USDA United States Department of Agriculture

Natural Resources Conservation Service

May

DRAFT WATERSHED PLAN AND ENVIRONMENTAL ASSESSMENT For the Lower Vermilion River Watershed Vermilion Parish, Louisiana

United States Department of AgricultureNatural Resources Conservation Service

In Cooperation With

Vermilion Soil and Water Conservation District

Prepared by

Natural Resource Conservation Service (NRCS)

Draft
Watershed Plan and Environmental Assessment for The Lower Vermilion River Watershed Project

ABSTRACT

Vermilion Parish, Louisiana

Lead Agency: U.S. Department of Agriculture, Natural Resources Conservation Service, Louisiana (USDA-NRCS)

Sponsoring Local Organization (SLO): Vermilion Soil and Water Conservation District (VSWCD)

Authority: This Watershed Plan and Environmental Assessment (Plan-EA) has been prepared under the Authority of the Watershed Protection and Flood Prevention Act of 1954 (Public Law [P.L.] 83-566) and the Regional Conservation Partnership Program (RCPP), authorized by Subtitle I of Title XII of the Food Security Act of 1985 (the 1985 Act), as amended by Section 2401 of the Agricultural Act of 2014 (the 2014 Act). The Plan-EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, P.L. 91-190, as amended (42 U.S. Code [U.S.C.] 43221 et seq.).

Abstract:
Local residents, agricultural producers and the VSWCD have been developing a plan to manage water issues in the LVRW since conceptual ideas were formulated in a 1964 plan. Salt water intrusion, soil contamination and flooding continue to present costly land management issues for growers and residents in the LVRW. This Plan-EA identifies the specific problems with water management in the LVRW and provides two alternatives that offer management solutions to address flood damage reduction, agricultural water management and water quality management. Both alternatives include water control structures and levee improvements designed and managed to regulate water movement through the LVRW, reduceflooding from tidal surges to ±6 ft NAVD88, and allow for expedient discharge of surface waters from abnormally high tideand precipitation events. Both alternatives would improve agricultural water management via a management plan that regulates salt-water influx thereby ensuring a more consistent and reliable source of freshwater for irrigation and livestock.The LVRWP will protect water quality by minimizing impacts from storm and tidal surge by reducing saltwater contamination of freshwater supplies in the watershed. Total estimated total project costs are $10,158,180.76, of which
$2,539545.19 will be paid for by the Sponsor and other funding sources. The estimated amount to be paid through USDA-NRCS P.L. 83-566 funds is $7,618,635.57. This document is intended to fulfill the requirements of *Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies (PR&G)* and the National Environmental Policy Act (NEPA) of 1969, P.L. 91-190, as amended (42 U.S.C. 43221 *et seq*.)., in order to be considered for authorization of P.L. 83-566 funding.

Comments: USDA-NRCS has completed this Draft Plan-EA in accordance with the NEPA and USDA-NRCS guidelines and standards. Reviewers should provide comments to NRCS during the allotted Draft Plan-EA review period. To submit comments, send via U.S. Mail to:

NRCS Louisiana State Office Attention: Chad Kacir 3737 Government Street
Alexandria, LA 71302
Or e-mail to richard.kacir@usda.gov

Non-Discrimination statement:

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies,the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistanceprogram, 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.

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LOWER VERMILION RIVER
WATERSHED PLAN AGREEMENT

between the
Vermilion Soil and Water Conservation District
(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 Lower Vermilion River Watershed, State of Louisiana, 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 assignedby 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 Lower Vermilion River Watershed, State of Louisiana, 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 (55 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 agree 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 toa 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 agree 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.

Cost-share Table for Watershed Operation or Rehabilitation Projects					
Works of Improvement	**NRCS**		**Sponsors**		**Total**
Cost-Shareable Items List measures by purpose and rate of assistance 1/	**Percent**	**Cost**	**Percent**	**Cost**	**Cost**
Flood Damage Reduction	100%	$1,000,655	0%	$0	$1,000,655
Agricultural Water Management	75%	$6,754,423	25%	$2,251,474	$9,005,897
Engineering Costs	100%	$674,619	0%	$0	$674,619
Subtotal: Cost-Shareable Costs		**$8,429,697**		**$2,251,474**	**$10,681,171**
Non-Cost-Shareable Items 2/					
Mitigation	0%	$0	100%	$170,000	$170,000
Project Administration 3/	0%	$0	100%	$272,906	$272,906
Real Property Rights 4/	0%	$0	100%	$116,363	$116,363
Subtotal: Non-Cost-Share Costs		**$0**		**$559,269**	**$559,269**
Total:	75%	**$8,429,697**	25%	**$2,810,743**	**$11,240,440**

1/ Installation costs explanatory notes:

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

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

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

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

4/ Real Property Rights include acquisition of real property rights

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

6. **Land Treatment Agreements.** The 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 theland 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 shownin 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 thewatershed.

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 sponsoris 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.

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.

10. **NRCS assistance.** This agreement is not a fund-obligating document. Financial and other assistance to be furnishedby 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 promptlynotify the Sponsors in writing of the determination and the reasons for the deauthorization of project funding, togetherwith the effective date. Payments made to the Sponsors or recoveries by NRCS must be in accordance with the legalrights 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 District 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 andwill 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. The EAP 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, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs).Remedies and complaint filing deadlines vary by program or incident.

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(202) 690-7442; or (3) email: program.intake@usda.gov. USDA

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By signing this agreement, the recipient assures the Department of Agriculture that the program or activities providedfor 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 performanceof 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 independentcontractors 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 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 occurringin 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 projector 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 influencingor 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 toa 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) (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 EPA List of Violating Facilities on the date when this agreement was signed by NRCS unless and until the EPA eliminates the name of such facility or facilities from such listing.

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

(4) To insert the substance of the provisions of this clause in any nonexempt 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 insection 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 withpretreatment 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 ofan

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 assure and certify 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 Parts3015, 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.**

Vermilion Soil and Water Conservation District

The signing of this plan was authorized by a resolution by the **Vermilion Soil and Water Conservation** governing body and adopted at an official meeting held on

_____, 2021 at Abbeville, LA

By: _____

Christian RichardChairman

USDA-NATURAL RESOURCES CONSERVATION SERVICE

Date: _____

Approved by: Date: _____

_____

Chad Kacir, State Conservationist
Natural Resources Conservation Service
3737 Government Street
Alexandria, LA 71302

SUMMARY (OMB FACT SHEET)

Summary Watershed Plan – Environmental Assessment

For

Lower Vermilion River Watershed

Vermilion Parish, Louisiana

District 3

Authorization: Watershed Protection and Flood Prevention Act of 1954, as authorized by Public Law 83-566 Stat. 666, as amended (16 U.SC. Section 1001 et seq.), and the Regional Conservation Partnership Program, as authorized by Subtitle I of Title XII of the Food Security Act of 1985, as amended by Section 2401 of the Agricultural Act of 2014. (See NWPH 606.17)

Sponsor: Vermilion Soil & Water Conservation District (VSWCD)

Proposed Action: The proposed action would utilize PL-566 funds to develop a watershed management plan, design/build water control structures, and install levee enhancements. Water control structures will be designed to reduce saltwater intrusion from irregular tidal influences and storm surge and allow for expedient discharge of surface waters from abnormally high precipitation events. The operations plan will regulate tidal influences to manage saltwater intrusion. Water control structures will be installed in Hebert Canal (Site A), Meaux's Ditch (Site B), and (Site C) an "unnamed" canal approximately one-mile south of Site B. A levee will be constructed along the northern bank of the Gulf Intracoastal Waterway (GIWW). The levee will extend eastward from the Leland Bowman lock for approximately one mile, parallel to and south of Hwy 333.

Purpose and Need for Action:

Purpose - to reduce the threat of saline storm surge and reduce flood-related damages to infrastructure, crops, livestock, local industries, residents, and landowners. Tidal surges regularly affect salinities, adversely affecting crop damages and annual production. The goal is to create a manageable system and plan that will ensure more stable of salinity and water levels

Need - The area is subject to flooding from precipitation and storm surges, saltwater intrusion from tidal influences, and difficult to accurately predict events such as tropical storms and hurricanes. Existing structures provide protection up to a certain extent. The highwater table and nearly level topographic gradient, preclude channel dredging as a solution and render existing structures alone insufficient. Insufficient drainage and inadequate water control structures fail to protect the area from flood events. Likewise, existing canals, water control structures and levees are inadequate toprevent saltwater intrusion as slope and elevation gradient allow backflow during tidal surges. Improvements to area levees and an updated and comprehensive water control plan are needed to abate the ongoing concerns of
flooding and saltwater intrusion.

Purposes for which the project is planned: Title 390, NWPM purposes are:

Purpose 1: Flood Prevention (Flood Damage Reduction) – The area is subject to regular flooding and has suffered flood-related losses to homes, crops, livestock, businesses, and infrastructure..

Purpose 5: Agricultural Water Management – Regular backflow of high-salinity water during times of low precipitation contaminates available fresh water supplies for irrigation and livestock. The purpose is to create a manageable system and plan that will ensure a more consistent and reliable source of fresher water for irrigation and livestock. Storm and tidal surges can flood low areas with high salinity waters which increases soil salinity and reduces productivity. The purpose is to protect farm and pasture lands by developing a plan and structures that will reduce storm and tidal surge impact and lower the risk of salt contamination of soils.

Need for action:

Flood Damage Reduction – Existing water control structures are inadequate to prevent storm surge and saltwater intrusion. Storm surge and tides above ±2 ft NAVD88 regularly overtop Hwy 333 at the GIWW, allowing high salinity water from the GIWW to flood marshes in the Bayou Chene area. Gravity drainage is inadequate because the high water-table and flat topography create a naturally slow drainage rate.

Agricultural Water Management – Area farmers pump irrigation water from Hebert Canal. Regular backflow of high-salinity water during times of low precipitation contaminates available fresh water supplies for irrigation and livestock. Storm and tidal surges can flood low areas with high salinity waters which increases soil salinity. More consistent and improved water quality can be achieved by regulating saltwater intrusion into the watershed via control structures.

Preferred alternative/plan:

The preferred alternative consists of three water control structures and a ±0.5-mile levee enhancement to protect homes, businesses, State and Parish infrastructure, cropland, grazing land and pasture from flooding and salinization that occur up to a height of 6' NAVD88. The recommended actions will reduce saltwater intrusionin Hebert Canal, Meaux's Ditch, and the "Unnamed" canal. Structural measures to be installed include three watercontrol structures, and construction of a levee along the GIWW that forms the southern boundary of the project area as described and depicted in the EA.

Project measures: The Proposed Action will:

- Incorporate three two-way, semi-automatic multiple gated sheet pile structures and approximately 0.5 miles of levee construction

Resource Information

Project Area	
Watershed Names	**12-digit Hydrologic Unit Code**
Little Bayou -Vermilion River	080801030303
Vermilion River-Frontal Intracoastal Waterway	080801030305

Latitude and Longitude. Coordinates for each proposed action in the project are provided below:

	Latitude	**Longitude**
Site A - Hebert Canal	**29.816733**	**92.931944**
Site B - Meaux's Ditch	**29.809077**	**92.139101**
Site C - "Unnamed" Canal	**29.796533**	**92.142481**
Site D - GIWW levee improvements	**29.772844**	**92.190817**

Watershed size (acres): The total watershed size is 45,918 acres encompassing two HUC-12 sub-watersheds.

Climate and topography: Vermilion Parish is characterized as having a humid, subtropical climate dominated by warm moist air from the Gulf of Mexico. Prevailing winds are from the south, with springtime averages of 11 miles per hour. The average January temperature is 50˚ F and the average August temperature is 81˚F. Average annual precipitation is 59 inches. Elevations range from <1-foot to ±6-ft NAVD88 with the majority of the LVRW having 0 to 1 percent slopes. The LVRW is bordered and transected by natural and manmade waterways, with cypress loughs and hardwood areas within low lying ridge-swale topography to the north (Palmetto State Park, Big WoodsSwamp).

Land Use in the Lower Vermilion River Watershed (Total 45,834 acres):	**Use**	**Acres**	**Percentage (%)**
	Agriculture (Cultivated Crops/Pasture)	17,468	38%
	Wetlands	23,856	52%
	Open Water	2,035	4%
	Developed	1,297	3%
	Forest	709	2%
	Shrub land	209	0.5%
	Grassland/Herbaceous	193	0.4%
	Barren Land	66	0.1%
Land ownership	**Ownership**	**Percentage (%)**	
	Private	98%	
	State-Local / Federal	2%	
Population and demographics		**Vermilion Parish**	
	Population	59,511	
	Percentage of person below poverty line	17.6%	
	Per Capita Income	$24,546	
Agricultural Production Demographics	**Lower Vermilion River Watershed**	**Acres**	
	Prime farmland	20,325	
	Not Prime Farmland	25,587	
	Vermilion Parish	**Percentages**	
	Change in Farmland Acreage from 2012-2017	+10%	
	Change in number of Farms from 2012-2017	+44%	
	Per Farm Average		
	Market Value for products sold	-25%	
	Government Payments	+95%	
	Total farm production expenses	-6%	
	Net cash farm income	-35%	

Resource concerns identified through scoping:

Alternatives

Alternative 1 No Action	Continued area-wide flooding resulting in: -Public safety concerns due to inability to evacuate residents. -Continued crop, livestock and equipment losses. -Wetland, wildlife and aquatic habitat degradation. -Silt and sedimentation in waterways. -Structure damage and recurring soil salinization and productivity loss.
Alternatives Considered	**Alternative 2(Preferred)**
	Install a water control structure on Hebert Canal. Install a water control structure on Meaux's Ditch at Hwy 333. Install a water control structure in an "Unnamed" canal at Hwy 333, about 1-mile south of Meaux's Ditch. Levee construction along 0.5 mile of Hwy 333 eastward from the Leland Bowman lock.

	Alternative 3
	Install a water control structure on Hebert Canal. Install a water control structure on Meaux's Ditch at Hwy 333. Raise existing levees 2 ft. (6ft. total) for approximately 11 miles.

Components of each alternative:

Alternative 2 (Preferred)

- Construction of a 0.5-mile-long six feet tall Bulkhead levee along the GIWW and Hwy 333.
- Install water control structures 1) Hebert Canal at GIWW - The design includes 9 10' X 10' bays, includes one 10' X 12' boat bay to allow passage of recreational type vessels., 2) Meaux's Ditch - spans the entire ±60 ft. channel and includes four 4' X 6' bays with wing walls at each end that anchor the structure to the bank line. The structure will be set at ±-6.3 ft. 3) Unnamed canal at Hwy 333.- this includes a flap-gate culvert structure that will allow flow in one direction, out of the project area, and prevent flow into the project area. The flap-gate(s) can be locked open to allow free flow in both directions. Culvert sizes are not yet designed.

Alternative 3

- Raising of existing levees about 2 ft. above existing ground (6 ft. total) approximately 11 miles. New proposed height of levee 6ft.
- Install water control structures: 1) Hebert Canal at School Board levee, 2) Meaux's Ditch at Hwy 333

See alternative details in **Chapter 4 Section 4.3**

Mitigation measures: Design features and BMPs that would be applied during construction of the proposed project components to avoid and minimize impacts to environment and social resources are described **Section 7.3.1**. For the known project components, an Operations Plan will be used to mitigate concerns of fisheries access for the Hebert Canal control structure. See **Appendix E**.

Project Costs	
Construction	$ 10,006,552
Engineering	$ 674,619
Project Admin	$272,905
Real Property Rights	$116,363
Annual O&M (non-federal)	$20,000
Mitigation	$170,000
Total Project Costs	$11,240,440
Total Annual Costs	$329,112

Permitting	Any jurisdictional wetlands impacted by project activities will require a Section 404 Clean Water Act Permit, in addition to a Coastal Use permit. A DOTD permit will also be required along Hwy 333.
Project benefits	
Project benefits	Implementation of the Preferred Alternative would reduce ongoing crop damages, increase freshwater availability/ reliability, and provide a strong barrier against saltwater intrusion from the Gulf.

Number of direct beneficiaries	+20 producers in the project study area (approximately 9,700 acres of rice, crawfish, cattle, and hay)	
Other beneficial effects in physical terms	Implementation of the Preferred Alternative would have moderate to long-term beneficial effects to agricultural freshwater availability and soil salinity reduction.	
Damage Reduction Benefits	Implementation of the Preferred alternative would decrease crop/land loss due to flooding and soil salinization. This provides approximately $10,403,435 in total damage reduction benefits for an average annual equivalent of $847,288.	
Total Quantified Benefits	$16,000,000	
Benefit to Cost Ratio	1.13	
Installation Period	5 years	
Net Annual Beneficial Effects (NED)	$343,000	
Period of Analysis	55 years	
Project Life	50 years	
Funding Schedule		
Year	**Other Funds**	**Total**
2021-2071	$2,539,545	$7,618,636

Environmental Effects:

Air Quality – minor short-term effects during construction activities; not anticipated to cause non-attainment within the project area or region. The proposed action would not result in significant adverse effects to air quality.

Cultural and Historic Resources - no historic properties are located within or adjacent to the APE. Louisiana SHPO concurred with the preliminary determination that no historic properties would be adversely affected by the LVRWP. All Tribes were also consulted during the SHPO review. The NRCS did not received any comments from the federally recognized Indian tribes consulted within or after the 30-calendar day review period. Canals and ditches within the APC are not eligible for listing on the NRHM, as these elements of the cultural landscape are not associated with significant historical events or persons, do not represent distinctive characteristics or the work of master and have little potential to produce information important to history or prehistory.

Fish and Aquatic Species - The Preferred Alternative has the greatest potential to adversely affect fisheries due to the proposed location of a water control structure in Hebert Canal at the GIWW. A BMP and mitigating factor is that the Operations Plan provides for the structure to remain "open" for the greatest amount of time possible over the course of a year. This provision would yield the least change to water flow, water levels, and salinity and provide maximum ingress/egress for fisheries. Operating criteria are based on specific circumstances (storm events, tidal surge, salinity levels) which support the project purpose of flood and salinity reduction/prevention.

Geology and Soils - Approximately 12 total acres of soil would be disturbed during construction. Soil impacts would be minor, short-term and adverse during construction. Moderate, long-term and beneficial impacts to soil resources from reduction of erosion and soil salinity issues associated with tropical storm surges and abnormal high tide events.

Land Cover/Land Use - No effect on land use adjacent to the project area, as property ownership and existing use of land would not change.

Public Safety and Human Health - will result in safety risks during installation, operation and maintenance of the system due to heavy equipment, high-voltage power and use of petroleum products. These risks will be mitigated through strict adherence to all local, state and Federal rules concerning worker safety. Measures may include signage, lighting, and access control during and after construction.

Recreation –Negligible effects to land-based recreation. Effects due to the operation of the control structures are anticipated to be minor, if any. In accordance with the Operations Plan, at least one gate will remain open to allow for recreationalboat passage during extreme high tide events.

Socioeconomics - The Preferred Alternative has an estimated annual NED benefit of $437,436.

Terrestrial Wildlife - The Preferred Alternative has potential for direct adverse effects to animals occurring in areas of direct impact during clearing/construction phases; potential to result in minor adverse effects to habitat over time and no measurable effects to species diversity and population levels in study area or LVRW

T&E / Special Status Species - Potential direct adverse effects to migratory birds if clearing and construction occur during nesting season; long-term loss of suitable nesting habitat. BMPs to avoid and minimize direct impacts is to schedule construction and clearing outside of nesting season (March –September). The Preferred Alternative may affect but is not likely to adversely affect special status and threatened or endangered species..

Invasive Species – potential for short and long-term adverse effects associated with introduction of construction equipment in terrestrial and aquatic habitats, and waste management during construction.

Vegetation – potential for long-term and short-term adverse effects associated with construction of proposed components of alternatives 2 and 3.

Water Quantity/Water Quality – Minor, long-term, and beneficial effects. Implementations of the project components would result in a slight reduction of water level and salinity during storm surges and tidal influences.

Wetlands, Flood Plains, Riparian Zones – Impacts to wetlands and riparian habitat from the construction and operation of the Preferred Alternative may be both short- and long-term**.**

Wild and Scenic River - No effects. No Wild and Scenic Rivers or State Scenic Waterways occur in the LVRWP area.

Major conclusions	Major, beneficial impacts to flooding and water quality by reduced salinity and reduced impacts from flooding of residential andagricultural areas.
Controversial Issues	Fisheries access due to the location of the Hebert Canal controlstructure
Issues to be resolved	Fisheries access will be mitigated by minimizing the closure of the structure according to the criteria set in the Operations Plan.
Is this report in compliance with executive orders, public laws, and other statues governing the formulation of water resource projects? Yes.	

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INTRODUCTION

Efforts to manage water resources in Vermilion Parish have long been broadly affected by steadily degrading coastal conditions coupled with normal tidal influences, as well as extreme weather-related events. Impacts from these events include saltwater contamination of irrigation water and livestock, erosion, and flood-related damages to farmland, infrastructure, local freshwater resources, homes and businesses. To address this ongoing threat, the Vermilion Soil and Water Conservation District (VSWCD) in partnership with the U. S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and other local stakeholders propose a strategic plan to expand and improve water control, management, and discharge in the Lower Vermilion River Watershed (LVRW).

The LVRW encompasses the south-central portion of Vermilion Parish, within the Louisiana Coastal Zone. The Lower Vermilion River Watershed Project (LVRWP) area is comprised of two HUC-12 watersheds:

Figure 1. Shows the Little Bayou–Vermilion River (080801030303) and the Vermilion River–Frontal Intracoastal Waterway (080801030305) hydrologically connected by the Vermilion River and a network of interior canals and bayous, including Hebert Canal, Mouton Canal, 7th Ward Canal, Meaux's Ditch, and Bancker Canal. These connections are further expanded by a network of interior canals that provide overland flow and drainage within the watershed. As the Vermilion River meanders southward towards Vermilion Bay, it is intersected by the Gulf Intracoastal Waterway (GIWW) in a general east-west direction. For the purpose of this project, the relationship between the two HUC-12 watersheds, the Vermilion River and the GIWW, is essential in identifying and rectifying the issues associated with flooding and water quality in the area.

