resources, and Tribal Consultations

The following tables provide a summary in checklist form for tribal consultations and the historical and cultural resources review process (8-1) and for state and federal consultations relating to wildlife (8-2).

Table 8-1. Cultural Resources and Tribal Consultation

Pedestrian Survey conducted by Archaeologist	X Yes	☐ No	Date: 12/05-12/08/2023
Historic Resources Survey	X Yes	☐ No	Date: 12/05-12/08/2023
Cultural Resources Identified	X Yes	☐ No	Date: 12/05-12/08/2023
Consultation with State Historic Preservation Office	X Yes	☐ No	Date: 08/20/2024, 10/24/2024, 11/15/24, 1/14/25 and 6/12/2025
Communications and Consultation with Tribes	X Yes	☐ No	Date: 09/25/23, 09/10/24, 09/25/24, 10/16/2024, 06/19/25
See list in Section 8.1.1 for tribes contacted.			

Table 8-2. Environmental/Wildlife Consultation

United States Fish and Wildlife Service	X Yes	☐ No	Date: 9/16/2025, 1/08/2026
Section 7 T&E Species Consultation (Project Code 2025-0020918)			
Following are determinations for species listed as having the potential to occur in the Project area. (NLAA = Not Likely to Adversely Affect). For more information, please see USFWS concurrence email in Appendix A and species details in Appendix D.			
Gray Bat (Endangered)			
Indiana Bat (Endangered)			
Tricolored Bat (Proposed Endangered)			
Alligator Snapping Turtle (Proposed Threatened)			
American Bittern (Endangered)			
Snuffbox Mussel (Endangered)			
Western Fanshell (Threatened)			
Pink Mucket Mussel (Endangered)			



Monarch (Candidate - considered for listing)		
Missouri Department of Conservation	X Yes ☐ No	Date: 10/23/2023,
United States Army Corps of Engineers	X Yes ☐ No	Date: 09/25/2023, Ongoing

8.3. Public Meetings

NRCS and the Sponsor held agency and public scoping meetings to provide information to the public about the Project and to gather comments for the scoping process. 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 (see Section 3.1).

Public meetings were held on October 26, 2023, and September 30, 2024. Notice of the public meetings was published 2-3 weeks before each meeting in the *Dexter Statesman*. Both the Initial Public Scoping Meeting and the Final Public Informational Meeting were held initially at the Lair Event Center (13583 Old Highway 25, Dexter, MO 63841) and finally at the Stoddard County USDA Service Center (18450 Ridgeview Lane, Dexter, MO 63841) in conjunction with a Live Virtual Stream on Microsoft Teams to accommodate remote participants.

The meetings provided instruction and guidance on the Project scope and the extent of activities required for developing the Plan-EA. The first public meeting was primarily a scoping meeting to introduce the Project and to identify needs and concerns. Points of discussion from this meeting included the possibility of improving the existing drainage ditches and effects on downstream farmland. Meeting minutes and the meeting sign-in sheet are in **Appendix A**. In the second meeting, the Project team presented the alternatives and estimated Project costs. Discussion items from this meeting included questions about the feasibility of planning half or full bank armoring of the ditches and cost-share needed from the DD12. Meeting minutes and the meeting sign-in sheet are in **Appendix A**.

9. THE PREFERRED ALTERNATIVE

9.1. Rationale for the Preferred Alternative

Four main alternatives were considered for this Project: Future Without Federal Investment, two Structural Alternatives, and one Nonstructural Alternative. The Structural Alternatives involve either a wetland creation or a bank and toe armoring for stabilization, rock riffles to stabilize headcutting, armoring pipe outlet locations, removal of sediment from drainage ditches, spreading/seeding of removed sediment to native grasses, turf reinforcement matting and seeding on exposed banks. The Nonstructural Alternative involves buyouts of floodplain properties. See Section 4 for alternative considerations.

The Future Without Federal Investment alternative would have the lowest cost (no Federal involvement) but would fail to address the purpose and need of the Project to reduce flood damages to agricultural lands and infrastructure.

The Nonstructural flood plain buyout alternative would have a high cost to achieve land rights buyouts, would somewhat address the purpose and need of the Project to reduce flood damages to agricultural lands and infrastructure, but does not reduce the environmental erosion and damage issues, does not protect road overtopping in flood events, and does not protect the 1 mile of county road that is eroding away, would not be locally acceptable, and has an exorbitant cost share that is not able to be carried by the sponsor. The Nonstructural Alternative 4 has a net monetized annual benefit of \$5,611,300.

For the Structural Alternatives, modeling showed that both would alleviate various degrees of flooding. The Structural Alternative 3 ditch work showed large reduction in flood damages, while the Structural Alternative 2 wetland creation showed very little reduction in flooding damages. The Structural Alternative 3 ditch work had a high cost efficiency while the cost for acquiring easements for wetland creation in the other Structural Alternative 2 could not be absorbed by DD12 for financial reasons as the 25% cost share on easement costs is more than could be borne by the sponsor for an alternative that was not predicted to reduce flooding as much as had been anticipated. The Structural Alternative 2 has a negative net monetized annual benefit of (\$283,100). The Structural Alternative 3 ditch work benefit-cost ratio is 8.5 with a net monetized annual benefit of \$6,265,300.

For these reasons, the Sponsor's Preferred Alternative is the Structural Alternative 3 involving ditch work.