According to the Vermilion Parish Comprehensive Resiliency Plan (VPCRP 2012), protecting the Parish's coast and improving flood protection have been consistently identified as the most important resiliency considerations throughout public outreach efforts and stakeholder engagement. As a coastal parish, Vermilion's existence, culture and its economy are intrinsically tied to the coast. Coastal erosion and the lack of sufficient flood control measures present significant limitations to engendering a safe and resilient Vermilion Parish. Coastal preservation, restoration and flood protection also overlap with other pressing issues such as sea level rise, water management and the protection of environmentally critical and sensitive areas (VPCRP 2012).

Saltwater intrusion also presents a significant water management issue in the LVRW. With an economy that depends on crops and livestock that can easily be destroyed by salinity changes in soils and water, the LVRW requires a reliable source of fresh water. Local farmers and residents fully understand the significance of saltwater intrusion and coastal erosion, and have voiced their concerns via outreach and scoping processes. Common causes of saltwater intrusion include natural tidal processes, groundwater pumping, and the construction of navigation, agricultural and drainage channels. Relative sea level rise, subsidence and hurricane storm surge also contribute to salinity issues in the LVRW. Difficult to accurately predict events also have potential to impact the area: one such event occurredas a result of a barge collision with the Leland Bowman lock that allowed saltwater into the LVRW (VPCRP 2012).

Due to the widely recognized need for improved development of water resources for agriculture and flood management in the LVRW, the NRCS is working with the VSWCD, the Sponsoring Local Organization (SLO),to allocate funding for the development of water control structures under Public Law 83-566 (PL-566). A preliminary investigation report prepared by the SLO, determined that the LVRWP Plan is feasible and recommended that a Watershed Plan-Environmental Assessment (Plan-EA) be prepared to meet the purpose of agricultural water management and flood prevention within the LVRW using PL-566 funds.

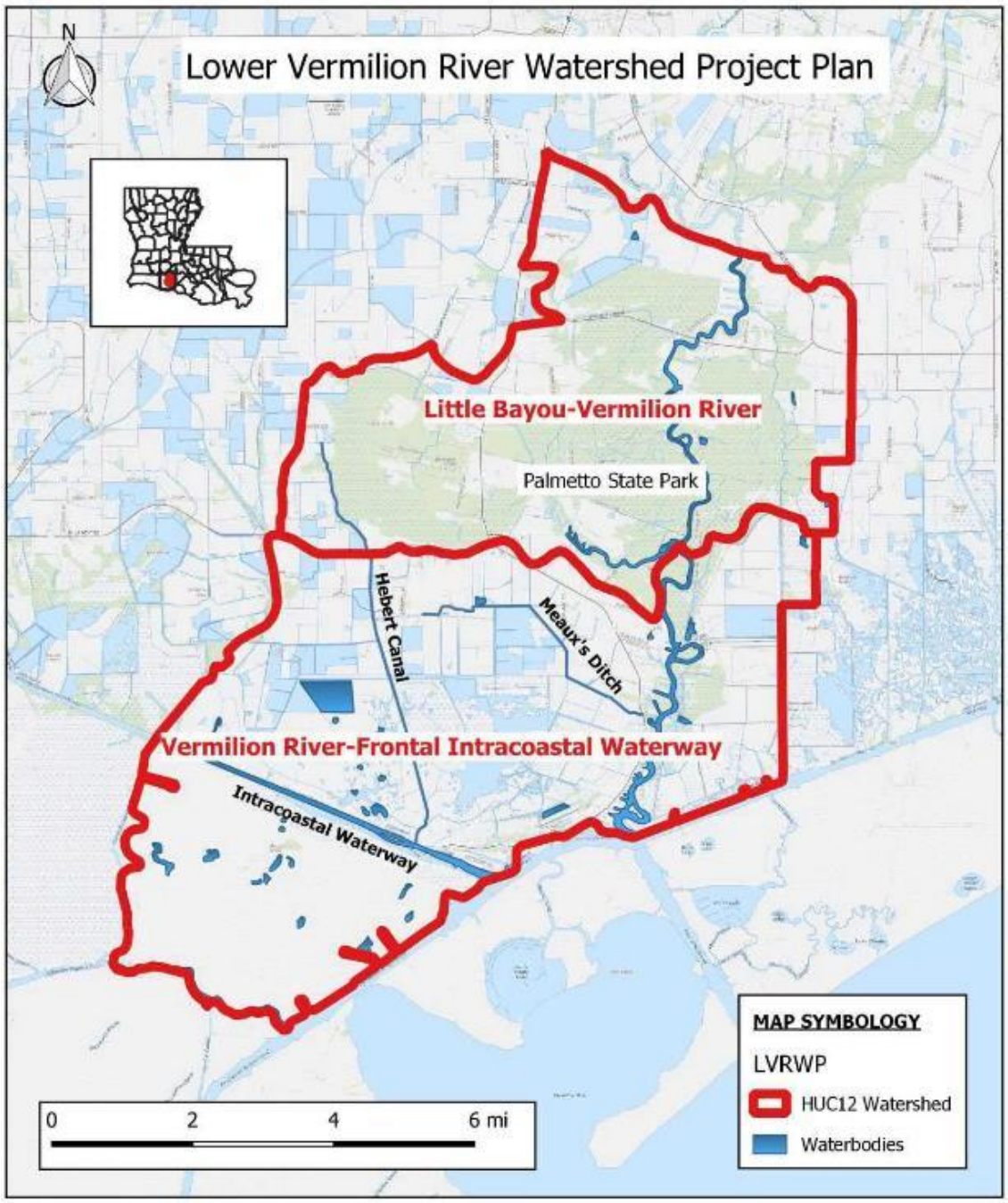

Figure 1. Project Site Map

Background

In 1964, the Iberia-Vermilion Soil Conservation District, the Vermilion Parish Seventh Ward Canal Gravity Drainage District, and the Vermilion Parish Police Jury (VPPJ) prepared a Watershed Work Plan under the PL-566. The 1964 Seventh Ward Canal Watershed Plan is considered a closed due to project life being complete. The project's primary objectives were to reduce flooding, provide adequate drainage outlets for all farmland, provide a more dependable supply of irrigation water, and protect the area from damage caused by saltwater intrusion during abnormally high tides. The 1964 Plan proposed installing structural and land treatment measures for the protection and development of the LVRW (available upon request). The control structures implemented from the 1964 Plan are still active today. Figure 2**.** depicts the typical structure used in the project area. Since enactment of the 1964 Plan, coastal flooding and salinity conditions in the LVRW, exacerbated by naturaland other events, have steadily worsened compelling the VSWCD to seek assistance through the PL-566 program.

Figure 2. Typical Control Structure – Meaux's Ditch

Decision Framework

The LVRWP Plan-EA has been prepared to assess and disclose the potential effects of the proposed action. The Plan-EA is required to request federal funding through the Watershed Protection and Flood Prevention Program, PL-566, authorized by Congress in 1954 and administered by the NRCS. Through this program, NRCS provides technical and financial assistance to project Sponsors (e.g., states, local governments, and tribes) to plan and implement watershed plans for watershed protection, flood mitigation, water quality improvements, soil erosion reduction, rural, municipal, and industrial water supply, irrigation, water management, sediment control, fish and wildlife enhancement, and hydropower.

NRCS has determined the need for a Plan-EA in order to implement the proposed action under PL-566. Due to the broad spatial scale of this analysis and the deductive planning approach, this Plan-EA does not identify the specific details associated with the engineering design and construction activities that would be required to implement the proposed action. Instead, this document intends to present an analysis in sufficient detail to allow NRCS to evaluate the level of impacts from the proposed alternatives and to further the decision-making process

under the NEPA with minimal additional NEPA analysis.

Sponsors, Stakeholders and Cooperating Agencies

The LVRWP Plan-EA is sponsored by the VSWCD and proposed in active stakeholders with the VPPJ and VermilionParish 7th Ward Gravity Drainage District. USDA NRCS acts as the cooperating agency.

Vermilion Soil and Water Conservation District is a local unit of state government established pursuant to Louisiana Soil Conservation Districts Law-Act No. 370, to identify, prioritize and address local natural resources conservation needs and concerns within Vermilion Parish. The encompassed and maintenance of the public utilities, roadways, natural resources, development, drainage, sustainability and other mean of public safety and wellbeing; usually conducted in concert with other public entities. The VSWCD will be the lead sponsor for this project, and will oversee all outreach, application, reports, or updates.

Vermilion Parish Police Jury is the parish administrative unit guided by an elected 14-member panel, with primary responsibility for development and maintenance of public utilities, roadways, Parish-wide resources, development, drainage sustainability and other means of public safety and well-being; usually conducted in concert with other public entities. VPPJ will serve as a stakeholder, cooperating with the VSWCD and other partners.

Vermilion Parish Gravity Drainage District #7, as a subdivision of the VPPJ, authorized by LA Revised Statutes, Title 38 – Public Contracts, Works and Improvements, Section 1751 – Gravity Drainage Districts, Chapter 7; Gravity Drainage Districts-Parts 1, General Provisions, by which the "*various parishes of the state…, may create on their own initiative, from lands which drain by gravity, gravity drainage districts. These districts shall be known as "Gravity Drainage Districts" with the number which the police jury may designate*"

USDA NRCS is the federal agency that historically has provided technical assistance to SWCDs to improve, protect, and conserve natural resources on private lands through a cooperative partnership with state and local agencies. While its primary focus has been agricultural lands, NRCS also makes technical contributions to broader soil surveying and classification, habitat enhancement, and water quality and wetlands improvements. NRCS is the lead federal agency for the LVRWP Plan-EA and is responsible for review and issuance of a decisionin accordance with the National Environmental Policy Act (NEPA).

Authorities

Section 102 in Title I of NEPA requires all federal agencies to evaluate the environmental, social and economic effects of their actions and prepare detailed analysis assessing impacts of and alternatives to actions that have potential to *significantly* affect the quality of the human and natural environment. Where it is determined that such effects would be significant, an Environmental Impact Statement (EIS) is prepared. In such cases that said effects have been determined to be not significant, but the activity has not been categorically excluded from NEPA, an Environmental Assessment is prepared to determine whether an EIS is needed (40 Code of Federal Regulations [CFR] 1501.4 and 1508.9; 7 CFR 650.8).

This Plan-EA serves to fulfill NRCS responsibility for compliance with the NEPA and has been prepared in accordance with Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 CFR 1500–1508) and the USDA NEPA regulations (7 CFR Part 650). This Plan-EA has been developed and completed pursuant to NRCS Title 190 General Manual Part 410, NRCS National Environmental Compliance Handbook Title 190 Part 610 (May 2016), and in accordance with the 2014 NRCS National Watershed Program Manual

(NWPM) 2014 NRCS National Watershed Program Handbook (NWPH), and Principles, Requirements, and Guidelines for Water and Land Resources Implementation Studies (PR&G).

Project Overview

The LVRW is located in south-central Vermilion Parish and is comprised of the Little Bayou–Vermilion River (080801030303) and the Vermilion River–Frontal Intracoastal Waterway (080801030305) HUC-12 watersheds. The LVRW encompasses approximately 46,000 acres, that includes the towns of Esther and Intracoastal City and approximately 6,500 acres of rice, crawfish, cattle, alligator and hay production. Over 150 rural residences are within the LVRW and are supported by a rural community infrastructure, including a local school, two churches, several cemeteries, the Port of Vermilion, several marine fisheries off-loading and processing facilities, and offshore oil production fabrication support services.

South-central Vermilion Parish is generally flat and poorly drained. The LVRW is bordered and transected by natural and manmade waterways, with relatively small cypress sloughs and hardwood areas within low lying ridge-swale topography to the north (Palmetto State Park, Big Woods Swamp). The proximity of land uses and landforms with little topographical relief often leads to flooding of homes, businesses, the rural highway system, and farmland and presents hazard to life, livelihood and resiliency of the local and parish-wide community. Drainage options are limited to existing open-channel gravity-fed drainage toward the Vermilion River/GIWW/Gulf of Mexico via 1) the 7th Ward Canal to the West, 2) Hebert Canal through the central portion of the project area, and 3) Meaux's Ditch in the eastern part of the area. (See **Figure 3**)

Existing water control structures and levees within the LVRWP area have proved insufficient to abate flooding and saltwater intrusion. The Leland Bowman lock, located on the GIWW just west of its confluence with Hebert Canal is designed to reduce saltwater intrusion, storm surge and backwater flooding on the GIWW. However, it provides limited protection to marshes behind the structure, as the Lock is often open, and when closed, low areas along Hwy 333 and Hebert Canal allow high tides and storm surge to flow into area marshes. Recurrent tidally-related flooding and saltwater intrusion cause long-term soil salinization, diminished agricultural productivity, degraded wetlands and wildlife habitat, water quality impairments and sedimentation.

The LVRWP will provide flood prevention benefits to agricultural enterprises, rural residences/communities, and area business and industry, with water quality and wetland habitat benefits throughout the watershed. The LVRWP proposes strategically placed water control structures and levee improvements to provide additional flood protection benefits to existing structures, thereby preventing recurrent and chronic issues related to saltwater intrusion and flooding associated with inherently poor drainage conditions of the area. The project will emphasize enhanced multi-channel gravity drainage into the GIWW, the Vermilion River, and Vermilion Bay, while restricting inland storm surge effects to the project interior, thus reestablishing historic mid-estuary salinity levels.

NRCS funding would be applied to water control, utilization and disposal upgrades that address water quality, insufficient freshwater for irrigation, soil quality degradation. The participating water conservancy districts and the water user association in each of the sub-watersheds are listed below:

1) Vermilion Soil & Water Conservation District, Abbeville, Louisiana
2) Vermilion Parish 7th Ward Gravity Drainage District, Abbeville, Louisiana
3) Vermilion Parish Police Jury, Abbeville, Louisiana

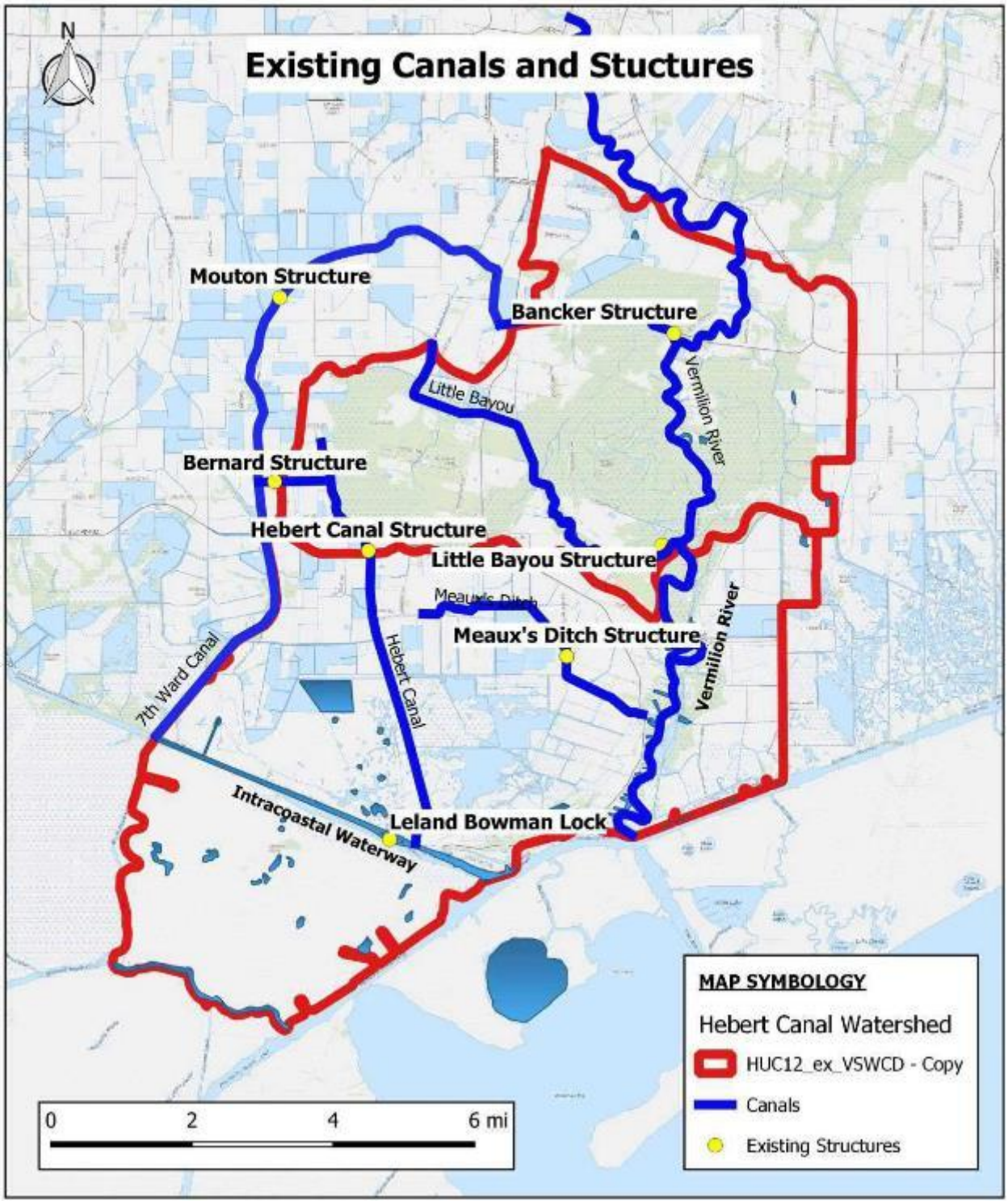

Figure 3. Existing Canals and Structures

NRCS funding can be applied to water management upgrades throughout the two sub-watersheds on private or parish lands. The Little Bayou–Vermilion River and the Vermilion River–Frontal Intracoastal Waterway subwatersheds were identified by the VSWCD in collaboration with water users in the LVRW, and meet the definition of a watershed as outlined in the NRCS NWPM (NRCS 2018). To meet that definition, sub-watersheds may be planned together if they comprise a component of a larger watershed and do not exceed a combined total

of 250,000 acres. The size of each of the two sub-watersheds that comprise the LVRW is summarized in the table **Table 1. Size of Subwatershed**

Table 1. Size of HUC 12 Subwatersheds

Subwatershed	Total Size of HUC 12 Subwatershed (acres)
Vermilion River–Frontal Intracoastal Waterway	27,276
Little Bayou–Vermilion River	18,642
Total	45,918

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1. PURPOSE AND NEED FOR ACTION

1.1 Purpose of the Project

The LVRWP area is subject to 1) flooding from unusually high precipitation events due to poor drainage; 2) flooding from storm surge, and; 3) saltwater intrusion from recurrent tidal influences as well as difficult to accurately predict events such as hurricanes and Leland Bowman lock failure. The purpose of the LVRWP is to reduce the threat of salinestorm surge and prevent flood-related damages to infrastructure, crops, livestock, local industries, residents, andlandowners of central and lower Vermilion Parish. This project will address three of the seven purposes listed inTitle 390, NWPM, Part 500, Subpart A, Section 500.4.B.

- Purpose 1: Flood Prevention (Flood Damage Reduction) – installation of water control structures andlevee improvements will reduce and/or prevent flooding associated with tidal inundation and storm surges,and allow for disposal of surface waters from abnormally high precipitation events.

- Purpose 5: Agricultural Water Management – will be accomplished via installation and operation of water control structures that will improve water quality by regulating saltwater intrusion into thewatershed, provide a more consistently reliable source of fresh water for irrigation and livestock, and allow for adequate drainage from abnormal precipitation events.

The project will benefit area farmers in three ways: 1) by protecting freshwater supplies used for irrigation of crops and watering stock from saltwater contamination; 2) by reducing the likelihood of soil contamination from recurrent and difficult to predict saline inundation; and, 3) providing flood protection thereby reducing damages and lossto infrastructure, residences and equipment.

1) Reducing saltwater intrusion will minimize damages to rice and crawfish production in the area, which includes the economic benefit of maintaining and safeguarding the early harvest of crawfish, which commands the highest season prices.
2) Reduce flood damages to crops by reducing the impact from flood events
3) Reduce dependence of groundwater for crops by providing a reliable and consistent source of fresh water for irrigation and livestock.

The primary and immediate goal(s) of the LVRWP Plan is to provide increased flood protection for residents and agriculture and create a sustainable watershed management plan by restoring surface water hydrology, and allowing for freshwater drainage through the LVRW while reducing likelihood of saltwater intrusion during storm surges and tidal events. Additional goals of the plan are to provide positive hydrologic conditions to support resilience within the coastal wetlands in order to further long-range protection from storm surge and the deleterious effects of saltwater intrusion. To this end, the LVRWP is consistent with the Louisiana Coastal Protection and Restoration Authority's (CPRA) 2017 Coastal Master Plan developed with the focus of reducing coastal flood risk, promoting sustainable ecosystems, commercial and recreational activities, strengthening communities, and supporting regionally and nationally important business and industry, and the 2023 Coastal Master Plan, to implement projects that provide benefit despite sea level rise and subsidence, that maintain estuarine gradients in future decades, and provide risk reduction at the community or regional scale.

1.2 Need for Action

The LVRW has been impacted hydrologically and economically by saltwater intrusion, and flood-related damages to infrastructure, crops, livestock and local industry. Recurrent tidal and surge events regularly increase salinity in watershed-wide surface water adversely affecting damages to crops and annual production. Louisiana crop insurers paid $121.7 million in 2019 to cover crop damages (NCIS 2019). These crop insurance claims are primarily associated with flooding and saltwater intrusion.