9.2. Measures to be Installed

The Structural Alternative 3 includes excavation of sediment and bank armoring of 14.6 miles of ditches for stabilization, installation of rock riffles and armoring of pipe outlets.

9.3. Mitigation

Any permanent impact to waters of the United States (WOTUS) may require mitigation in the form of restoration (re-establishment or rehabilitation), enhancement or establishment of aquatic resources. The need for compensatory mitigation would be addressed during the CWA Section



404 permitting process. The proposed action will not impact wetlands but will impact streams (ditches) used for drainage. The Sponsor will request an Approved Jurisdictional Determination (AJD) from the USACE – Memphis District to determine whether the ditches are subject to jurisdiction under Section 404 of the Clean Water Act and whether the proposed activities are exempt from regulation under Section 404(f)(1)(C). A 2020 memo between the USACE and the EPA outlines guidance for applying this exemption for maintenance of drainage ditches (USACE 2020).

9.3.1. Wetland Mitigation

Wetlands will not be impacted by implementation of the preferred alternative.

9.3.2. Stream Mitigation

Approximately 14.6 miles of streams (ditches) will be permanently impacted by implementation of the preferred alternative. The AJD will determine if the ditches are jurisdictional. It would then be necessary to determine the impact and assess whether compensatory mitigation would be required; this would likely include agency coordination to help inform this decision. If needed, the Missouri Stream Mitigation Method or other assessment methodology would generally be applied to determine appropriate mitigation. There is an in-lieu fee mitigation provider with a service area that includes the bootheel. If mitigation is necessary, it would also be necessary to address the preference hierarchy and other requirements established in the CWA 2008 Mitigation Rule.

9.4. Permits and Compliance

The following permit and compliance requirements will be required for construction of the Project. The Sponsor will need to apply for and secure applicable permits prior to moving forward with the project.

Clean Water Act Sections 404 and 401.

The Project appears to meet the Section 404(f)(1)(C) exemption for maintenance of drainage ditches and therefore not be subject to permitting by the U.S. Army Corps of Engineers (USACE). However, the USACE has the final determination as to which waterbodies fall under their jurisdiction and which are subject to Section 404 permitting. Therefore, if the project does not meet Section 404(f)(1)(C) exemptions, an individual Section 404 permit may be required for the placement of dredged or fill material within the Project Area. Should an individual Section 404 permit be required, an individual Section 401 Water Quality Certification from MODNR may also be required.

Migratory Bird Treaty Act and Endangered Species Act Section 7.

The Project area is within the range of four endangered or proposed endangered bat species and migratory birds. Mitigation measures include felling potential bat roost trees only during the inactive period of November 16 – March 31, and planning construction activities outside of the primary migratory bird nesting season, May 1 – July 15 (FSA 2020). USFWS concurred with NRCS finding of May Effect – Not Likely to Adversely Affect determination in correspondence dated 12/23/25 (see Appendix A).



National Pollution Discharge Elimination System.

The National Pollution Discharge Elimination System (NPDES) regulates the discharge of any pollutant from a point source into a water of the United States. The maintenance of the ditches will discharge sediment and other materials into streams (ditches). During the design phase, the sponsor will need to obtain an NPDES Construction General Permit. This will outline limits on what pollutants can be discharged, reporting requirements, and other provisions to ensure that the discharge does not adversely affect water quality. This permit will be obtained through the Missouri Department of Natural Resources.

National Historic Preservation Act.

As the lead federal agency, NRCS must comply with Section 106 of the National Historic Preservation Act. To satisfy this requirement, a Phase 1 cultural resources survey was conducted at the Project Area. One archaeological resource was identified; however, the recommendation is a finding of *No Adverse Effect to Historic Properties* for this resource.

Floodplain Management.

Any development within a regulatory floodplain will require a Floodplain Development Permit from Missouri Department of Public Safety – State Emergency Management Agency. All work must be in accordance with the requirements of the Floodplain Management Ordinance and with all other applicable county/city ordinances, federal programs, and the laws and regulations of the State of Missouri.

National Environmental Policy Act.

This document was prepared to comply with the National Environmental Policy Act (NEPA) and the Principles and Guidelines for Water and Related Land Resources Implementation Studies (PR&G).

9.5. Costs and Cost Sharing

Estimated installation costs for the Preferred Alternative are shown in **Table 9-1** and **Table 9-2**, with structural data in **Table 9-3**. Estimated average annual NED costs are in **Table 9-4** and estimated average annual flood damage reduction benefits in **Table 9-5**, while the comparison of NED benefits and costs are in **Table 9-6** and the benefit/cost ratio is in **Table 9-7**. The costs shown in the tables and throughout the document are based on standard cost accounting practices required of federal watershed planning agencies, such as NRCS. The cost accounting guidance complies with the Principles, Requirements and Guidelines for Federal Investments in Water Resources (PR&G). The basis for cost sharing between NRCS and the Sponsor is based on the provisions of the Watershed Protection and Flood Prevention program. Cost sharing for authorized projects is based on 390-USDA-NRCS, National Watershed Program Manual, Part 500, Subpart E, April 2014: 500.42.