Beyond the normal tidal surges and precipitation, tropical storm events present extreme flooding and saltwater issues with inundation lasting weeks and soil salinity remaining high/above normal productivity rates for months at a time. Between 1971 and 2019, six hurricanes and two tropical storms have made landfall in Vermilion Parish (National Oceanic and Atmospheric Administration (NOAA) 2020). In 2020, Hurricane Laura made landfall in Cameron Parish heavy rains and storm surge caused extensive flooding throughout the LVRWP area. Local residents/producers in the LVRW submitted an observation report afterwards depicting widespread flooding of fields and roadways (See **Appendix E**). The NOAA Lake Fearman gauge located approximately 12 miles southeast of the existing Hebert Canal water control structure, recorded the water level as 10.27 ft. before the failing (August 26, 2020). **Table 2 NOAA gauge recorded water levels before failing units in feet** presentsthe water level records for previous hurricanes at these same gauges. The North American Vertical Datum of 1988 (NAVD88) is the official vertical datum of the United States (Massachusetts Office of Coastal Zone Management, 2024). As a direct result of flooding caused by Hurricane Laura, some producers were forced to make difficult decisions regarding property and livelihood. At least one rancher had to cut levees to relieve flooding. Another rancher who leases 6,000 acres directly south ofMeaux's Ditch, indicated that he would not be returning with cattle due to repeated flooding.

Table 2. NOAA gauge recorded water levels before failing (units in feet)

Date	Hurricane	Lake Fearman (-5.42 ft. above NAVD88)
August 2020	Laura	10.27
July 2019	Barry	12.26
September 2008	Ike	12.2
September 2005	Rita	11.7

The effectiveness of gravity drainage to prevent flooding is severely limited due to the high-water table and nearly level topographic gradient (e.g., ±6 ft NAVD88) in the Little Bayou-Vermilion River Watershed to <1-foot NAVD88 in the Vermilion River-Frontal Intracoastal Watershed), making gravity drainage via channel dredging alone insufficient. Insufficient drainage and inadequate water control structures repeatedlyfail to protect area residents and infrastructure from flood events. Likewise, existing canals, water control structures and levees are inadequate to prevent saltwater intrusion, as slope and elevation gradient allow backflow during increased tidal surges. Improvements to area levees and an updated and comprehensive water control planare needed to abate the ongoing concerns of flooding and saltwater intrusion.

1.3 Problems and Opportunities

1.3.1 Problems

The project objective is to reduce the negative impacts of salt water intrusion on nearby farmland/landowners within the lower vermilion watershed. The Sponsors, in their application for assistance, have identified the following resource concerns to be addressed by the LVRWP Plan:

- Contamination of fresh surface water by saltwater resulting in a shortage of suitable irrigation water for rice and crawfish crops.
- Periodic loss of soil productivity and damage to crops resulting from high salinity storm tides.
- Threats to life and losses of property and infrastructure from flooding.
- Conversion of rice and hay to abandoned cropland because of saltwater intrusion and soils conditions.
- Total loss of economic viability for agricultural/livestock production and relocation from area.

Agriculture is dependent on a wide range of ecosystem processes that support productivity including maintenance of soil quality and regulation of water quality and quantity. Multiple stressors, including climate change, increasingly compromise the ability of ecosystems to provide these services. Key near-term climate change effects on agricultural soil and water resources include the potential for increased soil erosion through extreme precipitation events, as well as regional and seasonal changes in the availability of water resources for both rain-fed and irrigated agriculture. (USDA 2013)

During periods of low rainfall, fresh irrigation water in the Hebert Canal becomes contaminated with saltwater from the GIWW. Salinity levels in the canal, above certain minimal levels, make the available water unfit for use on rice and crawfish crops. A control structure at the south end of Hebert Canal would prevent saltwater intrusion within the LVRWP thereby providing a more reliably consistent supply of fresh water for irrigation.

Agricultural producers in the plan area have experienced periods of saltwater damage to irrigated crops and pastures. Abnormal high tides generated by tropical storms or hurricanes move inland and cause localized flooding. Soils become saturated with sea salts resulting in long-term impacts on crops and pastures.

The predicted higher incidence of extreme weather events will have an increasing negative influence on agricultural productivity. Extremes matter because agricultural productivity is driven largely by environmental conditions during critical threshold periods of crop and livestock development. (USDA 2013)

1.3.2 Opportunities

The Plan-EA provides solutions by proposing a comprehensive approach to decrease the frequency of saline storm surges impacting the watershed. The Plan-EA also proposes to reduce the occurrence of periodic loss of soil productivity and damage to crops resulting from high salinity storm tides. These improvements are expected to reduce the impact of flooding in the watershed as well as address water quality issues by enhancing the drainage.

2. SCOPE OF THE PLAN-EA

The scope of this Plan – EA is to seek relief from increasing flood events and salinity impacts within the project area due to high tide events and tropical storms compounded by relative seal level rise. The scoping process followed the general procedures per NRCS guidance and PL-566 requirements. Both NRCS procedures and NEPA regulations (40 CFR 1500-1508) require that the NRCS begin scoping early in the planning process. The NRCS, as the lead federal agency, has initiated NEPA analysis in the form of a Plan-EA to analyze impacts to the natural and human environment from this project.

The purpose of scoping is to identify issues, concerns, and potential effects that require detailed analysis. Using the input obtained during the scoping process, the project was refined to focus on relevant resource concerns and issues, and to eliminate minor or irrelevant issues from further detailed study. Relevant resource concerns are carried forward for further detailed study and discussion.

Tribal consultation was conducted in accordance with the National Historic Preservation Act (NHPA) of 1966 and Executive Order 13175 to maintain a relationship between NRCS and native tribes and to ensure the local tribal populations were notified of the scoping process. BWC sent a letter to the State Historic Preservation Office (SHPO) requesting that the SHPO contact the Chitimacha Tribe of Louisiana, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, and the Tunica-Biloxi Tribe and make the local tribal communities aware of the planning process for the proposed project. The state then contacted the individual tribes for comment on the Plan EA. No comment from the tribes was received, and the SHPO confirmed this via letter to BWC's planning team. See Appendix E for the SHPO confirmation letter.

The scoping process began on April 22, 2020 with a scoping meeting, which included the SLO, NRCS-LA, the LA Department of Agriculture and Forestry, BWC's planning team, and the VPPJ. Following this scoping discussion, BWC scheduled a meeting with the 7th Ward Gravity Drainage District on June 9th, 2020 to inform them of the proposed Plan–EA project, and request their participation as the operation and maintenance lead. Following this, two producer's meetings were held on July 12th and July 17th, 2020 near the project area in Palmetto Island State Park to introduce the producers to the affected environment, receive comment from them on their local resource concerns, and to collectively discuss possible solutions. A total of 25 producers attended the two meetings. A producer's survey was developed and sent to all local producers we could locate lying within the project area. A total of 25 surveys were sent and 10 responses received. Some of the major resource concerns were flooding, salinity, freshwater availability, and drainage. 80% of the polled producers voiced a preference of utilizing fresh surface water for irrigation, when available. The survey results provided a scoping platform to gain information on current resource concerns, understand the root causes of these concerns, and inform conceptual solutions..
The Louisiana Coastal Master Plan (LCMP) "aims to preserve coastal Louisiana's rich culture, ecosystems, and natural resources threatened by ongoing land loss and flood risk." The 2023 plan is the fourth plan iteration developed by the Coastal Protection and Restoration Authority (CPRA) and seek benefits that will "…create or maintain a significant amount of land that would otherwise be converted to open water over the next 50 years." The LCMP is an ongoing project to reduce coastal land loss, and preserve and restore available coastal marsh resources in Louisiana. This Plan-EA seeks alternatives, which also preserve available coast marsh resources and reduce coastal land loss.

Early in the planning process, essential fish habitat (EFH) was identified as a critical resource concern for our project area. We sent our initial communication to National Marine Fisheries Service (NMFS) on September 30, 2020 requesting habitat comment. This led to multiple discussions with NMFS regarding assessment of EFH within our project area. See Appendix E for NMFS communication.
On October 23, 2020 the BWC planning team contacted the USACE and visited their office at the Leland Bowman Lock (LBL) structure which sits astride the GIWW. We solicited comment from the USACE due to their proximity to the Hebert Canal and LBL confluence. The Hebert Canal is a dominant water feature of our project area and is the primary conduit for tidal impact into, and surface drainage out of, our project area. LA Hwy 333 is the sole roadway access to the LBL offices and this roadway is inundated with floodwater when levels rise above 1.5' NAVD88. See Appendix E for USACE meeting summary.

A local stakeholder meeting was held November 10, 2020 at the LSU Ag Center in Abbeville, LA. At this meeting BWC delivered a summary of the scoping discussions, the conceptual alternatives, preliminary agency comments, and proposed operation and maintenance plans. Additional discussion revolved around other, smaller drainage ways

which impact the project area and were to be included in the planning process. The conceptual alternatives were discussed in depth and modified according to the stakeholder needs and the preliminary agency comments. 12 attendees were present representing the SLO (VSWCD), the VPPJ, 7WGDD, local producers, and the BWC planning team.

A preliminary assessment was prepared to provide sponsors, local partners, agencies, and the public with information to evaluate the goals and objectives of the project. During the development of the assessment, project sponsors conducted initial consultation with natural resource agencies and stakeholders in the Lower Vermilion River Watershed area. Main resource concerns identified throughout the scoping process included flooding, salinity, freshwater availability, drainage, soils, essential fish habitat, cultural and historic resources, and invasive vegetation species. Table 1 provides a summary of resource concerns and their relevancy to the proposed action. Resources determined to be non-relevant were eliminated from detailed study, and those resources determined to be relevant have been carried forward for analysis.

2.1 Ecosystem Services Framework (ESF) and Methodology

There are many frameworks by which to categorize ecosystem services (ES). Some of those commonly cited include the Millennium Ecosystem Assessment framework (MEA) (Alcamo et al., 2003), The Economics of Ecosystems and Biodiversity framework [TEEB] (De Groot et al., 2010), the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services framework (IPBES, 2017), and the Common International Classification of Ecosystem Services [CICES] (Haines-Young & Potschin, 2018). The number of categories recognized varies widely; for instance, the MEA and TEEB frameworks name 21 distinct groups, while CICES includes 90. Our report focuses on the thirteen ecosystem services defined in Table 3

NRCS and the sponsors worked within the ecosystem services framework throughout the preliminary investigation and planning process. The following framework (Table 3) was applied to the Herbert Canal Study Area based on the following services:

- Provisioning services: tangible goods for human use such as food, clean air, fresh water, energy, fuel, forage, fiber, and minerals;
- Regulating services: maintain natural processes which provide buffers against environmental catastrophe such as long-term storage of carbon; climate regulation; water filtration, purification, and storage; soil stabilization; flood control; and disease regulation;
- Supporting services: underlying processes maintaining conditions for life such as pollination, seed dispersal, soil formation, and nutrient cycling;
- Cultural services: services related to the cultural or spiritual needs of people such as educational, aesthetic, spiritual and cultural heritage values, recreational experiences, and tourism opportunities

Table 3*. Definition of ecosystem services*

Services	**Example Benefits**
Provisioning	**Materials and/or energy outputs, often sold as market goods**
Energy and Raw Materials	Fuel, fiber, fertilizer, minerals, and energy
Food	Livestock, crops, fish, wild game
Medicinal Resources	Traditional medicines, pharmaceuticals, assay organisms
Ornamental Resources	Clothing, jewelry, handicrafts, decoration

Water Storage	Usable surface or groundwater, stored reliably
Regulating	**Ecosystem functions that influence critical ecosystem processes**
Air Quality	Ability to create and maintain clean, breathable air
Biological Control	Disease, pest and weed control
Climate Stability	Ability to support a stable climate at global and local levels
Disaster Risk Reduction	Ability to prevent or mitigate flood, wildfire, drought, and other natural disasters
Pollination, Seed Dispersal	Dispersal of genetic material via wind, insects, birds, etc.
Soil Formation	Soil creation for agricultural and/or ecosystem integrity
Soil Quality	Soil quality improvement due to decomposition and pollutant removal
Services	**Example Benefits**
Soil Retention	Ability to retain arable land, slope stability, and coastal integrity
Water Quality	Water quality improvement due to decomposition and pollutant removal
Water Supply	Ability to provide natural irrigation, drainage, and other water flows
Navigation	Ability to maintain necessary water depth for recreational and commercial vessels
Supporting	**Habitat, nursery, refugia**
Habitat	Ability to sustain species and maintain genetic and biological diversity
Information	**Non-material, non-consumptive benefits**
Aesthetic Information	Sensory enjoyment and appreciation of natural features
Cultural Value	Use of nature in art, symbols, architecture, or for religious or spiritual purposes
Science and Education	Use of natural systems for education and scientific research
Recreation and Tourism	Hiking, boating, travel, camping, and more

2.1.1 Natural Capital and Ecosystem Services

Natural capital provides the foundation for all human societies, yet is frequently overlooked. It consists of any "minerals, energy, plants, animals, ecosystems, [climatic processes, nutrient cycles, and other natural structures and systems] found on Earth that provide a flow of natural goods and services" (Daly and Farley, 2004). As forests, wetlands, and rivers intercept rainfall and filter water, those natural storage and filtration processes support clean water supplies. The flows of ecosystem goods and services from natural capital are illustrated in **Figure 4**.

Figure 4. Natural Capital, Ecosystem Function, and Ecosystem Goods and Services

Healthier landscapes support thriving economies and communities as the flow of ecosystem services provide resources for industries and improve the quality of life of people. Ecosystem services can be categorized in many ways, the sub-section below describes Earth Economics' framework for communicating ecosystem services.

2.2 Scoping Phase

The purpose of the scoping process is to identify issues, concerns and potential effects that require detailed analysis to support selection of the preferred alternative. Federal, state, local agencies, tribal entities, non- governmental organizations, local stakeholders, and the general public were invited to participate in the scoping phase of this Plan-EA. Tribes were consulted in accordance with the National Historic Preservation Act (NHPA)of 1966 and Executive Order (EO) 13175, *Consultation and Coordination with Indian Tribal Governments,* to maintain a relationship between NRCS and native tribes to ensure the local tribe populations were notified of thescoping process.

The Project and Scoping Phase were advertised multiple ways. A press release describing the project and announcing the start of the scoping process was issued on July 20, 2020. A mail-out survey of agricultural producers was distributed on June 26, 2020. Public announcements regarding opportunities to participate in the scoping were advertised on the project website (www.lvrwp.com), and via a regional media campaign. Meetings with agricultural producers were held July 17 and 23, 2020; and a general public meeting was held via Zoom webinar on August 6, 2020.

A preliminary field investigation was conducted June 18, 2020, in support of the scoping process, to provide Sponsors, local partners, agencies, and the public with information to evaluate the objectives and potential alternatives of the project. During the field investigation, the Bluewing Civil Consulting (BWC) technical team assessed the condition of existing levees and water control structures and collect data regarding environmental conditions in the watershed and at the proposed water control structure locations. Project partners from the 7th Ward Gravity Drainage District provided an onsite tour of the project area and guided the BWC technical team to existing and proposed water control structure sites.

Bluewing Civil Consulting (BWC) is the civil engineering/consultant firm assisting the sponsoring authority with the development of the Watershed Plan-EA.

2.2.1 Agricultural Producers Survey

Because much of the project area is managed for agriculture, a survey was created and distributed to agricultural producers to gather specific information regarding issues and concerns affecting producers in the LVRW. The survey provided a map of the project area and a list of questions pertaining to agricultural crop production, irrigation, and opinion questions on the status of the water control structures in place. These list of questions

included the type of farmland (cropland, livestock, and/or aquaculture), the type of crop(s) currently in production, or have been produced in the past 20 years, how many years have producers been farming, source of freshwater for agricultural production, main concern(s) regarding water resources in the project area, number of days in a year that freshwater source is affected by salt water, what the primary issues that are affecting crop production (flooding, drainage, freshwater availability, erosion/subsidence, salinity, etc.), have any hydrological issues forced producers to change crop production, and if the current four water control structures associated with the watershed were preventing saltwater intrusion and flooding in the area adequately. Twenty-five agricultural producers reside within the project area. Surveys were distributed to each of these individuals via the U.S. post and by email. A total of 10 local producers responded to the survey. The survey results provided valuable information about the primary issues faced by producers, freshwater access, and the effectiveness of existing structures**.** See an example of producer's surveys in Appendix D**.**

The results of the survey indicated that the average acres of farmland per producer is approximately 350 acres. The average years of production by producers per farm is 10-20 years. Livestock and aquaculture are the most common type of farmland within the project area; with rice, cattle, crawfish, and hay as the most common agricultural commodities produced. Eight out of ten producers stated their main source of freshwater comes from the surface (bayou, stream, or river). The primary source of surface water for most of the producers in the watershed is from the Vermilion River via Bancker Canal, 7th Ward Canal, Mouton Canal, Hebert Canal, and an interconnected network of ancillary drainagecanals. Freshwater supply throughout the watershed is regulated with a series of control structures managed bythe 7Th Ward Gravity Drainage District. When freshwater is limited, four out of the ten producers obtain freshwater from either an on-farm pond or groundwater well. The average number of days the producers are affected by saltwater is approximately 180. One out of ten producers stated they were forced to install new pumps and pipes within their farming operation in order to combat subsidence, and ultimately had to transition to a different agricultural commodity due to the change in land conditions. The primary issues producers face within the project area are flooding, salinity, freshwater availability, erosion and subsidence, and drainage.

Survey results suggest that the current water control structures are ineffective in preventing saltwater intrusion south of existing structures (**Figure 5**). Sixty percent of the producers indicate that the current water control structures are 'not effective enough' at protecting against flooding and changes in salinity levels. Below is a list of reasons given for deficient ineffectiveness:

- "The levee system around the structures have failed."
- "Some structures need allocating and levee raised."
- "For saltwater intrusion, it only helps north of existing structures not the south."
- "Installing new structures at proposed locations would be more effective."

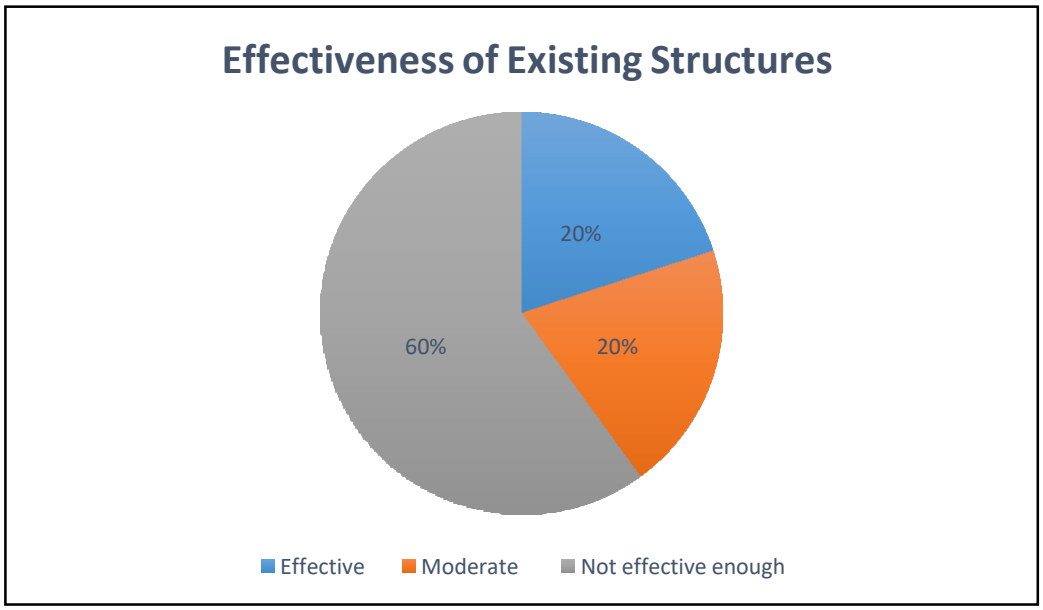

Figure 5. LVRWP Survey – Effectiveness of Existing Structures

2.2.2 Public Scoping Meetings

Because the project area is predominantly managed for agriculture, two small (in compliance with federal COVID-19 guidance) group meetings were held (July 17 and 23, 2020) to invite participation and receive input specifically from agricultural producers, introduce the considered alternatives, and assess participation and interest for this project. Questions and comments were discussed and addressed as an open floor discussion between the producers, SLO, BWC, and the BWC technical team. Details regarding public participation are located in Section **6.1 Public Participation**. There were ten people in attendance at the July 17 meeting, and nine people in attendance on July 23. Both meetings were held at Palmetto Island State Park, in Abbeville, Louisiana.

Due to federal COVID-19 restrictions, an in-person meeting with the general public could not be conducted. Instead, the NRCS, VSWCD and BWC hosted an online Zoom Scoping Webinar on August 6, 2020. The presentation introduced the NRCS Watershed Plan-EA process, provided background and history of the LVRW, described the purpose and need for the project, with data, maps, and illustrations of project components, and a comparison of considered alternatives. There were twenty registrants and thirteen in attendance, excluding project representatives and staff.

Discussions and questions following the presentation were related to the following topics:

- "How will this project be funded during construction, maintenance and operation?"
- "What about the use of intermediate marsh by white shrimp?"

2.2.3 Scoping comments

Comment cards were provided at all meetings and available at the project website throughout the public scoping period. Comments regarding the project were received from local producers, 7th Ward Gravity Drainage District, individuals and Sponsors. Comments included these items:

7th Ward Comments:

- Meaux's Ditch structure should be installed at LA 333. Levees should be reinforced from new structure heading east to Meaux's Ditch and from the western end to the pump-off ditch heading south.
- Concerns that a culvert structure will not allow adequate flushing of aquatics when necessary. Request that proposed materials are saltwater resistant.
- School Board Levee improvements will need to find another source of borrowed material (no material on site to build further east).
- Recent levee improvements were made last year (2019) about 150 ft east and west of the proposed Hebert Canal structure.
- Focus areas for strengthening; 7th Ward Canal protection levee to Hwy 82 and Meaux's Ditch near Hwy 333 needs to be dredged out.
- Current landowners are ok with signing off on the right-of-way near Meaux's Ditch.