Flood Prevention (Flood Damage Reduction)

- 1) Watershed Program funds must provide 100 percent of construction and engineering costs for works of improvement for flood damage reduction. No cost sharing is available to acquire land, easements, or rights of way needed in connection with works of improvement for this purpose, except for acquisition of wetland or floodplain



conservation easements (390-NWPM, Part 500, Subpart E, Section 500.42A, above) and, in some cases, acquisition associated with 390-NWPM, Part 500, Subpart E, Section 500.42C(3), below (100-percent cost-share).

The estimated Proposed Action (Preferred Alternative) costs are \$21,485,700. The sponsors' estimated costs (permitting) \$60,000, and the estimated cost eligible for PL 83-566 funding is \$21,425,700.

9.6. Installation and Financing

Installation

Works of improvement would be installed over a two-year period following authorization of Federal assistance under the Watershed Protection and Flood Protection Act, PL 83-566. Final design and installation of the works of improvement would commence upon approval of the Plan and acquisition of funds

Responsibilities

Responsibilities for carrying out a site-specific project would be shared between NRCS and the Sponsors as follows:

NRCS

- Provide overall project administration;
- Provide engineering design and construction inspection for works contracted by NRCS;
- Provide engineering designs for works contracted by Sponsors;
- Complete all required Federal, Tribal, State, and local consultation processes;
- Provide funds to Sponsors for preparing engineering designs and construction inspection for works contracted by Sponsors;
- Provide up to 100 percent of the total construction costs. The cost-share rate is to be commensurate with other national programs at the time of signing project agreements;
- Provide funds to Sponsors for project management and engineering typically performed by NRCS to implement projects.

Sponsors

- Provide project and contract administration costs for installing works of improvement;
- Acquire any land rights necessary for installing the works of improvement;
- Bear the costs of relocating or modifying utilities;
- Secure all required Federal, State, and local permits;
- Provide operation and maintenance of all components of installed works of improvement;
- When funded by NRCS, provide project management and engineering typically performed by NRCS to implement projects.

Contracting

This project would be constructed through project agreements between NRCS and the Sponsor for that site by means of a federal contract, local contract, division of work, or force account.

Real Property Rights

The Sponsors has acquired the real property rights and rights-of-way necessary to install, operate and maintain the works of improvement.

9.7. Operation, Maintenance, and Replacement

The preferred alternative proposed structure will be operated and maintained by the Stoddard County Circuit Court Drainage Ditch District 12, Missouri (Sponsor). The costs associated with this are detailed in **Appendix D**. An Operation and Maintenance (O&M) Plan will need to be created for the ditches with the final design.

9.8. Cost Tables

Tables 9-1 through 9-6 (Economic Tables 1 through 6) document and describe the Project costs, channel data and Project benefits for the Preferred Alternative. Estimated installation costs and cost distribution between NRCS and the Sponsor for the Preferred Alternative are shown in Tables 9.1 and 9.2 (Economic Tables 1 and 2). Channel data including channel dimensions and peak discharges are provided in Table 9-3 (Structural Table 3b). Total annualized costs for the preferred alternative are shown in Table 9-4 (Economic Table 4). Average Annual Flood Damage Reduction Benefits are provided in Table 9-5 (Economic Table 5). A comparison of NED Benefits and Costs is provided in Table 9-6 (Economic Table 6). Estimated detailed construction costs for each alternative are provided in Appendix D, Section D7. The calculation of damages for each alternative, the annual damages, construction cost estimates, project administration costs, and operation and maintenance costs were used to conduct a benefit-cost analysis (BCA) for the proposed project life of 50 years plus an additional 2 years for design and construction. Details on this BCA are provided in Appendix D, Section D7. The costs shown in these tables and throughout the document are based on standard cost accounting practices required of federal watershed planning agencies, such as NRCS.

Table 9-1. Economic Table 1 - Estimated Installation Cost [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars]¹

Works of Improvement	Unit	Number			Estimated Cost (Dollars) ¹		
		Federal Land	Non-Federal Land	Total	PL 83-566 Funds	Other Funds	Total Estimated Costs
Structural Measures, Channel Work - Area 1	lf	-	10690	10690	\$3,650,178	\$10,000	\$3,660,200
Structural Measures, Channel Work - Area 2	lf	-	11422	11422	\$2,993,126	\$10,000	\$3,003,100
Structural Measures,	lf	-	9724	9724	\$2,708,551	\$10,000	\$2,718,600



Works of Improvement	Unit	Number			Estimated Cost (Dollars) ¹		
		Federal Land	Non-Federal Land	Total	PL 83-566 Funds	Other Funds	Total Estimated Costs
Channel Work - Area 3a							
Structural Measures, Channel Work - Area 4	lf	-	27175	27175	\$7,284,020	\$10,000	\$7,294,000
Structural Measures, Channel Work - Area 5	lf	-	17865	17865	\$4,680,039	\$10,000	\$4,690,000
Structural Measures, Channel Work - Area 6	lf	-	200	200	\$109,786	\$10,000	\$119,800
Total Project	lf	-	77076	77076	\$21,425,700	\$60,000	\$21,485,700

¹ Price Base 2024

October 2025



**Table 9-2. Economic Table 2 - Estimated Cost Distribution, Preferred Alternative [Lick Creek and Dudley Main Ditch Watershed],
[MO], [Dollars]¹**

Works of Improvement	Installation Cost – PL 83-5662					Installation Cost – Other Funds							Total Installation Cost
	Const	Eng	Prop Acq	Admin	Total PL-83-566	Const	Eng	RP Rights	Permits	SPC	Admin	Total Other	
Structural, Channel Work	\$17,140,600	\$3,428,100	\$ -	\$857,000	\$21,425,700	\$ -	\$ -	\$ -	\$60,000	\$ -	\$ -	\$60,000	\$21,485,700

Cost Codes: Construction = Const; Engineering = Eng; Property Acquisition = Prop Acq; Project Administration = Admin; Real Property Rights = RP Rights; Sponsor Planning Costs = SPC.

Prepared October 2025

¹ Price base: 2024

² PL 83-566 Cost paid by federal agency responsible for assisting in improvement installation, USDA-NRCS.

Table 9-3. Structural Table 3b - Structural Data – Channel Work [Lick Creek and Dudley Main Ditch Watershed], [MO]

						Channel Dimensions ^{1/}				n Value		Velocities (ft/s)					
Channel name (reach)	Sta.	Drain- age Area (mi ²)	2% freq. design disch. g. (cfs)	Water surface elevation feet (NAVD88)	Hydraulic Gradient (ft/ft)	Gradient (ft/ft)	Bottom Width (ft)	Elev (ft/NA VD88)	Side slope	Aged (Existing)	As built (Proposed)	Age d (Existing)	As built (Proposed)	Excavation volume (yd ³)	Type of work ^{2/}	Existing channel type ^{3/}	Present Flow cond. ^{4/}
Cypress Lat No 1 (Area 1)	0+00	40	2,143	320.26	0.0001	0.0004	30	296.00	2.5:1	0.04	0.04	2.74	5.92	82,774	III, V	Ditch	Pr
Unnamed Channel (Area 2)	0+00	2.46	511	322.95	0.0002	0.0026	10	304.91	1.9:1	0.05	0.05	1.16	1.05	25,362	III, V	Ditch	Pr
Lick Creek (Area 2)	223+77	110	5,522	322.47	0.0001	0.00001	45	300.75	2.3:1	0.04	0.04	3.00	3.47	16,601	III, V	Ditch	Pr
Lick Creek (Area 2)	256+00	107	5,522	323.43	0.0003	0.0009	45	302.47	2.5:1	0.04	0.04	2.75	3.08	16,868	III, V	Ditch	Pr
Lick Creek (Area 3a)	288+75	106	5,541	323.98	0.0002	0.0001	45	305.00	2.9:1	0.04	0.04	2.25	2.39	20,165	III, V	Ditch	Pr
Dudley Main	0+00	39.1	3,145	324.87	0.0004	0.0006	20	305.50	1.9:1	0.04	0.04	2.68	2.94	20,082	III, V	Ditch	Pr



						Channel Dimensions ^{1/}				n Value		Velocities (ft/s)					
Channel name (reach)	Sta.	Drai- n- age Area (mi ²)	2% freq. desig n disch g- (cfs)	Water surface elevation feet (NAVD8 8)	Hydraul ic Gradien t (ft/ft)	Gradient (ft/ft)	Bottom Width (ft)	Elev (ft/NA VD88)	Side slope	Aged (Existi ng)	As built (Prop osed)	Age d (Exi sting)	As built (Pro pose d)	Excava- tion volume (yd ³)	Type of work ^{2/}	Existi ng chann el type ^{3/}	Pres ent Flow cond . ^{4/}
(Area 3a)																	
Lick Creek (Area 4)	338+00	61.9	4,024	324.88	0.0003	0.0005	35	305.41	2.3:1	0.04	0.04	3.59	3.48	117,531	III, V	Ditch	Pr
Lick Creek (Area 5)	609+60	10.6	4,778	339.14	0.0005	0.0005	35	321.66	2.5:1	0.04	0.04	4.06	4.58	75,666	III, V	Ditch	Pr
Dudley Main (Area 6)	194+00	55.2	2,980	339.37	0.0016	0.0015	25	323.33	1.7:1	0.045	0.045	5.07	5.04	819	III, V	Ditch	Pr

^{1/} Minor excavation to remove sediment and armor

Prepared: February 2025

^{2/} III- Cleaning out; V- Stabilization primary purpose

^{3/} Manmade ditch/previously modified channel (Drainage District 12 formed in 1909)

^{4/} Pr- perennial flow, I- Intermittent, E- Ephemeral, based on USGS quad maps

^{5/} Explain discharge velocities in the table are based on (design, year, etc)

Table 9-4. Economic Table 4 - Estimated Average Annual NED Costs [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars]¹

Item	Structural Measures, Channel Work
Annual Costs	
Amortized Installation Costs ²	\$ 781,500
O&M and Replacement Costs	\$ 56,000
Total Average Annual Costs	\$ 837,500

¹ Price base 2024

² Amortized over 52 years at 2.75% interest rate.

Table 9-5. Economic Table 5 - Estimated Average Annual Flood Damage Reduction Benefits [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars]¹

Item	Estimated Average Annual Flood Damage ^{1,2}				Damage Reduction	
	Without Project		With Project			
	Agriculture Related	Non Agric. Related	Agriculture Related	Non Agric. Related	Agriculture Related	Non Agric. Related
Floodwater						
Residential	\$ 4,937,306	-	\$ 3,531,858	-	\$ 1,405,448	-
Commercial	\$ 17,280,571	-	\$ 12,361,503	-	\$ 4,919,068	-
Agriculture	\$ 10,223,000		\$ 9,508,600		\$ 714,400	
Other	\$ 224,423	-	\$ 160,539	-	\$ 63,884	-
Sediment	-	-	-	-	-	-
Erosion	-	-	-	-	-	-
Total: \$7,102,800						

¹ Price base 2024

October 2025

² Agriculture-related damage includes damage to rural communities.