Producer Comments:

- Make sure the Theall land can gravity drain into Meaux's Ditch
- Alternative #2 provides the most protection from flood events and will support us as we struggle to manage our properties in the Vermilion Parish's rapidly changing coastal conditions
- Suggestion: instead of 'raising' Hwy 333 near Hebert Canal and GIWW intersection or creating a levee with borrowed material from the North side (wetland side), consider and investigate the possibility of placing rock or a bulkhead on the south side (GIWW side) of Hwy 333 and the proposed elevation of 6 ft.
- Strongly suggest existing structures remain in their current location and they not be removed.

- Without a control structure on the southern part of the Hebert Canal, we feel there is a greater risk of losing the quality of the wetlands that are so important to the fisheries. While these wetlands seem to be remaining intact with normal tidal flow, the damage done by high salinity flood waters is irreversible and devastating. The effects of Hurricane Rita changed this area significantly and turned marsh into open water.
- Repeat saltwater intrusion also puts the adjacent productive land in jeopardy. Without this flood protection project, this portion of the watershed will eventually no longer be productive. Without freshwater, when the land can no longer produce grass for grazing, haying, rice, alligators and crawfish, thepeople will leave. When the people no longer nurture and maintain the land, water will claim it. When there is only open water and wetlands from the Seventh Ward Canal to LA Hwy 333 south of Hwy 82, highly populated places like Abbeville and Lafayette will lose their line of defense against flood events and the buffer that protects them will be no more.
- LA 333 has a low spot west of Broussard Bros. It is recommended to analyze the levee along the Southside of LA 333

2.3 Ecosystem Services and Resource Concerns

This Plan considers how to address state permit requirement deficiencies and associated risks of impacts to public health and safety, critical infrastructure, and cultural resources in the Lower Vermilion watershed. Ecosystem services and resource concerns that may affect or be affected by measures to address the problem, whether directly, indirectly, or cumulatively, are considered to be relevant to the proposed action and discussed in the plan. Table 4 shows the ecosystem services and resources of concern considered during preplanning, early agency engagement, and public and agency scoping. The table indicates their relevance and provides the rationale for inclusion in or dismissal from detailed analysis.

2.4 Cumulative Actions

Discussed alternatives included the construction of three distinct water control structures along major channels in the project area. Hebert Canal, Meaux's Ditch at HWY 333, and an "Unnamed Canal" structure would all be placed at critical junctions and channels that feed into the inner waterways of the project area. Putting any measure of control and preventative structure in these areas specifically will assist in preventing further saltwater intrusion into the area. Additionally, improving existing levees or constructing new levees systems will limit the amount of fooding during tidal surges and major weather events. The cumulative actions of each alternative would preserve and sustain current conditions within the project area. Other alternatives that were explored included items such as "raising" the levee near Hwy 333, using materials found on site (from the North side) for levee creation and improvements, and establishing native vegetation and improving riparian areas.

2.5 Identification of Resource Concerns

Based on data collected during the preliminary investigation and the input received during the scoping phase, several resource concerns were identified. **Table 4** provides a summary of resource concerns and their relevanceto the Proposed Action. Resources determined to be irrelevant were eliminated from detailed study, and those resources determined to be relevant will be carried forward for further analysis.

Table 4. Summary of Resource Concerns for the Lower Vermilion River Watershed

ITEM/CONCERN	Relevant to the Proposed Action?		RATIONALE
	Yes	No	
WATER			
Surface Water Quality	X		Potential for protection and enhancement by reducing salinity.
Surface Water Quantity	X		Potential for protection by management of volume available for irrigation.
Ground Water	X		Potential for protection by reducing irrigation withdrawals. Chicot Aquifer System is the sole source aquifer (SSA) in the watershed.
Clean Water Act	X		Nationwide or individual permits may be required for the project if determined by NRCS and other agency consultation.
Regional Water Mgmt. Plans		X	Neutral effect(s) to existing regional water management plan.
Coastal Zone Mgmt. Area	X		This project is in a coastal management zone. Potential for protecting the coastal zone from saltwater intrusion. (2017 Coastal Master Plan)
Floodplain Management	X		This project will likely reduce the risk of flood loss potential for Flood Insurance Rate Map (FIRM) revision.
Forest Resources		X	Forest resources will not be impacted.
Wetlands	X		Potential impacts from construction implementation. Pre and post construction BMPs would be implemented to sustain and preserve

ITEM/CONCERN	Relevant to the Proposed Action?		RATIONALE
	Yes	No	
			current conditions of wetlands in area. Project life 55 years.
Flood Damages	X		Potential for flood damage reduction.
Ecological Critical Areas	X		Potential impacts; minimized through timing and operational controls.
Water Bodies (including waters of the U.S.)	X		Potential for protection by reducing salinity and erosion damage from surges.
Wild and Scenic Rivers		X	There are no Wild and Scenic Rivers in the project area.
SOILS			
Upland Erosion	X		Potential for increased soil loss due to stormwater runoff without intervention. Project will address potential soil loss through BMPs during construction activities.
Stream Bank Erosion	X		Potential for stream bank erosion during installation of structures and levee improvements.
Sedimentation	X		Potential to reduce sedimentation.
Prime and Unique Farmland (Farmland Protection Policy Act)	X		Potential for protection and enhancement by reducing saline storm surges.
AIR			
Air Quality	X		Localized, minor immeasurable temporary increase in pollutants and particulate matter.
Clean Air Act		X	The region within which the project is located is in attainment of federal air quality standards. No air permits are required for action.
PLANTS			
Endangered and Threatened Species		X	No threatened, endangered or candidate plant species occur in the project area.
Essential Fish Habitat	X		Potential to have minor to limited effects to lower salinity tidal fish and invertebrate species if the Hebert Canal structure operation remains "open" for all but larger storm events (tropical storms, hurricanes).
Invasive Species	X		Potential for short- and long-term adverse effects to terrestrial and aquatic habitats due to possibility of ingress and egress of invasive into project area by equipment and work being conducted. BMPs will help address these issues.
Natural Areas		X	There are no state or federal recognized natural areas in the project area.
Riparian Areas	X		Potential for impact from implementation.
ANIMALS			
Fish and Wildlife Habitat	X		Potential for short-term and long-term direct and indirect negative impacts to estuarine fisheries.

ITEM/CONCERN	Relevant to the Proposed Action?		RATIONALE
	Yes	No	
			Potential beneficial affects to wildlife habitat.
Coral Reefs		X	No coral reefs occur in the project area
Endangered and Threatened			
Species	X		May affect but not likely to adversely affect.
Invasive Species		X	Potential for short- and long-term adverse effects to terrestrial and aquatic habitats. BMPs will minimize and avoid potential for ingress of NIS
Migratory Birds/Bald Eagles	X		Migratory birds: potential direct and indirect
HUMANS			
Cost, NED			
Historic and Cultural Resources	X		This project will have no effect on historic and cultural resources.
Local and Regional Economy	X		Local and Regional Economy is expected to benefit from this project.
Potable Water Supply		X	This project will have little to no effect on the drinking water supply.
Recreation		X	This project is anticipated to have no/neutral effect on recreation. The HC boat bay will only be closed during storm events, and only for a few hours after.
Scenic Beauty and Parklands		X	No long-term adverse impacts on scenic beauty. Palmetto Island State Park will not be affected.
Public Health and Safety	X		Minimal potential for injuries during temporary project construction and maintenance. Potential reduction in flood depth and flood instances would improve public health and safety.
Land Use		X	No Impact. The land use in the project area isnot expected to change due to project. The project will assist in extending the lifespan of the current conditions and will help in decreasing the conversion of agricultural land and wetlands into open water over the length of the project period.
Significant Scientific features		X	No significant scientific features will beaffected by this project.

3. AFFECTED ENVIRONMENT

3.1 Location

The 45,918-acre LVRW is located in south central Vermilion Parish in southwestern Louisiana, northwest of Vermilion Bay. It is separated into two hydrologic units or subwatersheds: the northern Little Bayou-Vermilion River subwatershed (18,642 acres), north of Hwy 82, and the southern Vermilion River-Frontal Intracoastal Subwatershed (27,276 acres). The Vermilion River-Frontal Intracoastal subwatershed extends from Hwy 82 to about 3.5 miles south of the GIWW to Schooner Bayou, and east of the Vermilion River from the GIWW northward approximately 4.5 miles (**see Appendix B - Project Map**).

3.1.1 Climate

Vermilion Parish is characterized as having a humid, subtropical climate that is dominated by warm moist air from the Gulf of Mexico.

Monthly Normals

The NOAA National Center for Environmental Information climate dataset contains daily values of minimum temperatures, maximum temperatures and precipitation for the period of 1981-2010. This data was area weighted to HUC-12 regions with a focus on the Vermilion River-Frontal Intracoastal Waterway HUC-12, this data was further averaged to monthly values for the 30-year period 1981-2010, which is the current period for climate normal in the United States (NOAA 1981-2010). The lowest minimum temperatures occur in December and January, with values ranging from 42°F-44°F. The highest maximum temperatures occur in July and August with values approaching 90°F**.** The average annual precipitation is about 62 inches, with the maximum monthlyvalue occurring in July (7.3 inches), and the minimum monthly value occurring in April (3.8 inches) ().

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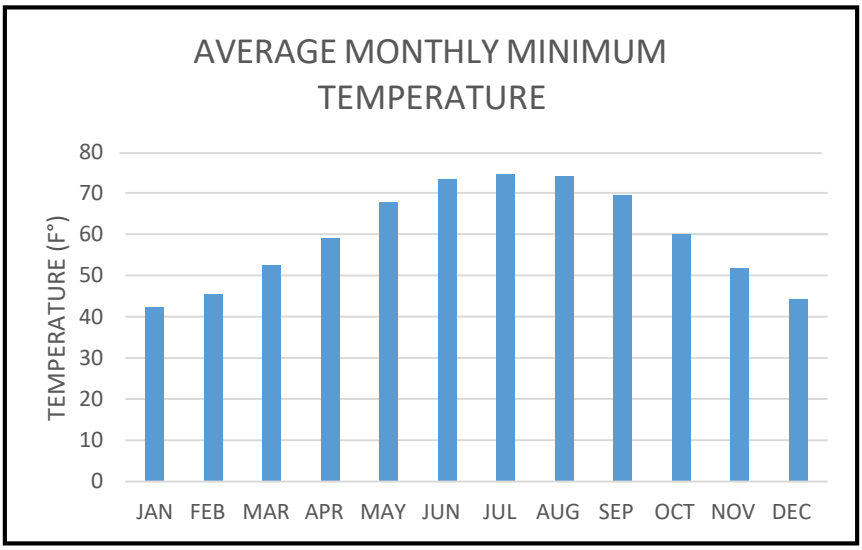

Figure 6. Average monthly minimum temperature in °F for the Vermilion River-Frontal Intracoastal Waterway HUC-12 basin for the period 1981-2010.

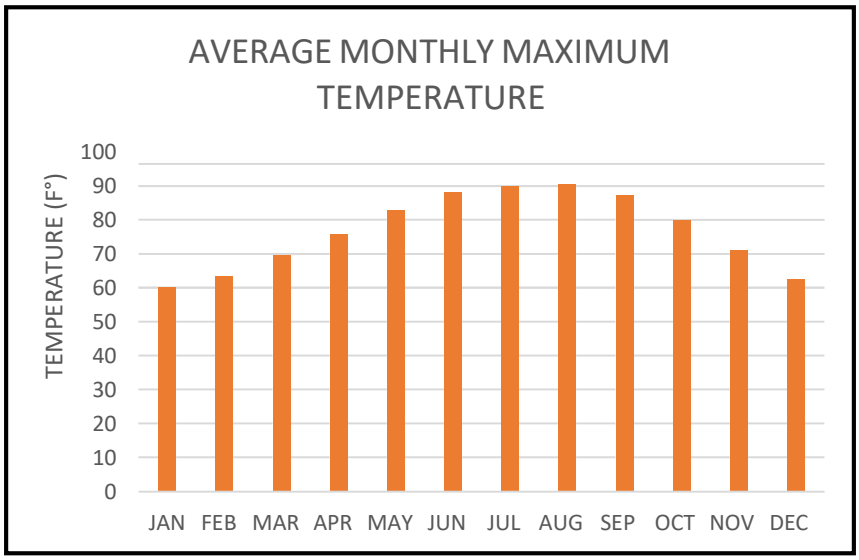

Figure 7. Average monthly maximum temperature in °F for the Vermilion River-Frontal Intracoastal Waterway HUC-12 basin for the period 1981-2010.

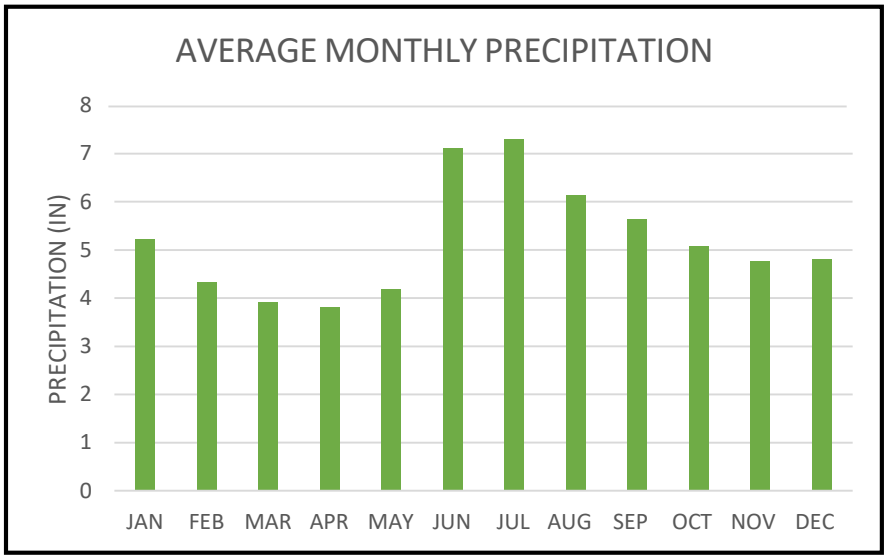

Figure 8. Average monthly precipitation in inches for the Vermilion River-Frontal Intracoastal Waterway HUC-12 basin for the period 1981-2010.

3.2 Water

The Vermilion River, which feeds the LVRW, is a distributary of the Bayou Teche, which together form the Teche-Vermilion watershed; both rivers being historic distributaries of the Mississippi-Atchafalaya-Red River system. In the near past (approximately 10,000 years ago) the Mississippi and Red (a tributary to the Mississippi) rivers have changed courses numerous times. At times, they combined, discharging as a single river via the (present) Atchafalaya Basin. At other times, the Red followed the (present) Sabine River course. The Mississippi has followed six main channels, including the Bayou Teche. Discharging for the largest drainage basin in North America (1,245,000 square miles or 40 percent of the continental United States), the Mississippi River carries upwards of 2.5 tons of sediment per second (Dempsey, Caitlin. 2018). The geologic process of carving channels, flooding, sediment deposition, and shifting course are key elements in the formation of deltas and development of a watershed. The Mississippi River's immense sediment load and springtime flooding created the deltaic geomorphology of coastal Louisiana. The LVRW exists entirely upon a near-historic Mississippi River deltaic plain.

Springtime floods made permanent habitation difficult in the delta region. Native peoples existed as nomads and conformed to flood events, but European settlements, beginning in the 1600s, sought to control the river and its yearly flood events. The flood of 1927 was so catastrophic; the USACE implemented the Mississippi River & Tributaries Project (MRTP) and began to broaden a series of controlling levees which today parallel the river from Cairo, Illinois, to its discharge at South Pass in southeast Louisiana. A major component of the MRTP is the Atchafalaya Basin, which serves as a spillway when major flood events warrant its use. To use this component, levees were constructed along the basin's east and west boundaries, and control structures were installed at the confluence of the Atchafalaya and Mississippi near Simmesport, Louisiana; which together allow for USACE

regulation of volume of flow from the Mississippi River into the Atchafalaya Basin.

Prior to the MRTP, the Teche was a distributary of the Atchafalaya. However, the west guide levee constructed across the flow alignment of the Bayou Teche, severed that hydrologic connection and the fresh water source for the Teche-Vermilion watershed. After completion of the MRTP levees in 1958, water quality in the watershed rapidly degraded, and in 1966 Congress authorized the USACE to construct the Teche-Vermilion Basins Project, to restore flow and ensure a supply of fresh water in the Teche-Vermilion watershed. A pumping station (completed in 1982) conveys water from the Atchafalaya Basin via a series of canals and structures to the Bayou Teche near Port Barre, in St. Landry Parish. Nineteen river-miles south of Port Barre, a small distributary, Bayou Fuselier, diverts about ten percent of that flow six miles to the Vermilion River, where it enters Lafayette Parish. Seventeen miles south of Bayou Fuselier, Ruth Canal diverts another aliquot four miles to the Vermilion River, which continues through Lafayette and Vermilion Parishes to Vermilion Bay and the Gulf of Mexico.

The LVRW is reliant upon water distribution and management to the north. Flows in Bayou Teche and the Vermilion River are controlled via the Teche-Vermilion pumping station. Water levels are assessed and determined by the Teceh-Vermilion Fresh Water District (TVFWD) based on levels in the Atchafalaya Basin, needs/demands for fresh water to the south,and to manage the potential for flooding from tropical storms and extreme precipitation events. (See **Appendix C –TVFWD Map**)

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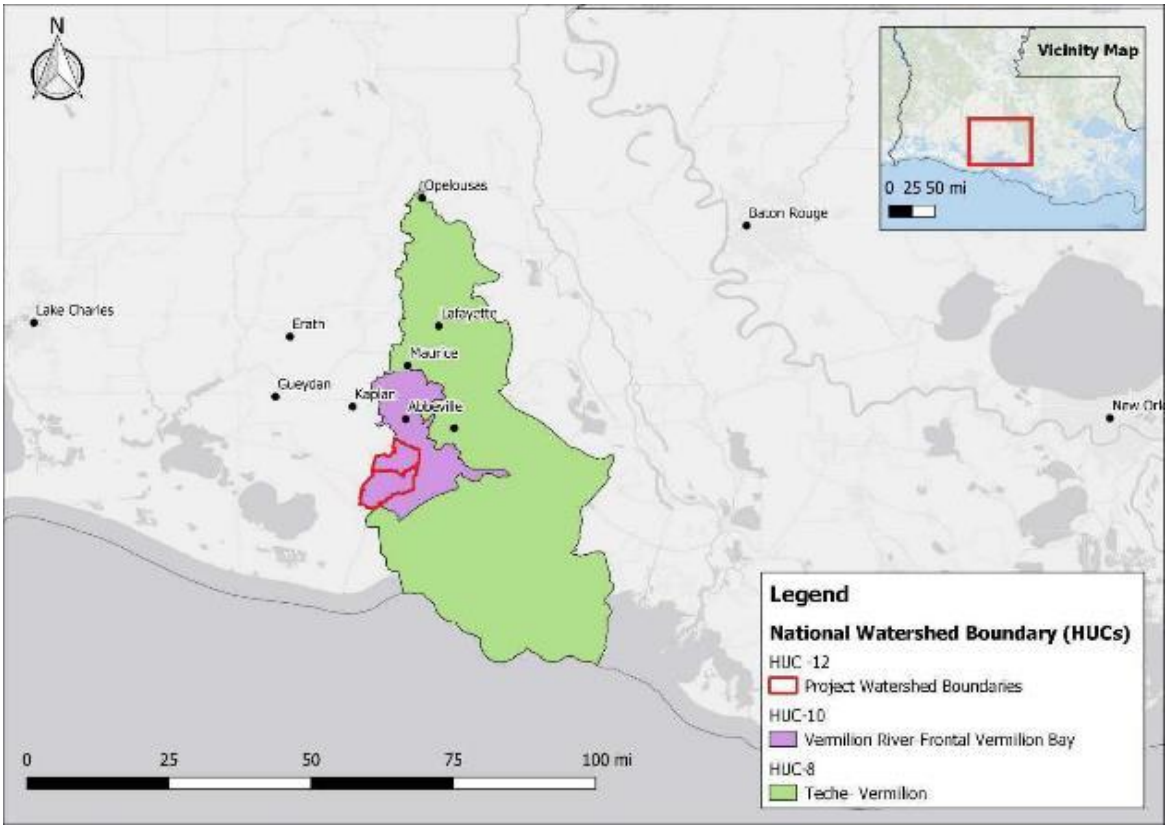

Figure 9. Watershed Boundaries (HUC-8, 10, &12)

3.2.1 Hydrology

The hydrology of the LVRW is a complex system driven by primary discharge from the Vermilion River, geomorphology of deltaic structure, numerous interior drainage and diversion channels, and water control structures. As a coastal system with near-sea-level elevations and being comprised of 26 percent of marsh, tides, wind, and climate have a strong influence on water movement in the LVRW. In addition to the aforementioned features and processes, 38 percent (See Land Use **Table 23**) of the LVRW is dedicated to aquaculture and farming practices that pump, hold, drain, and otherwise move water seasonally and throughout the year, accessing both surface and ground water.

The Little Bayou-Vermilion River subwatershed covers approximately 18,642 acres and its primary receiving streams are Bancker Canal and Little Bayou. There are four water control structures in this subwatershed: 1) Bancker Canal 0.1 mile downstream of its confluence with the Vermilion River, 2) Bancker Canal 7.2 river-miles south of its confluence with the Vermilion River, 3) Little Bayou 0.25 mile downstream its confluence with the Vermilion River, and 4) Hebert Canal just north of Hwy 82

The Vermilion River-Frontal Intracoastal subwatershed covers approximately 27,276 acres of land and receives flow from the Bancker Canal via the 7th Ward Canal along the western boundary, and via Mouton Canal into Hebert Canal. This subwatershed is also connected to the Vermilion River via Meaux's Ditch, which is controlled by a structure and utilized primarily as drainage to draw water from the area and prevent flooding from the Vermilion River. The Meaux's Ditch structure is located 1.7 miles from its confluence with the Vermilion River.

Average Monthly Discharge

The nearest gaging station to the LVRWP area is located on Vermilion River (USGS 07386980) at Perry, LA. The total estimated drainage area that flows through the Perry gage is 475 square miles (304,000 acres). During1984–2012, the average daily discharge for the Vermilion River at Perry was 1,140 cubic feet per second (ft3/s) or (737 million gallons per day (mgd)) (USGS 2013). Distances from the Perry gage to channels in the LVRW are as follows:

Bancker Canal	8.4 miles
Little Bayou	12
Meaux's Ditch	15.2
GIWW	16.9

Below is the chart of an average monthly discharge for Vermilion River at Perry. Discharge is measured at cubic feet per second (ft^3/sec). The highest monthly discharge occurs primarily in the winter months (Nov-Feb).

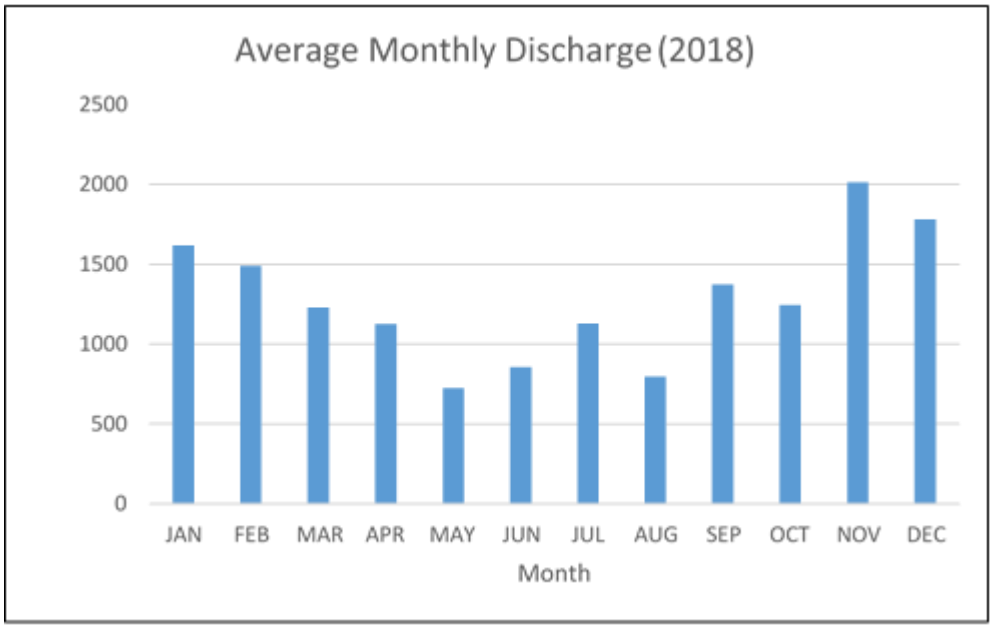

Figure 10. USGS Average Monthly discharge of Vermilion River at Perry, LA (07386980)

Tides and Tidal Datum

The LVRWP area is tidally influenced. Diurnal (a single high and low tide daily) and semidiurnal (two high tides and two low tides) tides cause regular movement of water into and out of the LVRW. The Hebert Canal study area, which is fifty percent marsh, is particularly influenced by tidal action. Normal astronomical tides are diurnal and can have a spring range of as much as 2 ft. The mean tidal range is approximately 1.28 ft. at Calcasieu Pass and 1.48 ft. at Freshwater Bayou Canal. Amplitudes are influenced by tides, but is generally controlled by meteorological events. South winds drive water from the Gulf of Mexico into the marshes. (USACE 2016) North winds push water out of the marsh. Tide datums and tidal constituents may also change over time, owing to changes in the geometry of a tidal basin (FEMA 2016).

Storm Surges

Reverse (upstream) flow in coastal bayous and rivers can occur during periods of low flow, sustained southerly winds, and/or high tides (Baker 1988). Along the Gulf coast, reverse flow occurs with extreme winds and storm surge during tropical storms and hurricanes. Storm surge is the rise of the ocean surface in response to the barometric pressure and to wind caused by tropical cyclones (hurricanes) or extratropical cyclones (wave cyclones) driven by temperature contrasts between warm and cold air masses. Storm surges associated with tropical systems push massive volumes of gulf water into the marsh and reverse the flow of coastal bayous and rivers. As an example, surges associated with Hurricane Laura (August 2020) exceeded ten feet at Lake Fearman, southeast of the project area. Storm surge effects are predictable within the span of an oncoming tropical storm or hurricane. Storm surges generally correspond to hurricane season, but may occur any time during the year when a large storm moves in from the Gulf. The NOAA recognizes the Atlantic Basin(Atlantic Ocean, Caribbean Sea, and Gulf of Mexico) hurricane season as June through November. The peak of the season is from mid-August to late October (NOAA 2020).

While the extreme high tide and storm surges are difficult to predict in our project area, the NOAA provides data that shows the probability that an area will exceed a certain water levels. The closest NOAA station collecting data for exceedance probability levels is approximately 50 miles southwest of our project area. This station is #8764311 Eugene Island, LA. (NOAA 2020 a)

Relative Sea Level and Land Subsidence

Subsidence is a natural process by which recently deposited, unconsolidated deltaic loam is compressed by gravity and sinks lower in elevation. In natural delta systems, the process of subsidence is offset by accretion, the building of deltaic plains from the deposition of sediment carried into a region by floodwaters . Historically, due to this process, the Mississippi has changed course several times. As floodwaters seek the steepest slope, gravity drew the floodwaters to coastal areas which experienced the greatest subsidence. Leveeing the Mississippi River began in the early 1700's, and with the completion of the MRTP coastal Louisiana no longer receives the large volumes of sediment from spring flooding. Consequently, areas of subsidence cannot be replenished.

Extraction of oil and gas deposits and withdrawal from fresh water aquifers also contributes to subsidence. Subsurface fluids trapped in annular spaces in rock formations exert a pore pressure on the surrounding formation. As the fluids are extracted, that pore pressure is reduced or depleted causing annular spaces to collapse and the

earth to sink as it fills those annular spaces. Many areas along the Gulf Coast have subsided as a result of gas, oil, or water extraction over the past few decades.

Subsidence compounds observable sea level rise,and together create an effect known as “relative sea level rise”. Due the location of the project area in relation to the Gulf Coast, the relative sea level rise along coastal Louisiana has increased the northern limits of the saltwater/fresh water boundary. Without nourishment and sediment deposition, the process of subsidence combined with salt-water encroachment yields a natural succession from fresh eventually to salt marsh and open water areas. The NOAA reports on a few causes to relative sea level rise. Global warming/climate change is causing global mean sea level to rise in two ways. first, glaciers an dice sheets worldwide are melting and adding water the ocean . Second, the volume of the ocean is expanding as the water warms. Third, on a much smaller scale, a decline in the amount of liquid water on land - aquifers, lakes, and reservoirs. Shifts of liquid water from land to ocean is largely due to groundwater pumping. The NOAA reports the relative see level trend for the closest NOAA station collecting data for relative sea level rise is approximately 50 miles southwest of our project area. This station is #8764311 Eugene Island, LA. The relative sea level trend for this area if 9.65 millimeters/year with a 95% confidence interval of +- 1.24 mm/yr based on monthly mean sea level data from 1938 to 1974, which is equivalent to a change of 3.17 ft. in 100 years. (NOAA 2020 b)

Existing Salinity Protection

As a coastal parish, the direction of water movement in the LVRW is a concern in terms of consistent availability of fresh surface water. Proximity to the Gulf, tides, winds, and anthropogenic causes all increase saltwater movement into the LVRW. The Louisiana coast is dominated today by a network of anthropogenic canals constructed for oil and gas exploration, production, and transmission activities, as well as various other economic uses. The GIWW and Four Mile Canal are direct conduits for saltwater into the LVRW from Vermilion Bay. The Leland Bowman lock regulates saltwater movement to the west, but there are no structures preventing saltwater intrusion into Hebert Canal and the Vermilion River.

Current Salinity Monitoring

Mermentau Basin Salinity Monitoring: The USACE, New Orleans District Operations Division, monitors salinity levels in the Mermentau Basin. Once a week (or approx. 3-4 times a month), salinity (grains per gallon (gpg)) readings are recorded by the Leland Bowman Lockmaster at multiple sites in the basin, five of which are located in the LVRW. USACE monitoring sites within or near the project study area are:

- L2-Bowman East
- L3-Meaux Canal Bridge
- L4-Meaux Canal Structure
- L6-Hebert Canal & Hwy 82

(See Appendix C for a map of the monitoring sites)

Figure 11 provides average monthly salinity data for the above monitoring sites recorded from 2010 through 2020. The graph indicates multiple peaks at the various structures. The existing Hebert Canal structure (L6), peaks in September at 1.9 ppt. Meaux’s Canal/Ditch Bridge (L3 and L4) data show an abrupt increase from July to August

with peak readings of 150 gpg (2 ppt), and another spike in November. The highest average salinities for the study area are in the GIWW east of Leland Bowman lock (L2), near HWY 333 and Hebert Canal. Data for station L2 range from 155 gpg (2.6 ppt) in May to 220 gpg (3.7 ppt) in November

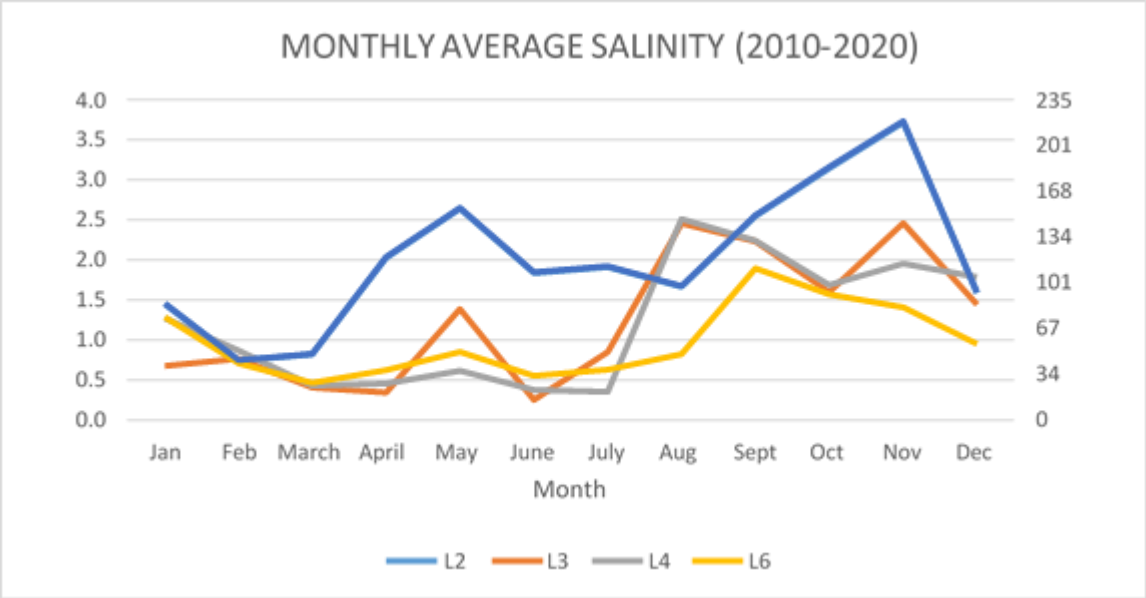

Figure 11. LVRW Monthly Average Salinity in Grains Per Gallon (gpg) and Parts Per Thousand (ppt)from 2010-2020

3.2.2 Water Quality/Quantity

Section 303(d) of the Clean Water Act requires EPA and the states to identify and develop plans to restore impaired waters total maximum daily load (TMDL). By definition, an impaired water does not meet the standardsassociated with its assigned use classification. There are four LDEQ ambient water quality monitoring stations within the LVRWP area: two in the Vermilion River (9.2 and 10.4 miles south of Abbeville), one in 7th Ward Canal (1.8 miles north of GIWW), and one in the GIWW (1.5 miles west of Hebert Canal). The LDEQ 2018 Water Quality Integrated Report 303(d) list of impaired waters indicates four impaired waterbodies in the LVRWas listed in **Table 5 LDEP 2018 303 (d) List of Impaired Waters in LVRWP Area.**

Table 5. LDEQ 2018 303(d) List of Impaired Waters in LVRWP Area

Subsegment Number	Waterbody Name	Segment Reach	Impaired Use	Pollutants
LA060802	Vermilion River	Hwy 3073 to GIWW	PCR	Dissolved oxygen, nutrients, fecal coliform
LA060804	GIWW	Vermilion Lock to ½-mile west of Gum Island Canal	FWP	Dissolved oxygen Enterococcus bacteria
LA061201	Vermilion-Teche River Basin	Coastal bays and gulf waters to the state 3-mile limit	OYS	Fecal coliform

Subsegment Number	Waterbody Name	Segment Reach	Impaired Use	Pollutants
LA050702	Seventh Ward Canal	Bancker Canal to GIWW	FWP	Mercury
FWP = Fish and wildlife propagation OYS = Oyster propagation PCR = Primary contact recreation				

Groundwater/Aquifers

The Chicot aquifer system, extending into Texas and eastward to the Atchafalaya River, is 23,000 km² (8,880 square miles) is the principal aquifer system of southwestern Louisiana, and the most heavily pumped aquifer in the State. (Stuart et.al. 1994) Tapped by more than 2,300 pumping wells, the Chicot aquifer provides approximately 400 mgd. In 1990, 609-mgd was withdrawn from the Chicot aquifer over a 13-parish area. Of this total, 70 percent was used for irrigating rice, soybean and corn, as well as growing crawfish, 25 percent for public supply and industrial use, the remaining 5 percent for domestic use and power generation. The Chicot aquifer is over-drafted by approximately 350 mgd and has been losing water for more than 10 years. Local farmers using multiple deep-water wells are experiencing extended or repeated droughts. Intensified water abstraction from the aquifer during the last decade has contributed to saltwater intrusion and subsidence. These issues in turn, eventually lead to loss of freshwater resources and land loss. (recharge-louisiana.org 2020)

In 2010, about 31.75 mgd was withdrawn from the ground in Vermilion Parish from the Chicot Aquifer. About 61.86 mgd was withdrawn from the surface, including about 20.18 mgd from the Vermilion River (**Table 6 Water Withdrawals By Source in Vermilion Parish, Louisiana, 2010 (Sargent, 2011; B.P. Sargent, unpub data, 2011**). Withdrawals for rice irrigation (62.53 mgd) accounted for about 67 percent of the total water withdrawn and about92 percent of the total surface water withdrawn. Withdrawls from aquaculture (crawfish, fish, etc.) accounted for20 percent of the total water withdrawn (**Table 7 Water Withdrawals By Use Category in Vermilion Parish, Louisiana, 2010 (modified from Sargent, 2011)**).

Table 6. Water Withdrawals by Source in Vermilion Parish, Louisiana, 2010 (Sargent, 2011; B.P. Sargent,unpub. data, 2011)

Water Withdrawal by Source (mgd) (2011)		
Source	**Groundwater**	**Surface Water**
Chicot Aquifer	31.75	
Bayou Queue de Tortue		20.18
Vermilion River		20.18
Other Streams		21.50
Total	31.75	61.86
Source: https://pubs.usgs.gov/fs/2014/3080/pdf/fs2014-3080.pdf		

Table 7. Water Withdrawals by Use Category in Vermilion Parish, Louisiana, 2010 (modified fromSargent, 2011).

Water Withdrawals by Category in Vermilion Parish (mgd) (2011)			
Use Category	**Groundwater**	**Surface Water**	**Total**
Public supply	6.39	0.00	6.39
Industrial	1.55	0.00	1.55
Rural domestic	2.29	0.00	2.29
Livestock	0.07	0.27	0.33
Rice irrigation	5.51	57.02	62.53
General irrigation	0.11	0.44	0.55
Aquaculture	15.83	4.14	19.97
Total	31.75	61.86	93.61
Source: https://pubs.usgs.gov/fs/2014/3080/pdf/fs2014-3080.pdf			

3.2.3 Floodplains

Vermilion Parish has opted into the Federal Flood Insurance Program and is therefore subject to FEMA regulations, including FEMA delineation and mapping of flood zones and Special Flood Hazard Areas (SFHA). All areas within Vermilion Parish are mapped on FEMA's National Flood Hazard Viewer, an online interactive ARCGIS tool that provides information regarding FEMA flood hazard zones. (See Appendix C, Figure FEMA flood hazard map).

The entirety of the Vermilion River-Frontal Intracoastal subwatershed is mapped as zone VE—coastal high hazard areas; subject to high velocity water including waves; defined by the 1% annual chance (base) flood limits(also known as the 100-year flood) and wave effects 3 ft or greater. AE Zones also depict the SFHA due to riverineflood sources, but instead of being subdivided into separate zones of differing BFEs with possible wave effects added, they represent the flood profile determined by hydrologic and hydraulic investigations and have no waveeffects (Hatheway et. al. 2005).

Most of the Little Bayou-Vermilion River subwatershed is mapped as AE, with a portion of the area along Bancker Canal mapped as VE. AE Zones are within the 100-year flood limits; and are defined with BFE that reflect the combined influence of stillwater flood elevations and wave effects less than 3 ft.

3.2.4 Water rights

Louisiana water rights laws state that any riverine landowner can pump freely from rivers/streams adjacent to their surface property as long as their pumping does not jeopardize or infringe upon the use of surface waters bythe general public or for use as a viable stream. Therefore, pumping of surface waters and ground water from theChicot aquifer are essentially unmanaged and used at will as needed by the landowners. There is no metering ofor monetary charges for waters pumped for use on surface lands within the LVRW.

3.3 Soils and Geology

3.3.1 Regional Geological Characteristics

The geology of the LVRW is Louisiana Prairie Terraces (Pleistocene) and Chenier Plain Fresh Marsh (Holocene)

at the surface. Geological units in Vermilion Parish, Louisiana Prairie Terraces (Pleistocene) covers 34% of this area and is light gray to light brown clay, sandy clay, silt, sand, and some gravel. Chenier Plain Fresh Marsh (Holocene) covers 29% of this area. (LSU-LGS 2015)

Soil Classifications

The primary soil units underlying the subwatersheds for the project area were identified with the NRCS Web Soil Survey (NRCS 2012). Soils that occur in the LVRW can be classified into map units based on their position in the natural landscape. There are four general classes of landscapes in the watershed: upland, Gulf Coast prairie, drained and protected former marsh, and marsh. (**See Appendix C - Soil Map**)

Upland soils found in the watershed are Jeanerette and Patoutville. These soils are gently undulating, somewhat poorly drained and loamy throughout. This map unit consists of soils on broad flats, side slopes, and low ridgesin the uplands. Slopes range from zero to three percent.

Gulf Coast Prairie soils include Mowata, Crowley, Judice, Kaplan, and Midland. These are mainly level, nearly level, and very gently sloping, somewhat poorly drained and poorly drained soils that have a loamy surface and clayey /loamy or loamy subsoil.

Gueydan is a soil that was once marsh but has been drained and protected from flooding. This mucky soil is mainly level and poorly drained. Flooding is rare but can occur during hurricanes or when protection levees anddrainage pumps fail.

Allemande is a marsh soil that occurs in the project area. It is characterized as level, very poorly drained soil that has a peaty or clayey surface layer and mucky and clayey underlying material in a fresh marsh.

Farmland Designations

Within the LVRW, 20,325 acres or 44 percent of the watershed has soils which are classified by the NRCS as being “prime farmland”, approximately 6 acres of soils are considered to be “prime farmland if protected from flooding or not frequently flooded during the growing season”, and 25,587 acres or approximately 56 percent of the soils are considered “not prime farmland” (NRCS 2017a), see **Table 8 Prime and Important Farmland.**

Prime Farmland. According to the USDA, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. Within the prime farmland designation, soils can be further classified as:

- prime farmland if irrigated;
- prime farmland if irrigated and drained;
- prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season; and

- prime farmland if irrigated and the product of I (soil erode-ability) x C (climate factor) does not exceed 60.

Farmland of Unique Importance. Unique farmland is land other than prime farmland that is used for the production of specific high-value food as citrus, tree nuts, olives, cranberries, fruits, and vegetables. With the combination of soil quality, growing season, moisture supply, temperature, humidity, air drainage, elevation, and aspect needed for the land to produce sustainable high yields of these crops under propermanagement

Farmland of Statewide Importance. This is land, in addition to prime and unique farmlands, that is of statewide importance for the production of food, feed, fiber, forage, and oil seed crops. Criteria for defining and delineating this land are to be determined by the appropriate State agency or agencies. Generally, additional farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high a yield as prime farmlands if conditions are favorable. In some States, additional farmlands of statewide importance may include tracts of land that have been designated for agriculture by State law.

Farmland of Local Importance. Land that is not identified as having national or statewide important is considered to be "farmland of local importance" for the production of food, feed, fiber, forage, and oilseed crops. This land designation is definable by the appropriate local agencies and may include tracts of land that have been designated for agriculture by local ordinance.