Table 9-6. Economic Table 6 - Comparison of NED Benefits and Costs [Lick Creek and Dudley Main Ditch Watershed], [MO], [Dollars]¹

Works of Improvement	Flood Damage Reduction	Sediment Reduction	Other Economic Effects	Average Annual Benefits	Average Annual Costs ²	Benefit/Cost Ratios
Alternative 3 - Channel Work	\$7,102,800	-	-	\$7,102,800	\$837,500	8.5

¹ Price base: 2024

October 2025

² From Table 9-4.

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11. LIST OF PREPARERS

This Plan-EA was prepared by Conservation Works Joint Venture (CWJV) with support from WSP, and local and state NRCS staff. Subject matter experts responsible for hydraulic and civil engineering, resource conservation, soils, biology, economics, geology, ecology, and contract administration internally reviewed this Plan-EA and concurred on findings and solutions. The inhouse review was followed by a review by the NRCS National Water Management Center, and then an interagency and public review. Table 11-1 lists the qualifications of the individuals who provided significant input and effort in preparing this Plan-EA.

Table 11-1. Experience and Qualifications of Report Preparers

Name and Project Role	Present Title	Education	Years Experience
USDA-NRCS Missouri			
Chris Hamilton	Assistant State Conservationist for WRE	B.S., M.S. Biology	35
Steven Hefner	Natural Resources Specialist	A.B. Biology and M.S. Agronomy	35
Russell Snyder	State Archaeologist	B.S. Anthropology, M.S. Cultural Resources Management	24
Brandon Viers, P.E.	Civil Engineer	B.S. Civil Engineering	28
John Hester, P.E.	Area Engineer	B.S. Civil Engineering	31
Michelle Gross	District Conservationist	B.S. Agribusiness, M.S. Business Administration	24
Nancy Walker	Area Conservationist	B.A. Education	25
L. Rex McAliley, PhD	Wildlife Biologist	B.S., M.S. and Ph.D. Biology	25
Sponsor			
Davis Minton	Chairman		
Consultant – Conservation Works JV			
Scott Hobart, P.E., Maurer-Stutz, Project Task Manager, Watershed Planning Lead	Project Manager	BS Civil Engineering	24
Jason Sweet, PMP, GISP, Prairie Engineers	Environmental Lead	BS Wildlife Biology, MA Geography	21
Keith Plavec, P.E., Maurer-Stutz, Alternatives Analysis	Senior Project Manager	BS Civil Engineering, MS Civil Engineering	26



Name and Project Role	Present Title	Education	Years Experience
Bethany Bertsch, P.E., Maurer-Stutz	Civil/Water Resources	BS Biological Systems Engineering, MS Agricultural and Biological Engineering	7
Katlyn Kopkowski	GIS Analyst	BS Geography	2
Jennifer Trapani, PLS, Prairie Engineers, Surveying Discipline Lead	Surveyor	BS Construction Management, Survey Specialization	26
Sarah Stai, CSE, Prairie Engineers	Senior Environmental Scientist	BS Ecology, PhD Ecology	20
Sylvia Harris, Prairie Engineers	Senior Environmental Scientist	BS Biology, MS Biology	20
Trevor Cunningham, CST, Prairie Engineers	Environmental Scientist	BS Wildlife Conservation and Management	10
Marina Osier, Prairie Engineers	Environmental Scientist	BS Forestry, MS Biology	10
Crystal Hudak, Prairie Engineers	Environmental Scientist	BS Oceanography & Marine Biology, MA in Environmental Restoration, MS in Environmental Policy & Management	10
Katie Cochran, Prairie Engineers	GIS Analyst	BA Geographic Information Science and Geoscience, MS in Environmental Science and Sustainability	4
Avantika Ramekar, Prairie Engineers	GIS Analyst	BS Geography, MS GIS, PhD Geography	5
Cori Hertfelder, Terracon, Cultural Resources Lead	Environmental Department Manager	MS Archaeology	11
Jane Lybarger, Terracon, Cultural Resources	Cultural Resources Group Manager	M.A. Anthropology	18
Larry Sample, P.E., WSP, Assistant Project Task Manager	Agricultural Engineer	MS Agricultural Engineering	27
Scott Taylor, P.E., WSP, Economics Lead	Civil Engineer	MS Civil Engineering	31



Name and Project Role	Present Title	Education	Years Experience
Dana Waits, WSP, Economics	Lead Consultant, Environmental Scientist	BS Environmental Science	20
Joseph Hiebert, WSP, Economics QA/QC	Economist	BS Sustainability and Economics MS Geography	7
Mary Motte Firki, PWS, WSP, QA/QC - NEPA/PR&G	Environmental/ Natural Resources Lead	MS Forest Resources	25
Kathryn Warner, WSP, QA – Cultural Resources	Lead Consultant, Archaeologist	MA Anthropology	24
Doug Tate, P.E., WSP	Geotechnical Engineer	BS Civil Engineering	42

12. DISTRIBUTION LIST

Comments regarding the Draft Plan-EA were requested from the agencies and stakeholders listed below in Table 12-1. The table also notes if a response was received.