(See **Appendix C** for Farmland Classification Map)

Table 8. Prime and Important Farmland

NRCS Farmland Designation	Approximate Acreage within Watershed	Approximate Portion ofthe Watershed (percent)
Prime Farmland	20,325	44
Not Prime Farmland	25,587	56
Prime Farmland if protected from flooding or not frequently flooded during the growing season	6	0.01
Farmland of Statewide Importance	0	0
Farmland of Local Importance	0	0
Total	**45,918**	**100**
Source: NRCS 2017a		

3.3.2 Erosion and Subsidence

Soil erosion is a naturally occurring process that refers to the loss of topsoil by the forces of wind and water (NRCS 2017c). Soil compaction, low organic matter, loss of soil structure, poor internal drainage, salinization and soil acidity are soil degradation issues that can accelerate the soil erosion process (NRCS 2011).

Shoreline erosion on the large bays is caused primarily by natural wave energy. Wave energy has gradually increased over the centuries because the bays are naturally getting deeper due to the very slight but constant subsidence and global sea-level rise. Wave energy is also believed to have been increased because humans reduced the size of the oyster reefs between Marsh Island and Point Au Fer that shielded the large bays from waveand tidal energy in the Gulf of Mexico. Severe shoreline erosion occurs on Marone and Redfish Points, Shark Island, and the shore of Weeks Bay.

Shoreline erosion can dramatically affect wetland loss when it causes relatively isolated marsh drainage systems to become hydraulically connected with dynamic water bodies such as navigation canals and the large bays. In other areas, shoreline erosion is particularly rapid and causes the direct loss of significant wetland acreage. These may be classified as hot spots of erosion. Erosion caused by boat wakes and water surges associated with the passage of large vessels also causes wetland loss along the GIWW and other navigation canals.

According to NRCS, subsidence is a gradual lowering of the surface elevation of an organic soil, or a reduction in the thickness of organic matter. The most important cause of organic soil subsidence is a process commonly termed "oxidation". A high-water table creates anaerobic conditions that slow the breakdown of organic materials.The balance between accumulation and decomposition of organic material shifts dramatically when soil is drained. Oxidation under aerobic conditions converts the organic carbon in the plant tissue to carbon dioxide gasand water. Aerobic decomposition under drained conditions is much more efficient thereby causing the loss of organic matter. (NRCS 2012)

South Louisiana is experiencing rapid subsidence and land loss in addition to a multitude of environmental problems. Subsidence is the general term for the gradual sinking of coastal land into the ocean. It is controlled by natural drivers such a tectonics (faulting) processes, sediment loading and compaction, glacial isostatic adjustment (could be defined as sea level rise caused by melting glaciers), and anthropogenic drivers such as fluid withdrawal, and surface water drainage and management. Compaction of underlying sediments from weighted levees, beaches, buildings, etc. and consolidation of the sediment's textural variability plays a significant role in the gradual sinking of the Chenier plain. Land loss is a direct result of this process.

3.3.3 Salinity

Agricultural producers in the LVRW are constantly battling contamination of soils due to frequent saltwater inundation caused by storm surges. In 2020, Louisiana experienced one of the busiest hurricane/tropical storm seasons since 2005. Out of the eight Gulf storms that year, six had Louisiana in its crosshairs. Out of the six, Hurricane Laura (August 22, 2020) took the hardest hit on Louisiana when it made landfall in the southwestern part of the state as a Category 4 hurricane. Because of these storm events, many producers experienced major flooding and saltwater intrusion, inundating agricultural lands lasting weeks/months. The long inundation period left soils contaminated with salts resulting in drastic changes in the soils chemical composition and significantly influencing the productivity of future crops grown in fields.

On November 20 and 24, 2020, four electromagnetic induction (EMI) surveys were conducted on four rice/crawfish fields by the Natural Resources Conservation Service (NRCS) Louisiana State Soils Staff. The DuelEM meter captured readings, in millisiemens per meter, at both "shallow" (0.0-0.5 m) and "deep" (0.0-1.5

m) intervals within the soil profile for each field. **Field 1** showed readings exceeding 100mS/m in both "shallow" and "deep" surfaces surface. In many cases, readings exceeding 100 mS/m indicate the presence of soluble salts. This indication warranted further investigation. **Fields 2-4**, however, did not show readings exceeding 100mS/m within the "shallow" intervals. While fields 2-4 did show a few "hotspots, the ECa readings throughout the fields were found to be at acceptable levels for rice and crawfish production. This finding did not warrant further investigation and were not sampled as a result of the EMI survey.

Further investigation of Field 1 showed higher readings found in depression areas and along the boundary line, beside ditches and lower lying areas. Higher surface concentrations in "hotspot" areas indicate not enough time has passed for salinities to leach below the surface by means of precipitation and/or flushing of freshwater. NRCS recommended the LSU Ag Center for guidance on salinity management and rice production for Field 1.

The results of the EMI survey conducted with the project area indicate . the location of the Field within the survey

(See **Appendix D** for full Soil Salinity report and maps)

According to USDA NRCS Soil Survey data soil health concentration for the LVRW indicate 10.4% of soils in the watershed are rated as "surface salinization risk" for agricultural soils. This rating limits the excess of surface salts, indicating that the soils are somewhat favorable for surface salinization. Careful management of these areas are needed to avoid damage from salinity. The location of the "surface salinization risk" area is primarily located centrally in the 2 HUC-12 watersheds. This area is mainly used for agriculture purposes. (see **Appendix C**)

3.4 Air Quality

The Clean Air Act of 1970 (CAA) (42 U.S.C. §7401 et seq.) authorizes the U. S. Environmental Protection Agency (USEPA) to regulate emissions of hazardous air pollutants and establish National Ambient Air Quality Standards (NAAQS) (USEPA 2020). The NAAQS identify the maximum concentration of a given pollutant/time(legally allowable), and are currently established for: carbon monoxide (CO), lead (Pb), ground-level ozone (O_3),nitrogen dioxide (NO_2), particulate matter (PM), and sulfur dioxide (SO_2). The USEPA has delegated authority to the Louisiana Department of Environmental Quality (LDEQ) to implement and enforce the NAAQS (LDEQ 2015). The LDEQ maintains a statewide system of monitoring stations to track air quality trends and to determine compliance with the NAAQS. LDEQ data informs the USEPA and the NOAA air quality monitoring system, *AirNow* (http://www.airnow.gov/), the national online air quality monitoring/forecasting service.

There are no air quality monitoring stations within the proposed project area. The nearest station is located approximately 27 miles northeast of the project area in St. Martinville, Louisiana. The LDEQ data indicates that all stations in Louisiana are in attainment, except for St. Bernard Parish (for SO_2) which is approximately 130 miles east of the project area. *AirNow* data indicate that air quality in the project area is good to moderate (*AirNow* 2022).The region and project area are in attainment (**Table 9 AirNow Air Quality Data for Intracoastal City, Louisiana**).

Table 9. AirNow Air Quality Data for Intracoastal City, Louisiana.

Date	Ozone	PM2.5
21-Jun-20	19 - good	48 - good
14-Aug-20	20 - good	7 - good
7-Sep-20	56 - moderate	45 - good
19-Mar-22	44 - good	56 - moderate
03-Nov-22	48 - good	57 - moderate
Source: https://www.airnow.gov/		
PM2.5 refers to particles that have a diameter less than 2.5 micrometers and remain suspended for longer. These particles are formed as a result of burning and chemical reactions that take place in the atmosphere.		

LDEQ Air Permit Requirements

Emissions sources associated with construction, operations and maintenance of the project do not require an LDEQ air permit. The LDEQ has identified certain types of emissions that are immeasurable and/or minimal sources of pollutants, and as such are not required to apply for or obtain an LDEQ air quality permit. Emissionssources that do not require an LDEQ air permit are:

- mobile sources such as automobiles, trucks, and aircraft;
- non-road engines; such as lawn mowers, snowmobiles, forklifts, generators, recreational boats, aircraft engine, etc.
- controlled burning of agricultural by-products in the field or of cotton gin agricultural wastes;
- controlled burning in connection with timber stand management, or of pastureland or marshland in connection with trapping or livestock production; or
- facilities with potential emissions less than 5 tons per year (TPY) of any regulated air pollutant as defined by the Federal Clean Air Act, less than 15 TPY of all such defined pollutants combined, and less than the minimum emission rate (MER) for each toxic air pollutant.

3.5 Vegetation Communities and Habitat

3.5.1 Ecoregions

Vermilion Parish forms the southeastern corner of the Western Gulf Coastal Plain, an approximate 6,000-square-mile area of marsh and prairie spreading, in a roughly triangular manner, from the Gulf of Mexico approximately 60 miles inland between the Sabine River to Vermilion Bay. The LVRWP area sits at the interface of three eco-regions distinguished by geomorphological qualities that, in concert with climatic and hydrologic regimes, support vegetative communities that characterize these regions—Texas–Louisiana Coastal Marsh, Lafayette Loess Plains, and Northern Humid Gulf Coastal Prairies. Roughly 9,000 acres of the LVRWP area lies within the TX-LA Coastal Marsh, characterized by shallow tidally influenced marshes of maiden cane and sawgrass, bayous and canals. Higher elevations (from three to six feet above mean sea level) in the LVRWP area along Hay 82 and Hwy 333 are within the Lafayette Loess Plains ecoregion. Historic native prairie vegetation has been largely converted to rice, crawfish and pasture. The west edge of the LVRWP area barely overlaps the Northern Humid Gulf Coastal Prairies. Historically vegetated with herbaceous prairie species, this area has been converted to agricultural crops

3.5.2 Land Cover Types

The National Land Cover Dataset (NLCD), a 30-meter resolution (landscape scale) raster coverage created by satellite imagery interpretation, was used to characterize the spatial distribution of vegetation communities across the project area. From the NLCD land cover classes, 13 vegetation communities were identified. **Table 10** lists the percent land cover in order of prevalence in the subwatersheds. **Figure 7** in **Appendix C** depicts the spatial distribution of land cover in each of the two subwatersheds.

Plant community composition along the Gulf Coast is influenced by climate, salinity and hydrology. Wetland Indicator Status is determined by a species' ability to germinate, survive and populate areas under certain hydrologic regimes. Thus, wetland habitats are categorized and defined largely by species composition and vegetative communities. Note: **Section 3.6** describes the project area's wetlands and riparian areas using other higher-resolution datasets. The following narratives briefly describe the habitat types and vegetative communities in the project area. (NLCD 2016)

Barren land: Areas that have very little to no vegetation as a result of salt scald or other chemical application, or having a permatized surface such as gravel, limestone, or asphalt.

Cultivated Crops: Rice, crawfish, alligator, and hay are some of the major crops cultivated in the LVRW.

Deciduous forest: occur in upland areas that may experience periodic flooding; include a closed canopy of trees (>20 ft tall), a sparse to dense understory of young trees or shrubs, and an herbaceous groundcover of grasses or forges. In the LVRWP area species composition would be the same as mixed forest described above.

Developed open space: Residential, business, or industrial areas including infrastructure, roads, parking areas, and buildings.

Emergent Herbaceous Wetlands are characterized by erect, rooted, herbaceous hydrophytes, present for most of the growing season in most years. These wetlands are usually dominated by perennial plants. All water regimes are included except subtidal and irregularly exposed. Emergent herbaceous wetlands in the LVRWP include tidal fresh and intermediate marsh.

Evergreen forest: occur in upland areas and include a closed canopy of trees (>20 ft tall), with an understory of young trees or shrubs, and an herbaceous groundcover. In the LVRWP, the dominant native canopy species is live oak (*Q. virginiana*). Live oak stands often include a small percentage of deciduous species including sweetgum, water oak, red maple, and pignut hickory.

Hay/Pasture: open areas of grasses, legumes, or grass-legume mixtures planted for specifically as fodder for livestock grazing or the production of seed or hay crops.

Herbaceous: open non-woody vegetation that is either naturally occurring or open maintained areas not specifically planned for agricultural (crops, hay).

Mixed forest: occurs in palustrine and estuarine systems and includes an overstory of trees (>20 ft tall), an understory of young trees or shrubs, and an herbaceous groundcover. All water regimes are included except

subtidal. Species in the LVRW include bald cypress, sweetgum (*Liquidambar styraciflua*), swamp bay (*Perseapalustris*), laurel oak (*Quercus laurifolia*), water oak (*Q. nigra*), red maple (*Acer rubrum*), American elm (*Ulmusamericana*), and pignut hickory (*Carya glabra*).

Shrub/Scrub: dominant canopy is woody (non-tree species) vegetation less than 6 meters (20 ft) tall; moderately open to dense, closed canopy and few to no trees taller than 20 ft., occurring in all water regimes except subtidal. This could be a secondary successional sere, or the final or climax stage of a vegetative community. Shrub/scrub may include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. Shrub-scrub wetlands occur only in the estuarine and palustrine systems. Species in the LVRWP include groundsel tree (*Baccharis halimifolia*), marsh elder (*Iva frutescens*), inkberry (*Ilex glabra*), honey locust (*Gleditsia triacanthos*), buttonbush (*Cephalanthus occidentalis*), red maple (*Acer rubrum*), black willow (*Salix nigra*), and young bald cypress (*Taxodium distichum*).

Tidal Freshwater Marsh: emergent freshwater (salinity <0.5 parts per thousand (ppt)) wetlands dominated by herbaceous plants adapted to saturated soil conditions, upstream from brackish marshes but where water level changes are still tidally influenced. The dominant emergent fresh marsh species observed in the Hebert Canal - Vermilion River Segment of the sub watershed observed on June 18, 2020, were broadleaf cattail, sawgrass, bullwhip, giant cutgrass, roseau cane, bulltongue, and rattlebox/coffeeweed, with many species found in trace amounts (**Table 10 Percent of Land Cover in the Subwatersheds**). Dominant aquatic species found in fresh marsh area canals included water lettuce, a native species, and non-native species: salvinia, water hyacinth, alligatorweed, and giant salvinia.

Tidal Intermediate Marsh: (salinity 0–5 ppt) emergent wetlands with dominant species of: cattail, hog cane, giant cutgrass, roseau cane, elephant's ear, water hyacinth, alligator weed, and maidencane.

Woody Wetlands: may include shrub/scrub, deciduous hardwood forests and swamps, occurring along riparian corridors and areas adjacent to marsh but with elevations high enough to sustain woody species. Canopy may be relatively open or dense and closed.

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Table 10. Percent of Land Cover in the Subwatersheds

Land Cover	Percent of Subwatershed	
	Vermilion River-Frontal Intracoastal	Little Bayou-Vermilion
Emergent Herbaceous Wetland	49.9	3.53
Herbaceous	0.48	0.33
Hay/Pasture	13.13	11.48
Cultivated Crops	22.8	29.83
Woody Wetlands	4.57	44.99
Shrub/Scrub	0.09	0.99
Mixed forest	0.06	1.53
Evergreen forest	0.01	0.2
Deciduous forest	0.02	1.97
Barren Land	0.2	0.09
Open Water	6.45	1.5
Developed, Open Space	0.48	1.66
Developed, Low Intensity	1.19	1.86
Developed, Medium Intensity	0.34	0.03
Developed, High Intensity	0.38	0
Total	100%	100%

Vermilion River-Frontal Intracoastal Subwatershed (27,276 acres)

The LVRWP features are located in the Vermilion River-Frontal Intracoastal Subwatershed (Intracoastal Subwatershed). Within the Intracoastal Subwatershed lies the Hebert Canal study area, which is where all of the project components are taking place.

Hebert Canal Study Area

The Hebert Canal study area encompasses 12,610 acres, generally segregated into agricultural land to the north, and fresh intermittent marsh to the south. On June 18, 2020, a technical team of biologists and environmental scientists conducted a field assessment of this area. The findings from that assessment indicate dominate emergent fresh **(Figure 9)** and intermediate marsh species **(Table 11 Percent Cover of Dominant Fresh Marsh Vegetation Observed in the Hebert Canal Watershed Study** and **Table 12 Percent Cover of the Dominant Intermediate Marsh Vegetation Observed in the Hebert Canal Watershed)**. In comparing the dominant fresh

to species, only bullwhip and the aquatics, salvinia, giant salvinia, water lettuce, and duckweed were found in fresh marsh locations but not at intermediate marsh locations. Switch grass, hogcane, giant foxtail, pokeweed, and eastern baccharis were found in the intermediate marsh locations, but not in the fresh marsh locations (Table 11).

Table 11. Percent Cover of Dominant Fresh Marsh Vegetation Observed in the Hebert Canal WatershedStudy Area on June 18, 2020.

Species	Scientific Name	Habitat Comments	Percent Cover
Emergent Plant Species			
Cattail	*Typha latifolia*	F-I	24
Sawgrass	*Cladium mariscus (cf C. jamaicense)*	F-I	17
Bullwhip	*Schoenoplexus californicus*	F-I	5
Giant Cutgrass	*Zizaniopsis miliacea*	F	14
Roseau Cane	*Phragmites australis*	F-B	7.5
Bulltongue	*Sagittaria lancifolia*	F-I	5
Rattlebox/ Coffeeweed	*Sesbania spp.*	F-B	Trace-5
Aquatic Plant Species			
*Salvinia	*Salvinia minor*	Invasive; F-B	23
*Water Hyacinth	*Eichhornia crassipes*	Invasive; F	20
*Alligatorweed	*Alternanthera philoxeroides*	Invasive, F-I	12
*Water Lettuce	*Pistia stratiotes*	F-I	5
*Giant Salvinia	*Salvinia molesta*	Invasive; F-B	Trace-5
Species Found in Trace Amounts (1 % cover or Less) Virginia Saltmarsh Mallow (*Kosteletzkya virginica*), Elephantsear (*Colocasia esculenta*), Eastern Baccharis (*Baccharis halimifolia*), Buttonbush (*Cephalanthus occidentalis*), Sedge (*Cyperus* spp. (cf *C. haspan*), Marshmallow (*Hibiscus lasiocarpos*), Pennywort (*Hydrocotyle* spp.), Soft Rush (*Juncus effusus*), Common Duckweed (*Lemna minor*), Floating Waterprimrose (*Ludwigia* spp.), Maidencane (*Panicum hemitomon*), Pickerelweed (*Pontederia cordata*), Saw Palmetto (*Sabal minor*), Bagscale (*Sacciolepis striata*), Black Willow (*Salix nigra*), Yellow Foxtail (*Setariaglauca*), Wiregrass (*Spartina patens*), Baldcypress (*Taxodium distichum*), Sickle Senna (*Senna tora*), and Alligator-flag [*Thalia* spp. (cf *T. geniculata*)].			
Notes: Numbers = Average Percent Cover (8 stations) Habitat comments - F = Fresh marsh; I = Intermediate marsh; B = Brackish marsh Percentages do not equal 100%. Sampled by ocular estimate on June 18, 2020. Clark (2020), Appendix 3.5, Chabreck and Condrey (1979)			

Table 12. Percent Cover of the Dominant Intermediate Marsh Vegetation Observed in the Hebert CanalWatershed Study Area on June 18, 2020.

Species	**Scientific Name**	**Habitat Comments**	**Percent Cover**
Cattail	*Typha latifolia*	F-I	46.3
Sawgrass	*Cladium mariscus (cf C. jamaicense)*	F-I	15
Roseau Cane	*Phragmites australis*	F-B	6.7
Switch Grass	*Panicum virgatum*	F-B	6.7
Hogcane/ Big Cordgrass	*Spartina cynosuroides*	F-B	6.3
Elephantsear	*Colocasia esculenta*	Exotic; F	5
Bulltongue	*Sagittaria lancifolia*	F-I	5
Giant Cutgrass	*Zizaniopsis miliacea*	F	4
Giant Foxtail	*Setaria magna*	F-I	1
Marsh Morningglory	*Ipomea sagittata*	F-B	1
Pokeweed/Pokeberry	*Phytolacca americana*	higher marsh	1
Eastern Baccharis	*Baccharis halimifolia*	F to B elevated areas	Trace
Sedge	*Cyperus spp. (*cf *C. haspan)*	F-I	Trace
Aquatic Plant Species			
*Water Hyacinth	*Eichhornia crassipes*	Introduced; F	5
*Alligatorweed	*Alternanthera philoxeroides*	Introduced, F-I	5

Notes: Numbers = Average Percent Cover (4 stations)
Habitat comments - F = Fresh marsh; I = Intermediate marsh; B = Brackish marsh
Percentages do not equal 100%. Sampled by ocular estimate on June 18, 2020.
Clark (2020), Appendix 3.5, Chabreck and Condrey (1979)

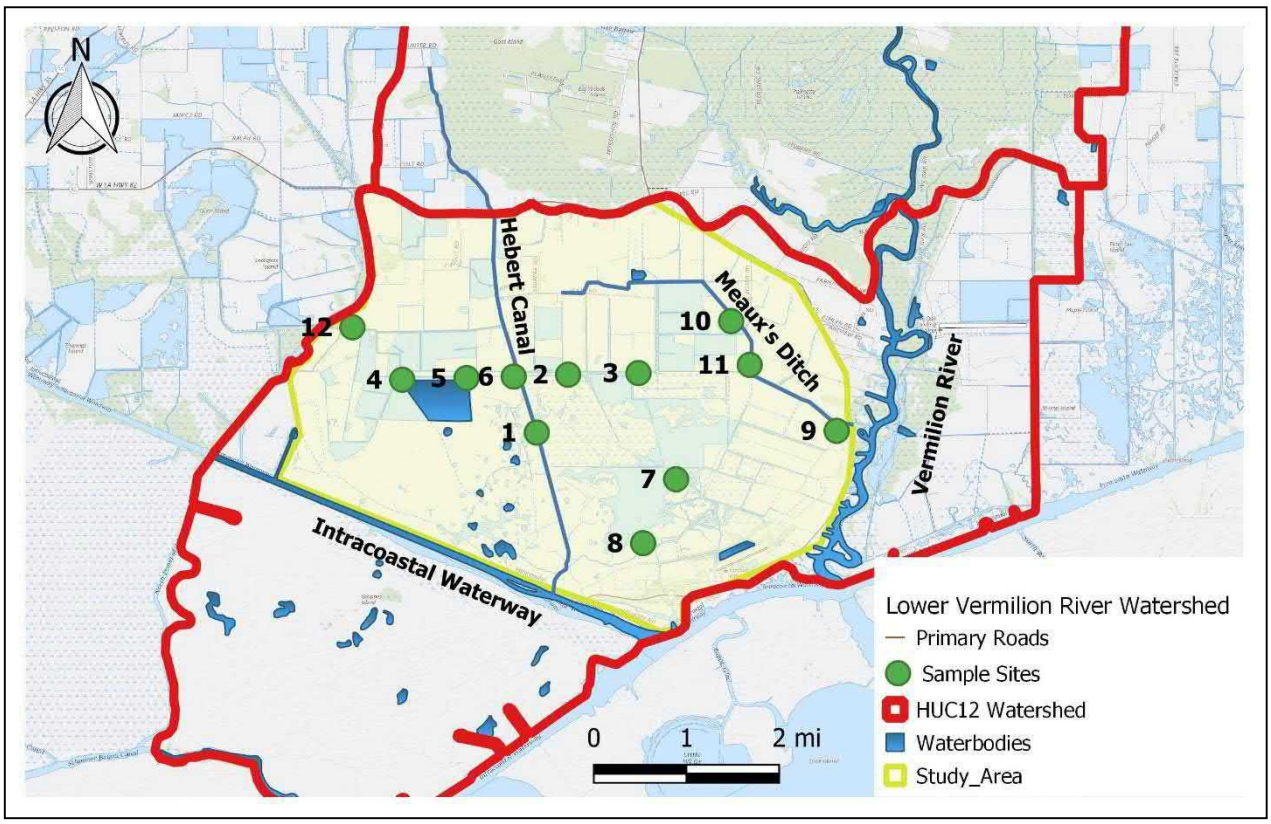


*Figure 12. Vegetation Sample Stations in the Hebert Canal Watershed Study Area -on June 18, 2020***.**

The Little Bayou-Vermilion River Subwatershed (Little Bayou Subwatershed) is located north of the LVRWP area. The subwatershed extends approximately 6 miles north of Highway 82 and is about 5 miles wide, encompassing 18,642 acres. None of the project features are located in this subwatershed, and although there are hydrologic connections between the Herbert Canal study area and Little Bayou Subwatershed, little if any of the project benefits would be realized in areas north of Hwy 82. Since it was anticipated that there would be no effects from the LVRWP to the Little Bayou Subwatershed, no field assessments were conducted in this area. Wetlands consist primarily of cypress-tupelo swamp, scrub-shrub swamp, bottomland hardwoods, small bayous, ponds, canals, andthe Vermilion River. Subwatershed uplands are composed of coastal live oak forests and agricultural lands (**Table 13 Vegetation Sample Stations in the Hebert Canal Watershed Study Area)**.

Table 13. Likely Vegetation Within Little Bayou-Vermilion River Subwatershed by Habitat.

Common Name	**Scientific Name**	**Swamp (7,709 acres)**	**Scrub-Shrub Swamp**	**Fresh Marsh (644 acres)**	**Freshwater Pond (40 acres)**	**Bottomland Hardwood Forest**	**Coastal Live Oak Forest**
Baldcypress	*Taxodium disticum*	X					
Tupelo gum	*Nyssa aquatica*	X					
Black willow	Salix nigra	X	X				
Green ash	*Fraxinus pennsylvanica*	X				X	
Swamp red maple	*Acer rubrum* var. *drummondii*	X	X			X	X
Water elm	*Planera aquatica*	X	X				X
Water locust	*Gleditsia aquatica*	X					
Buttonbush	*Cephalanthus occidentalis*	X	X				
Virginia willow	*Itea virginica*	X					
Dwarf (Swamp) palmetto	*Sabal minor*		X			X	
Eastern baccharis	*Baccharis halimifolia*		X				
Wax myrtle	*Morella (= Myrica) cerifera*		X				X
Lead plant	*Amorpha fruticosa*		X				
Cattail	*Typha latifolia*			X			
Sawgrass	*Cladium mariscus (= C. jamaicense)*			X			
Roseau cane	*Phragmites australis*			X			
Switch grass	*Panicum virgatum*			X			
Bullwhip	*Schoenoplexus californicus*			X			

Common Name	Scientific Name	Swamp (7,709 acres)	Scrub-Shrub Swamp	Fresh Marsh (644 acres)	Freshwater Pond (40 acres)	Bottomland Hardwood Forest	Coastal Live Oak Forest
Bulltongue	*Sagittaria lancifolia*			X			
Maidencane	*Panicum hemitomon*			X			
Pickerelweed	*Pontederia cordata*			X			
Giant cutgrass	*Zizaniopsis miliacea*			X			
Water lettuce	*Pistia stratiotes*				X		
Water primrose	*Ludwigia spp.*				X		
Alligatorweed	*Alternanthera philoxeroides*				X		
Water hyacinth	*Eichhornia crassipes*				X		
Common salvinia	*Salvinia minima*				X		
Giant salvinia	*Salvinia molesta*				X		
Sweetgum	*Liquidambar styraciflua*					X	X
Water oak	*Quercus nigra*					X	X
Hackberry	*Celtis laevigata*					X	X
American elm	*Ulmus americana*					X	X
Red oak	*Quercus falcata*					X	
Deciduous holly	*Ilex decidua*					X	X
Yaupon holly	*Ilex vomitoria*					X	
Green hawthorn	*Crataegus virdis*					X	
Switchcane	*Arundinaria gigantea*					X	
Live oak	*Quercus virginiana*						X
Honey locust	*Gleditsia triacanthos*						X

Common Name	Scientific Name	Swamp (7,709 acres)	Scrub-Shrub Swamp	Fresh Marsh (644 acres)	Freshwater Pond (40 acres)	Bottomland Hardwood Forest	Coastal Live Oak Forest
Box elder	*Acer negundo*						X
Swamp dogwood	*Cornus foemina*						X
Elderberry	*Sambucus canadensis*						X
Red bay	*Persea borbonia*						X

(LA Department of Wildlife and Fisheries 2009; Clark 2020)

3.5.3 Special Status Plant Species

Special status plant species considered in this Plan-EA are all/any plant species that were identified and/or indicated by the U.S. Fish and Wildlife Service (USFWS) and Louisiana Department of Wildlife and Fisheries (LDWF) to occur or have potential to occur in the project area. A list was generated from a search conducted at both the USFWS Information for Planning and Consultation (IPaC) database and the LDWF *Rare Species and Natural Communities* online database.

Note: The IPaC database uses an ARC-GIS program to develop a project-specific search based on the project area boundaries to identify possible occurrence within an area. The LDWF database generates a list of species known to occur in the parish, in this case, Vermilion Parish, and does not provide for specific occurrence within the LVRWP area. All species listed were either ground-truthed for occurrence, or eliminated from further consideration because habitat within the project area is not suitable for the species to occur in the area. This information is provided in compliance with the Endangered Species Act of 1973(ESA) (16 U.S. Code CHAPTER 35). The ESA (16 U.S. Code CHAPTER 35 § 1541) prohibits unauthorized taking of listed plant species; including, damage or destruction of endangered plants on federal lands and on private lands when knowingly inviolation of State law.

Federal and State Threatened and Endangered Plants

According to the IPaC database, there are no federal-listed plants, candidates for listing, or critical habitat within the LVRWP (USFWS 2022) **(Appendix E**). According to the LDWF *Rare Species and Natural Communities* online database, there are no federal or state-listed threatened or endangered plant species known to occur in Vermilion Parish (LDWF 2022).

Special Status Plants

There are 18 plant species assigned state and/or global ranks (indicative of population stability) in Vermilion Parish. The fresh to intermediate habitat in the LVRWP area provides potential suitable habitat for five of those. One species, powdery thalia (*Thalia dealbata*), was observed in a pasture south of the west pump-off canal. Powdery thalia occurs in freshwater habitats, shallow ponded areas, ditches, and shallow sloughs. Few individuals were observed outside of areas proposed for direct impact. A complete list of the state and globally ranked plant species known to occur in Vermilion Parish is provided **Appendix E –Table E.1**. The list discuss the species, their rankings, and a brief explanation regarding habitat requirements and potential for occurrence in the LVRWP area.

Invasive Species

Executive Order 13112 (1999) directs Federal agencies to, ". . . prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological and human health impacts that invasive species cause." According to the Executive Order, an "invasive species" is defined as a species that is: 1) non-native (or alien) to the ecosystem, and 2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health (Federal Register 1999). NRCS policy states that a plant species is considered "invasive" when it occurs on the Federal or State-specific noxious weed list. See **Table 14 List of Invasive Plant Species Observed and Possibly Occurring Within the Lower Vermilion River Watershed Project Area** for a list of possible invasive species occurring within the LVRW.

Invasive species can have major effects on watershed water quality, and aquatic ecosystem health. Invasive species can, 1) grow vigorously and out-compete native plants due to no or few herbivores, 2) outnumber nativespecies and compete for space and resources (i.e., light, nutrients, and water), 3) block waterways and reduce fisheries production and impede navigation, 4) reduce fisheries waterfowl habitat, 5) alter water quality by changing pH, reducing dissolved oxygen and increasing temperature (LDWF 2015).

BMPs to prevent introduction and spread of invasive plant species

BMPs for pre-construction, during construction, and for normal operations post-construction for invasive aquatic plant species follow NOAA guidelines. General guidelines are provided below, and in detail in Appendix E.

Drain:

- Drain every conceivable space or item that can hold water.
- Follow factory guidelines for eliminating water from engines.
- Drain bilges and ballast tanks by removing the drain plug. Bilge pumps are not capable of removing all water from the boat hull.
- Drain live-wells, bilge, ballast tanks, and transom wells.

Clean:

- Remove any visible plant or plant fragments, as well as mud or other debris. Plant material, mud, and other debris routinely contain other organisms that may be an invasive species.
- Check trailer, including axle and wheel areas, in and around the boat itself: anchor, props and jet engines, ropes, boat bumpers, paddles.
- Clean all parts and equipment that came in contact with water using one or more of the methods listed in Appendix E.

Dry:

- Allow everything to completely dry before launching into new waters; five days in warm, dry weather and up to 30 days in cool, moist weather.

- If sufficient drying time is not available, decontaminate all surfaces using one or more of the cleaning methods described in Appendix E. Carefully inspect for invasive organisms before entering a new water body.

NOAA guidelines (see Appendix E)

- https://invasivemusselcollaborative.net/wp-content/uploads/2018/11/NOAA-Decon-Watercraft.pdf

BMPs for invasive terrestrial plant species follow Department of Natural Resources (Wisconsin), construction BMPs in wetlands. General guidelines are provided below, and in detail in Appendix E

Pre-activity:

- Educate staff working on structural construction sites about common invasive species in the AOI, and the BMPs used to prevent their spread
- Wear outer layers of clothing and footwear that are not "seed-friendly". This includes low-tread footwear that does not hold soil, seeds, or plant parts, and disposable shoe covers
- Inspect and clean clothing, footwear, and gear for soils, seeds, plant parts, or invertebrates before starting construction activities

During activity:

- Prior to moving tools and equipment onto and off activity sites; crape, brush, or wash soil and debris from exterior surfaces to minimize the risk of transporting plant parts
- If construction mats are used, ensure they are free of invasives
- Run equipment air intake fans in reverse before moving from infested to non-infested areas
- Reduce soil disturbance areas where possible. In the event soil disturbance occurs, encourage prompt regeneration of desirable vegetation or cover exposed soil to reduce germination or introduction of invasive plants
- Use erosion control/stormwater management technical standards to prevent erosion
- Manage stock piles of materials to limit the spread of invasive species
- Keep and reuse on-site materials rather than importing new materials when feasible

Post-activity:

- Monitor each site following all activities; determine necessary actions based on presence of invasive species
- Keep records of any invasive species surveys done on the site and activities of control methods used

USDA guidelines (see Appendix E)

- https://dnr.wisconsin.gov/sites/default/files/topic/Invasives/bmp_WetlandInvasive.pdf

Table 14. List of Invasive Plant Species Observed and Possibly Occurring Within the Lower VermilionRiver Watershed Project Area.

Common Name	Scientific Name		USDA - NRCS	LDWF	Comments
Alligator weed	*Alternanthera philoxeroides*		X	X	Observed in Project Area 6-18-2020
Giant salvinia	*Salvinia molesta*		X	X	Observed in Project Area 6-18-2020
Salvinia	*Salvinia minima*			X	Observed in Project Area 6-18-2020
Water hyacinth	*Eichhornia crassipes*		X	X	Observed in Project Area 6-18-2020
Water lettuce	*Pistia stratiotes*		X	X	Observed in Project Area 6-18-2020
Elephantsear	*Colocasia esculenta*			X	Observed in Project Area 6-18-2020
	Possible Invasive Species in Project Area				
Brazilian waterweed	*Egeria densa*		X	X	Not observed
Eurasian watermilfoil	*Myriophyllum spicatum*		X	X	Not observed
Hydrilla	*Hydrilla verticillata*		X	X	Not observed
Parrot feather	*Myriophyllum aquatica*		X	X	Not observed

Terrestrial Invasive Species					
Chinese tallow	*Triadica sebifera*		X	X	Observed in Project Area 6-18-2020
Johnson's grass	*Sorghum halepense*		X		Observed in Project Area 6-18-2020
Japanese climbing fern	*Lygodium japonicum*		X		Not observed
Japanese honeysuckle	*Lonicera japonica*		X		Not observed

(USDA, NRCS 2020, LDWF 2005)

See Also Appendix E Field Trip Vegetative Species Percent Composition Data

3.6 Wetlands and Riparian Areas

The two subwatersheds within the project area contains numerous aquatic resources, including wetlands, lakes, pond, streams and bayou's, as well as riparian areas. The two HUC-12 watersheds contain a total of 24,773.9 acres of wetlands, the Little Bayou – Vermilion River Subwatershed and the Vermilion River – Frontal Intracoastal Waterway Subwatershed.

Both the Little Bayou - Vermilion River Subwatershed and the Vermilion River- Frontal Intracoastal Waterway subwatershed contain riparian areas along natural watercourses. These riparian areas influence the flow of water, nutrients, sediments, and animal and plant species in the landscape. They also form important transition zones at which terrestrial and aquatic ecosystems interface with the surrounding environment. There are approximately 25 acres of riparian areas within the project area. These areas are located on the west side of the Vermilion River and concentrated near the Meaux's ditch confluence.

Wetland definitions vary by government agency, but the U.S. Army Corps of Engineers (USACE) administers and enforces Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (CWA). Many waterbodies and wetlands are waters of the United States and are subject to the USACE's regulatory authority.

Section 404 of the CWA defines wetlands as "those areas inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (USEPA 2015a).

NRCS defines wetlands as land that has:

- A predominance of hydric soils;
- Is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and
- Under normal circumstances supports a prevalence of such vegetation" [16 U.S.C. § 3801 (a) (27)].

Little Bayou – Vermilion River Subwatershed (18,642.38 Acres)

Table 15 shows the wetland and other aquatic resource types in the Little Bayou - Vermilion River subwatershed, (LBVR) which includes a total of 8,775.1 acres (**Appendix C, Figure 9**). Wetland and aquatic resources make up approximately 47.1 percent of the total acreage of the Little Bayou - Vermilion River subwatershed; with wetlands (freshwater, estuarine and marine types) accounting for approximately 39.0 percent of the subwatershedand other aquatic resources (freshwater ponds, lakes, and rivers) accounting for approximately 0.01 percent of the subwatershed. (USFWS 2020e)

Table 15. Wetland and Aquatic Resource Types in the Little Bayou - Vermilion River Subwatershed.

Wetland/Aquatic Resource Type1	Private (Acres)	Local (State/County/City Recreation Lands) (Acres)	Total (Acres)*
Freshwater Emergent Wetland	585.9	58.1	**644.0**
Freshwater Forested/ Shrub Wetland	6,688.2	1,020.3	**7,708.5**
Freshwater Pond	28.8	11.4	**40.2**
Riverine	134.9	246.2	**381.1**
Estuarine and Marine Deepwater	1.3	0.0	**1.3**
Subwatershed Total	**7,439.1**	**1,336.0**	**8,775.1**

Vermilion River – Frontal Intracoastal Waterway (27,276.42 Acres)

Table 16 shows the wetland and other aquatic resource types in the Vermilion River – Frontal Intracoastal Waterway subwatershed, which includes a total of 16,998.8 acres (**Appendix C, Figure 10**). Aquatic resources make up approximately 62.3 percent of the total acreage of the subwatershed; with wetlands (freshwater, estuarine, and marine) accounting for approximately 56.5 percent of the subwatershed and other aquatic resources(freshwater ponds, lakes, and rivers) accounting for approximately 2.4 percent of the subwatershed.

Table 16. Wetland and Aquatic Resource Types in the Vermilion River – Frontal Intracoastal Waterway Subwatershed.

Wetland/Aquatic Resource Type1	Local (State/County/City Recreation Lands) (Acres)	Private (Acres)	Total (Acres)*
Freshwater Forested/ Shrub Wetland	11.4	1,557.5	**1,568.9**
Freshwater Emergent Wetland	16.6	3,047.7	**3,064.3**
Freshwater Pond	0.0	121.8	**121.8**
Lake	0.0	176.7	**176.7**
Riverine	301.6	365.6	**667.2**
Estuarine and Marine Deepwater	487.6	1,107.3	**1,594.9**
Estuarine and Marine Wetland	91.7	9,694.1	**9,785.8**
Other	0.0	19.2	**19.2**
Subwatershed Total	**908.9**	**16,089.9**	**16,998.8**

3.7 Fish and Wildlife

3.7.1 Fisheries

Intracoastal Subwatershed

The Vermilion River-Frontal Intracoastal Subwatershed (Intracoastal Subwatershed) encompasses 27,276 acres of fresh and intermediate marshes, agricultural lands, canals, Bayou Chene, small bayous, and open water areas. The Hebert Canal study area, seated entirely within the Intracoastal Subwatershed, has limited hydrologic connections to the Vermilion River to the east and tidal connections with the Gulf Intracoastal Waterway (GIWW) to the south. Existing fisheries ingress and egress (access) points (**See Appendix C – Project Map)** to the study area are:

1. Hebert Canal – provides drainage from the Little Bayou-Vermilion River subwatershed; bisects the entire study area (4.1-miles) from Hwy 333 southward to the GIWW (east of the Leland Bowman lock)
2. Seventh Ward Canal – limited hydrologic connections along west boundary of study area; drains to the GIWW (west of the Leland Bowman lock)

Meaux's Ditch does not provide an estuarine fisheries ingress/egress route because the ditch's existing spoil banks are high (±5 – 6 ft. NAVD88), and because surrounding areas are impounded agricultural pastures and rice fields. There is no estuarine habitat associated with Meaux's Ditch. There is a water control structure in Meaux's Ditch two miles upstream from its confluence with the Vermilion River that effectively blocks fisheries access northward of that structure. Although that structure can be operated to allow limited water flow to the north, it is primarily operated to drain water from the agricultural areas to the north.

The "Unnamed" canal, located 0.9-mile south of Meaux's Ditch, does not provide an estuarine fisheries ingress/egress route because it is a dead-end pump-off canal with a plug and drainage pipes located 0.3 miles west of its confluence with the Vermilion River. The canal drains cattle pastures and agricultural lands which are entirely enclosed by interior levees. There is no hydrologic connection between the area drained by this canal and estuarine habitat.

The only viable avenues for estuarine fisheries access to the project area is via the Hebert and Seventh Ward Canals. Estuarine dependent fisheries and invertebrate organisms are currently able to access the intermediate marshes in the southern project area and very limited fresh marshes to the north that are not restricted by existing water control structures and leveed impoundments. There is no water control restriction on the Seventh Ward Canal within the project area, but that canal is west of the existing Leland Bowman lock on the GIWW. That lock restricts estuarine organism movement westward in the GIWW to the Mermentau Lakes subbasin, but do nottotally block such movement because that lock is open for drainage much of the time. Estuarine organism movement in Hebert Canal is limited by the existing water control-drainage structure north of Highway 82.

Project area fisheries habitat consists of Bayou Chene, drainage canals (i.e., Hebert Canal, Seventh Ward Canal, Meaux's Ditch, and the "Unnamed" Canal), open water areas within the fresh and intermediate marshes, the Vermilion River, and the GIWW, which form the eastern and southern project boundaries. Most of the fresh marshes are leveed; controlled by gravity drainage structures and or pumps. Watershed fisheries species consist of those that can survive in shallow fresh and intermediate marshes and associated waterways, usually under warm water and lowered dissolved oxygen conditions. Likely fisheries species within the project area would consist of fisheries common to fresh to intermediate marshes in the northwestern portion of the Vermilion Bay

estuary.

Hebert Canal Study Area

The Hebert Canal study area encompasses 12,610 acres within the Intracoastal Subwatershed, comprisedprimarily of agricultural lands in the north and eastern portions of the study area, and fresh and intermediate marshto the south. On June 18, 2020, a technical team of biologists and environmental scientists conducted a field assessment of the area. Fisheries samples were taken via 10-foot diameter cast net with 3/16-inch mesh. A total of 11 fresh and estuarine fish and invertebrate species (to tolerate low salinity levels

Table 17) were collected from 8 sample sites (Figure 13). Approximately 2 to 3 casts were made per station. The stations are: 1) Hebert Canal at Semmes Bridge, 2) West Pump-Off Canal between Hebert Canal and the Seventh Ward Canal, 3) Hebert Canal at the East-West Pump-Off Canals (at the Alternative 3 proposed structure), 4) Bayou Chene east of Hebert Canal, 5) Hebert Canal at the Highway 333 Bridge, 6) Meaux's Ditch at Hwy 333, 7) Hebert Canal at Hwy 82, 8) Seventh Ward Canal at Hwy 82.