Table 12-1. Distribution List

Agency or Stakeholder	Response Received	Agency or Stakeholder	Response Received
Federal Agencies		Tribal Governments	
US Army Corps of Engineers		Absentee-Shawnee Tribe of Indians of Oklahoma	
US Environmental Protection Agency	10/18/2023	Apache Tribe of Oklahoma	
US Federal Emergency Management Agency		Cherokee Nation	
US Fish and Wildlife Service	10/23/2024	Delaware Nation	
US Geological Survey		Delaware Tribe of Indians	
USDA Farm Service Agency		Eastern Shawnee Tribe of Oklahoma	
USDA Forest Service		Iowa Tribe of Oklahoma	
USDA Rural Development		Miami Tribe of Oklahoma	
		Osage Nation	
		Peoria Tribe of Indians of Oklahoma	
		Ponca Tribe of Nebraska	
		Ponca Tribe of Oklahoma	
		Quapaw Nation	
		Shawnee Tribe	
		United Keetoowah Band of Cherokee Indians in Oklahoma	
Missouri State Agencies		Local Agencies	
Governor of Missouri		Stoddard County Commission	
Missouri Department of Agriculture		Stoddard County Soil and Water Conservation District	
Missouri Department of Conservation	10/23/2023	City of Bloomfield	
Missouri Department of Natural Resources	10/30/2023 10/24/2024	City of Dexter	
Missouri Department of Transportation		City of Dudley	
Missouri Levee and Drainage District Association			



Agency or Stakeholder	Response Received	Agency or Stakeholder	Response Received
Missouri State Emergency Management Agency			
Missouri State Floodplain Administrators			
Missouri Association of Soil and Water Conservation Districts			
Public Stakeholders		Delegates	
		US House	
		US Senate	
		Missouri State Representative - District 151	
		Missouri State Senate - District 25	



APPENDIX A COMMENTS AND RESPONSES

Table of Contents

Consultation Absentee Shawnee 2024.....	A-1
Consultation CR SHPO 2024.....	A-3
Consultation CR SHPO 2025.....	A-5
Consultation Eastern Shawnee 2024.....	A-7
Consultation MODNR	A-9
Consultation Osage Nation 2024	A-16
Consultation Quapaw 20240925.....	A-18
Consultation Quapaw 20250619.....	A-20
Consultation Shawnee Tribe 2024.....	A-25
Consultation TE MODC	A-27
Consultation TE USFWS.....	A-33
Consultation USEPA	A-43
Consultation USFWS 20250922.....	A-47
Initial Interagency Meeting Minutes.....	A-49
Initial Interagency Meeting Sign-In Sheet.....	A-81
Initial Public Meeting Minutes	A-83
Initial Public Meeting Presentation.....	A-116
Initial Public Meeting Sign-In Sheet.....	A-145
Initial Public Meeting Stakeholder Letters	A-147
Initial Public Meeting Stakeholder List	A-480
IPaC_ Lick Creek - Dudley Main Project Area Biological Assessment 20251119	A-481
IPaC_ Lick Creek - Dudley Main Project Area General Project Design Guidelines 20251119.....	A-507
IPaC_ Lick Creek - Dudley Main Project Area Species List 20251119.....	A-512
IPaC_ Lick Creek - Dudley Main Project Area Species Survey Guidelines 20251119	A-522



IPaC_ Lick Creek - Dudley Main Project Area Technical Assistance Letter 20251119.....	A-623
Land Rights Letter DD12.....	A-364
Memo NRCS and USFWS Consultation	A-365
NB 190-25-8 ECS–Interim Guidance for Executive Orders 14148 and 14173 and NEPA Implementing Procedures	A-636
Second Public Meeting Minutes	A-638
Second Public Meeting Presentation	A-369
Second Public Meeting Sign-In Sheet	A-697
Second Public Meeting Stakeholder Letters	A-699
Second Public Meeting Stakeholder List.....	A-847



APPENDIX B
WATERSHED PROJECT MAP

Table of Contents

B1 Watershed.....B-1

B2 Project Area.....B-2

Figure 1-1. Lick Creek – Dudley Main Ditch Watershed, Affected Resource Area

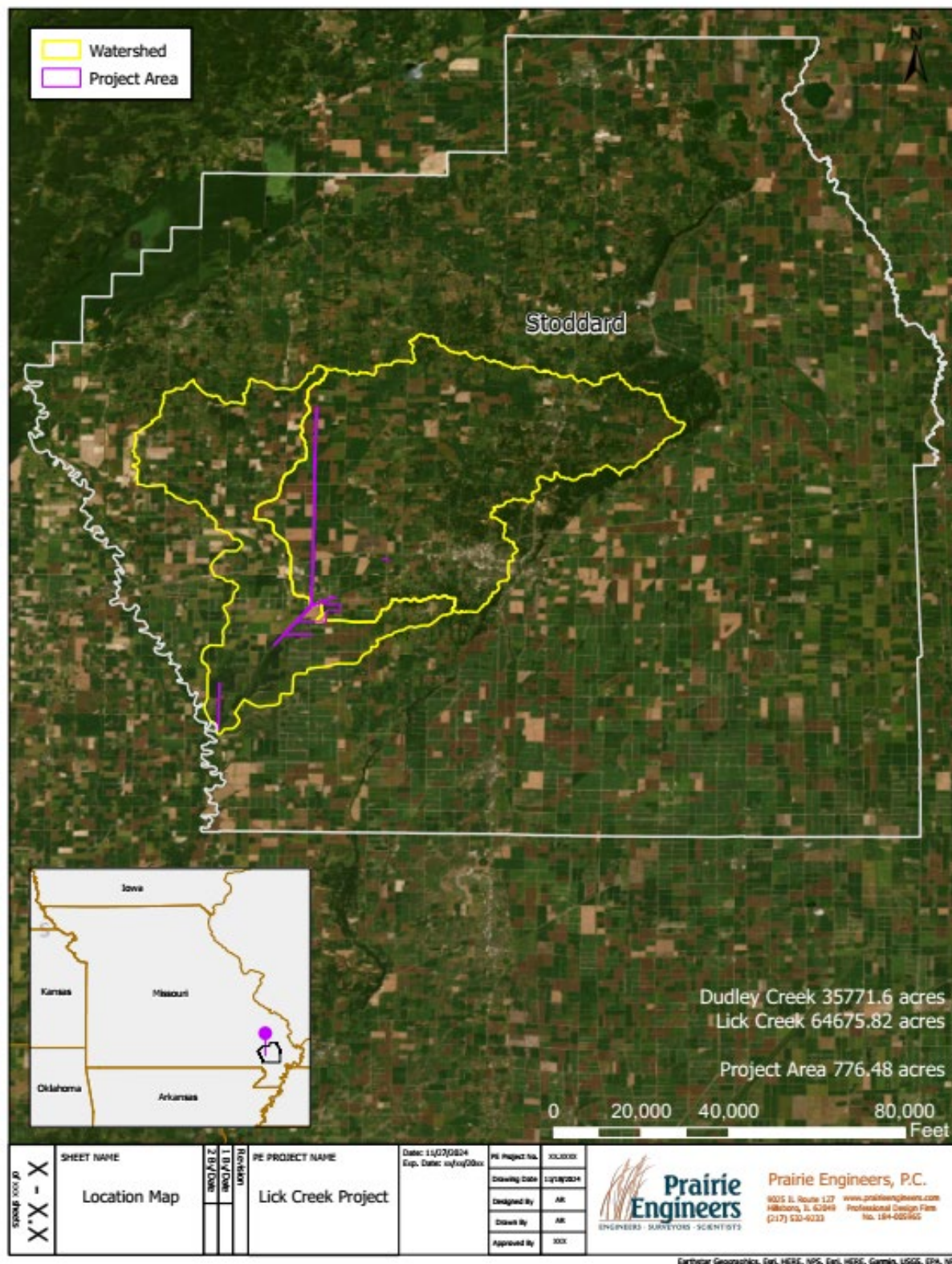
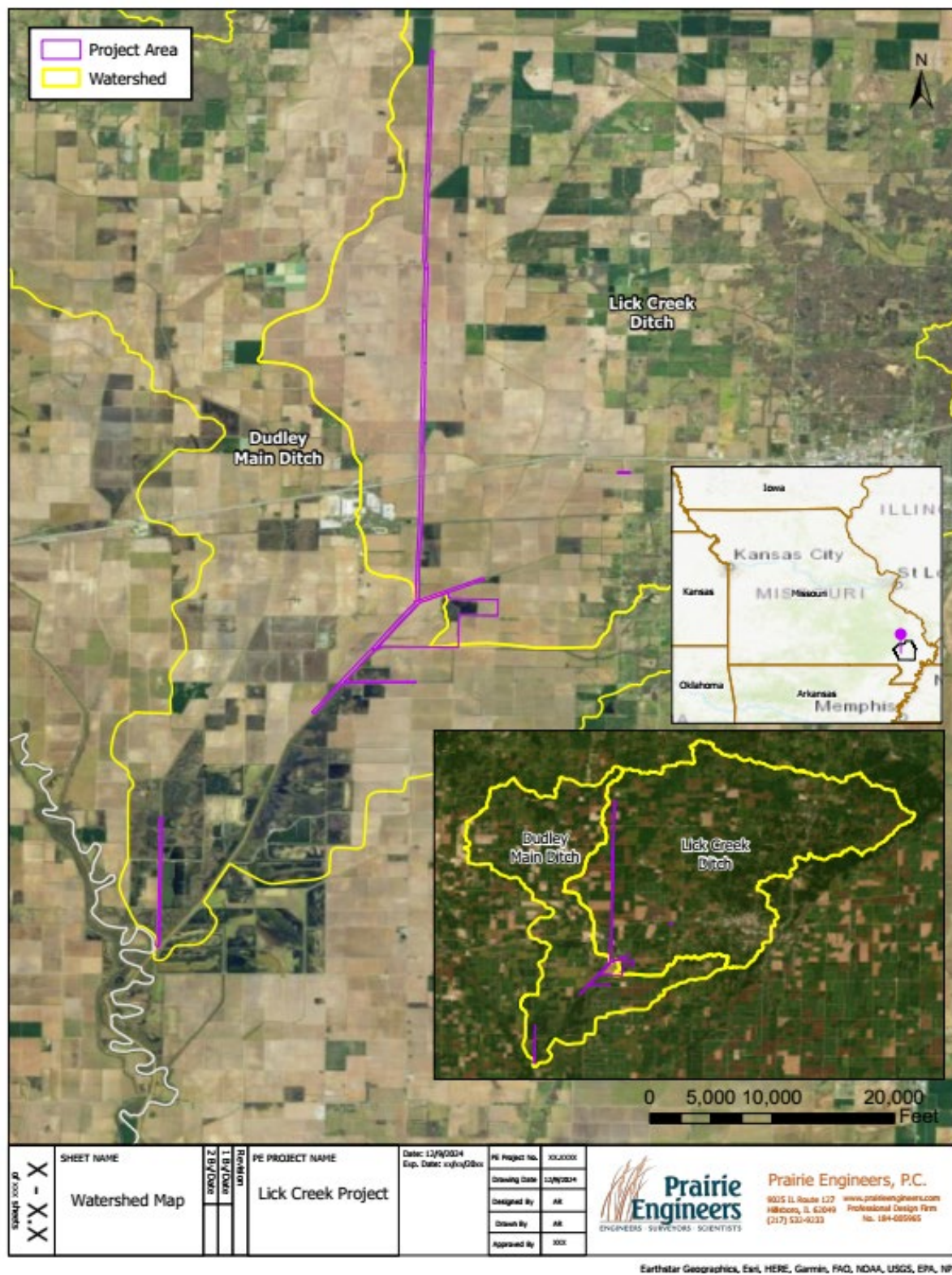


Figure 1-2. Lick Creek – Dudley Main Ditch Watershed, Project Area





APPENDIX C SUPPORT MAPS

Table of Contents

C1 Location ARA	C-1
C2 Topo ARA.....	C-2
C3a NLCD ARA.....	C-3
C3b-h NLCD PA Series.....	C-4
C4a Soils ARA.....	C-11
C4b-h Soils PA Series.....	C-12
C5a PrimeFarmland ARA.....	C-19
C5b-h PrimeFarmland PA Series.....	C-20
C6a-k Floodplain PA Series.....	C-27
C7 WOTUS ARA	C-38
C8 NWI ARA	C-39
C9 Rivers&Streams ARA	C-40
C10 303d ARA	C-41
C11 Natural Areas ARA	C-42
C12a-g Land Rights PA Series	C-43
C13a-ab 100 Year Floodplain Comparison Series.....	C-50
C14 Concept Layouts.....	C-78

APPENDIX D

INVESTIGATIONS AND ANALYSES REPORT

Table of Contents

D1.	Introduction.....	D-1
D1.1.	Summary of Principles, Requirements, and Guidelines	D-1
D2.	Land Use	D-2
D3.	Soils.....	D-4
D3.1.	Drainage Class and Hydrologic Soil Group	D-4
D3.2.	Prime and Unique Farmland and Farmland Soils of Statewide Importance	D-11
D4.	Geology.....	D-12
D4.1.	Geologic Setting	D-12
D4.2.	Geology.....	D-12
D4.3.	Geologic Investigations	D-13
D5.	Engineering.....	D-14
D5.1.	Land Rights Assessment of Project Area	D-14
D5.2.	Geotechnical	D-14
D5.2.1.	Slope Stability Analyses.....	D-14
D5.3.	Conclusions	D-14
D5.4.	Hydrology and Hydraulics.....	D-15
D5.4.1.	Hydrology and Hydraulic Analyses	D-15
D5.5.	Non-Structural	D-17
D5.5.1.	Wetland Development.....	D-17
D6.	Biology.....	D-18
D6.1.	Waters of the U.S. (Streams, Lakes and Wetlands).....	D-18
D6.2.	Surface Water Quality (Clean Water Act).....	D-19
D6.3.	Vegetation.....	D-19
D6.4.	Threatened and Endangered Species	D-21
D6.5.	Migratory Bird Treaty Act/Bald and Golden Eagle Protection Act	D-23
D6.6.	Fish and Wildlife Habitat.....	D-25
D6.7.	Invasive Species.....	D-25
D7.	Economics.....	D-24
D7.1.	General.....	D-24
D7.2.	Determining Project Damages	D-24
D7.2.1.	Structural Damages	D-24
D7.2.2.	Agricultural Damages.....	D-27
D7.3.	Benefit-Cost Analysis.....	D-32
D7.4.	Alternative Cost Estimates	D-33
D7.5.	Comparative Cost Analysis	D-33
D7.5.1.	Alternative 2 Installation Cost.....	D-35
D7.5.2.	Alternative 3 Installation Cost.....	D-36
D7.5.3.	Alternative 4 Non-Structural Buyout Costs	D-43



D8.	Human Environment.....	D-44
D8.1.	Socioeconomic Issues	D-44
D9.	Cultural Resources	D-47
D9.1.	Survey Methodology	D-47
D9.2.	Phase I Archaeological Survey	D-47
D9.3.	Historic Resources Survey.....	D-47
D9.4.	Background Research	D-47
D9.5.	Summary.....	D-48



APPENDIX E
OTHER SUPPORTING INFORMATION

Table of Contents

Lick Creek and Dudley Main WOTUS_TE_DRAFT 20240409	E-1
Section 106 Archaeological Survey Report Redacted	E-95
Section 106 Architectural History Report_revised	E-171