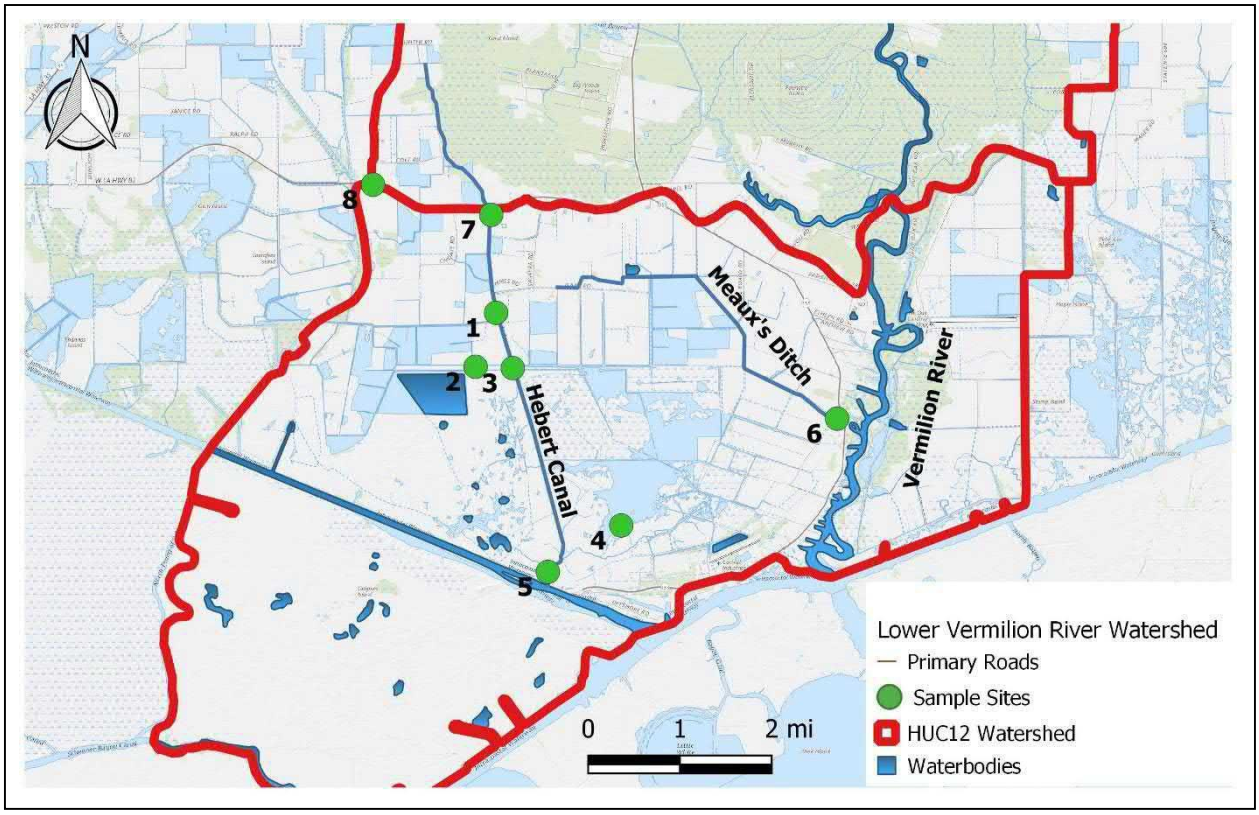


Figure 13. Map of Hebert Canal Project Area Fisheries Sampling Sites

The data show that estuarine species are able to access the project area from the GIWW via Hebert Canal, and from the Vermilion River via Meaux's Ditch. However, once the fish enter Meaux's Ditch they have difficulty accessing adjacent wetlands because those wetlands are impounded agricultural rice and crawfish ponds. The dividing line between fresh and intermediate marsh is an east-west line at the southern boundary of the School Board property near the location of sample station No. 3 (**Figure 13**) (or at the proposed Alternative 3 Hebert

Canal structure). The estuarine species collected can occupy near freshwater habitats and the freshwater species are able to tolerate low salinity levels.

Table 17. LVRWP Area Sampling June 18, 2020.

	Stations							
Common Name Scientific Name	**Site 1- Hebert Canal at Semmes Bridge**	**Site 2- West Canal between Hebert Canal & 7th Ward Canal**	**Site 3- Proposed Hebert Canal Structure**	**Site 4- Bayou Chene East of Hebert Canal**	**Site 5- Hebert Canal Hwy 333 Bridge**	**Site 6- Meaux's Ditch at Hwy 333**	**Site 7- Hebert Canal at Hwy 82**	**Site 8- 7th Ward Canal at Hwy 82**
Freshwater Drum ***Aplodinotus grunniens***	1 (caught by fisherman)							
Gizzard Shad ***Dorosoma cepedianum***	1							
Bluegill ***Lepomis macrochirus***		1	1			1	1	2
Striped Mullet** ***Mugil cephalus		2			1		1 (jumping)	1
Small Mouthed Buffalo ***Ictiobus bubalus***			1					
Gulf Menhaden** ***Brevoortia patronus			2			13		
Alligator Gar ***Lepisosteus spatula***			1		1			
Blue crab** ***Callinectes sapidus				2			1	
Atlantic Croaker** ***Micropogon undulatus					2			
Sailfin Molly ***Poecillia latipina***							1	
Largemouth Bass ***Micropterus salmoides***								1
Total (11 species; N = 38)	**2**	**3**	**5**	**2**	**4**	**14**	**4**	**4**
*** Estuarine (tidal) species** **5-foot radius cast net (78.5 ft^2). Approximately 2-3 casts/station.**								
D. Clark, T. St. Germain 6-18-2020								

Data from fisheries studies conducted at Lake Peigneur (Clark and Fuselier, 1976), White Lake (Morton, 1973), and Vermilion Bay (Perret, 1966, and Dugas, 1970), provide a list of low salinity estuarine fish and invertebrates

(Table 18 **Estuarine Fish and Invertebrates Likely to Occur in the LVRW**P) and freshwater fish and invertebrates (Table 18 **Freshwater Fish and Invertebrates Likely to Occur in the LVRWP Area Fresh Marshes**) likely to occur in the LVRWP area, in addition tothose collected during field investigations.

Table 18. Estuarine Fish and Invertebrates Likely to Occur in the LVRWP Area Tidal IntermediateMarshes.

Common Name	**Scientific Name**
*Atlantic croaker	*Micropogon undulatus*
*Blue crab	*Callinectes sapidus*
*Gulf menhaden	*Brevoortia patronus*
*Striped mullet	*Mugil cephalus*
Bay anchovy	*Anchoa mitchelli*
Hogchoker (flounder)	*Trinectes maculatus*
White shrimp	*Litopenaeus setiferus*
Spot	*Leiostomus xanthurus*
Sand sea trout	*Cynoscion arenarius*
Bay whiff (flounder)	*Citharicthys spilopterus*
Brown shrimp	*Farfantepenaeus (= Penaeus) aztecus*
Southern flounder	*Paralichthys lethostigma*
Gulf killifish	*Fundulus grandis*
Red drum	*Sciaenops occellatus*
Black drum	*Pogonias cromis*
+Blue catfish	*Ictalurus furcatus*
+*Gizzard shad	*Dorosoma cepedianum*
+Threadfin shad	*Dorosoma pentenense*
+*Freshwater drum	*Aplodinotus grunniens*
+*Alligator gar	*Lepisosteus spatula*
* Collected in the project area on June 18, 2020. + Freshwater fish that frequently enter low salinity tidal waters (Hoese and Moore 1977).	

Table 19. Freshwater Fish and Invertebrates Likely to Occur in the LVRWP Area Fresh Marshes

Common Name	Scientific Name
*Gizzard shad	*Dorosoma cepedianum*
*Small mouthed buffalo	*Ictiobus bubalus*
*Freshwater drum	*Aplodinotus grunniens*
*Alligator gar	*Lepisosteus spatula*
*Largemouth bass	*Micropterus salmoides*
*Bluegill (bream)	*Lepomis macrochirus*
*Sailfin molly	*Poecillia latipina*
Blue catfish	*Ictalurus furcatus*
Channel catfish	*Ictalurus punctatus*
Threadfin shad	*Dorosoma pentenense*
Spotted gar	*Lepisosteus oculatus*
Mosquitofish	*Gambusia affinis*
Common carp	*Cyprinus carpio*
Black crappie	*Pomoxis nigromaculatus*
White crappie	*Pomoxis annularis*
Yellow bass	*Morone mississippiensis*
Red swamp crawfish	*Procambarus clarki*
River shrimp	*Macrobrachium ohione*
Grass shrimp	*Palaemonetes pugio*
+ Striped mullet	*Mugil cephalus*
+ Gulf killifish	*Fundulus grandis*
*Collected in the project area on June 18, 2020. + Estuarine fish that frequently enter low salinity fresher waters.	

3.7.2 Essential Fish Habitat

Congress established the Essential Fish Habitat (EFH) mandate in 1996 to improve the Magnuson-Stevens Fishery Conservation and Management Act, stressing the importance of healthy habitat for commercial and recreational fisheries. EFH pertains to federally managed fish and invertebrates (NOAA 2020).

The LVRWP is located within an area identified as EFH for post-larval, juvenile, and sub-adult life stages of white shrimp, brown shrimp, and red drum. Intermediate marshes located south of the East-West Pump-Off Canals and agricultural impoundments consist of relatively unaltered marshes that are fully accessible to estuarine fisheries species via the GIWW and Vermilion River. The agricultural levees to the north and Hwy 333 to the south and east of the project area currently prevent fisheries ingress/egress. In addition, there are no wetlands for the fish to access should those levees be breached. Impacted fresh marshes are located north of the East-West Pump-Off Canals and consist of impounded or partially impounded marshes with very limited to no fisheries access.

EFH requirements vary depending upon species and life stage

Table 20 **EFH for Federally Managed Species in the LVRWP Area)**. Categories of EFH in the project area include estuarine emergent wetlands, marsh edge, estuarine water column, tidal creeks, ponds, submerged aquatic vegetation, and estuarine water bottoms. Detailedinformation on Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico, prepared by the Gulf of Mexico Fishery Management Council(GMFMC), as required by the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (NOAA 2006).

Table 20. EFH for Federally Managed Species in the LVRWP Area

Species	Life Stage	EFH
Brown Shrimp	Post-larval/juvenile	marsh edge, submerged aquatic vegetation, tidal creeks, inner marsh
	subadult	same as post larval/juvenile
White Shrimp	Post-larval/juvenile	marsh edge and ponds, submerged aquatic vegetation, inner marsh
	subadult	same as post larval/juvenile
Red Drum	Post-larval/juvenile	submerged aquatic vegetation, estuarine mud bottoms, marsh/water interface
	subadult	mud bottoms, oyster reefs

In addition to being designated as EFH for white shrimp, brown shrimp, and red drum, aquatic habitats to be affected by this project provide valuable nursery and foraging habitats for other economically important fishery species including Atlantic croaker, striped mullet, Gulf menhaden, and blue crab. The later three species were collected in the project area during limited fisheries sampling on June 18, 2020 (see Section 3.7.1). Those estuarine-dependent species serve as prey for other species managed under the MSFCMA by the GMFMC (e.g., red drum, mackerels, snappers and groupers) and highly migratory species (e.g., billfishes and sharks) managed by the NMFS.

The U. S. economy and the fishing industry benefit from stable fisheries and seafood. Commercial and recreational fishing in the U.S. produced $208 billion in sales, contributed $97 billion to the gross domestic product, and supported 1.6 million full- and part-time jobs in 2015 (NMFS 2020).

Little Bayou-Vermilion River Subwatershed

The Little Bayou Subwatershed is located north of the Intracoastal Subwatershed. None of the project features are located in this Little Bayou subwatershed. Little Bayou is a small bayou south of Palmetto Island that connects the Big Woods area with the Vermilion River. It is under water control via a structure at the intersection of Little Bayou and the Vermilion River. That bayou is out of the project area and does not provide estuarine fisheries access to the area north of the project area due to the presence of the control structure. The Little Bayou Subwatershed wetland and upland habitats consist of cypress-tupelo swamp, scrub-shrub swamp, bottomland hardwoods, small bayous, ponds, canals, coastal live oak forests, agricultural lands, and the Vermilion River. Freshwater fisheries species likely to use this fresh swamp habitat include those listed in Table 17.

3.7.3 Terrestrial Wildlife

Field investigations were conducted June 18 and September 29, 2020, to assess habitat types and quality and to document wildlife species occurrence in the LVRWP area. Intensive trapping required to adequately assess species occurrence and population density on landscape-wide and temporal scales is not practical within the scope of this EA. Therefore, a general discussion of potential species based on observations made during field investigations, professional knowledge of local fauna, and a literature search is provided. Habitat types in the LVRWP area can be generally categorized as: upland forest, scrub-shrub, upland/levee, marsh, cropland, pasture, developed, shallow open water, bayous, and manmade channels. Those habitats and their interfaces provide cover and foraging, nesting, wintering and stopover habitat for a wide variety of birds, mammals, reptiles, amphibians, and invertebrate species. Mammal species observed, known, or expected to occur in the LVRWP area include white-tailed deer (Odocoileus virginianus), red fox (Vulpes vulpes), coyote (Canis latrans), bobcat (Lynx rufus), river otter (Lontra canadensis), mink (Mustela vison), muskrat (Ondatra zibethicus), nutria (Myocastor coypus), striped skunk (Mephitis mephitis), raccoon (Procyon lotor), opossum (Didelphis virginiana), eastern cottontail (Sylvilagus floridanus), swamp rabbit (S. aquaticus), fox squirrel (Sciurus niger), nine-banded armadillo (Dasypus novemlinetus), marsh rice rats (Oryzomys palustris), fulvous harvest mice (Reithrodontomys fulvescens), least shrews (Cryptotis parva), and house mice (Mus musculus). (Trani et. al. 2007, NRCS 2001, Martin et. al. 1991). American alligator (Alligator mississippiensis) and numerous other reptiles and amphibian species also occur in the LVRW..

Project Specific Wildlife Habitat

Wildlife species diversity and population density are directly correlated with habitat quality and amount in the landscape (Fahrig 2013). Habitat quality is typically quantified based on factors such as forage quality and availability, habitat continuity and/or relative fragmentation in the landscape, and proximity to developed areas and disturbances (anthropogenic variables). Areas with high quality habitat generally exhibit greater species diversity and support more robust populations. Conversely, areas with lesser quality habitat exhibit reduced populations and species diversity.

Habitat types and quality vary widely throughout the LVRWP area with distinct differences exhibited at each location of the (proposed) structures and levees of the six alternatives. Notes on habitat quality at specific sites are based on visual observations made during field visits. Factors considered when assessing habitat quality include: plant species diversity and percent canopy cover, native vs. nonnative vegetation, amount of habitat available and continuity in the landscape, conversion to nonnative or non-vegetative cover, grazing pressure, proximity to development, roads or traffic. Field observations and aerial imagery (Google Earth 2022) were used to develop a baseline evaluation of habitat types, amount, development and fragmentation relative to surrounding areas and the region. For the purposes of this EA, areas exhibiting primarily native plant species with diverse community structure, that are isolated from developed or high-traffic/disturbance areas or areas that have been converted to non-natural cover types are considered to be of greater value to wildlife and higher quality habitat. Areas that have been altered, converted to nonnative cover, exhibit high percentage of nonnative species, are heavily grazed, exhibit fragmentation, or are in close proximity to development, roads, or traffic are considered of lesser quality and value for wildlife.

To assess potential for wildlife occurrence within the LVRWP area and provide baseline information for the determination of effects in Chapter 5, each potential area of direct impact is described below:

3. *Hebert Canal-GIWW water control structure* – site provides open water and scrub-shrub bankline habitat. The site is relatively remote, being generally located within an expansive marsh system and bounded to the south by the GIWW; however, terrestrial habitat quality has been severely degraded by construction of and proximity to Hwy 333 and placement of granite rip-rap as shoreline revetment along the GIWW and Hebert Canal bankline. There is an industrial site approximately 0.28 miles to the east and small residences/camps 0.4 miles west. Bankline vegetation includes a mix of nonnative herbaceous grasses and forbs, and upland native scrub-shrub dominated by groundsel tree, roseau cane, and coffeeweed, and provides some poor quality cover and forage for small mammals, reptiles and invertebrates. It is estimated that the site would impact less than 0.25 acre of poor-quality terrestrial habitat on either side of the GIWW-Hebert Canal confluence. Information regarding location and amount of staging area is not available. Open water has potential to provide habitat for West Indian manatee during summer.

4. *Hebert Canal-School Board Levee water control structure* – provides open water, fresh-intermediate marsh and upland scrub-shrub habitat for aquatic, semi-aquatic and terrestrial species. The location is relatively remote, being 0.8 miles south of the nearest residence and 1.75 miles south of Hwy 82; however, landscape-level conversion of marsh to agriculture in areas north of the school board levee have reduced amount and quality of habitat for terrestrial species. Habitat along canal banks/levees has become naturalized, and with expansive marsh areas south of the levee provide high quality habitat for terrestrial wildlife species. Potential exists for West Indian manatees to occur in Hebert Canal (during summer months), and the submerged aquatic vegetation in open water channels provides forage for that species.

5. *"Unnamed" Canal structure at Hwy 333* – provides open water area surrounded by regularly maintained/mown upland agricultural pastures; canal banks provide native and nonnative herbaceous vegetation that is periodically treated with herbicides. This site is adjacent to the Hwy 333 corridor and within 350 feet of rural residences and boat slips east of Hwy 333. The site and surrounding areas have been cleared and converted from native cover to herbaceous/pasture and non-vegetative surfaces. The nearest natural habitat is 0.8 mile to the southwest. The area of direct impacts would encompass less than a tenth-acre of poor-quality habitat; areas surrounding the site provides poor quality habitat for terrestrial wildlife.

6. *Meaux's Ditch structure at Hwy 333* – the entire site location has been converted from native habitat to maintained/managed areas: Meaux's ditch provides open water access to Vermilion River; ditch banks are vegetated with a mixed native-nonnative herbaceous community that is periodically maintained with herbicide treatments. There is a gravel road parallel to the ditch on either side that creates an upland levee to ±4 feet. A bulkhead runs along approximately 25 feet of the ditch bank on the south side. Pastures surround the site to the west. The area to the east of Hwy 333 and opposite the site is a forested tract that follows Meaux's Ditch to its confluence with the Vermilion River. That area provides approximately 75 contiguous acres of riparian forest and open marsh areas. Though near the road and human activity, the tract provides good quality dense cover, foraging and nesting habitat for a variety of terrestrial species and birds.

7. *0.5-mile levee at GIWW/Hwy 333* – the proposed levee site is a heavily impacted area situated between the GIWW bankline and the Hwy 333 corridor. The GIWW bankline has been reinforced with granite rip-rap; vegetation includes a mix of nonnative herbaceous grasses and forbs, and upland native scrub-shrub dominated by roseau cane, groundsel tree, and coffeeweed. Few hackberry and live oak trees occur in the area west of Hebert Canal. Habitat in the area suffers fragmentation, conversion, disturbances from Hwy

333 and proximity to development on the east end of the site. Though the site footprint has not been established, it is estimated that the levee would directly impact <0.7 acre of poor-quality cover and forage for birds, small mammals, reptiles and invertebrates on the east side of Hebert Canal, and approximately 0.25 acre of poor-quality habitat on the west side of Hebert Canal.

8. *Levee – east pump-off canal/school board property* – Approximately 2.5 miles of existing levee would be enhanced within this site. Essentially the entire area has been manipulated to employ the current levee and canal system; habitat in the area has been fragmented and converted to agricultural fields to the north, levees and canals, and pasture to the southeast; some fresh-intermediate marsh remains south of the site along approximately 1.2 miles of the canal eastward of Hebert Canal. During site investigations, the canal exhibited dense emergent and submerged, native and nonnative aquatic vegetation; canal banks are vegetated with dense herbaceous cover vegetated with roseau cane and baccharis. Levee banks and tops exhibit nonnative grass species. Though heavily manipulated, naturalized vegetation along canal banks provides moderate quality cover, forage, and nesting habitat for a variety of wildlife species, resident and migratory birds

9. *Levee – west pump-off to 7th Ward Canal* – This component of Alternative 3 involves enhancing approximately 8 miles of existing levees, including: ±1.25 miles of levee along the west pump-off canal, ±2.5 miles of levees along the 7th ward canal, and ±4.25 miles of levees that connect the west pump-off levee to the 7th ward canal levee. Essentially, the entire area has been manipulated to employ the current levee and canal system; habitat in the area has been fragmented and converted to agricultural fields north of the pump-off canal; and to provide pasture lands south of the pump-off canal. During site investigations, the west pump-off canal exhibited dense native and nonnative emergent and submerged aquatic vegetation and dense herbaceous and scrub-shrub species along its banks; numerous wading birds and songbirds were observed nesting during June 18, 2020 field investigations. Areas to the south of the canal exhibited heavily grazed fresh and intermediate marsh species. Levees along the 7th Ward Canal exhibit upland hardwood tree species. Though heavily impacted by local management practices, habitat in the area continues to provide moderate quality habitat.

3.7.4 Terrestrial Special Status Wildlife

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703–712), administered by the USFWS, prohibits the taking (including killing, capturing, selling, trading, and transport) of protected migratory bird species. The LVRW is within the Mississippi Flyway, one of four North American migration routes between nesting and wintering areas for neotropical birds. Proximity to the coast and the relatively undeveloped setting combined with the variety of habitat types in the project area produce high potential habitat for a vast array of migrant and resident bird species of nearly every guild. Raptors, wading birds, rails, gallinules, and passerine songbirds occur in the project area as year-round residents and also as seasonal or migrant habitués. Resident terns and gulls occur near open water areas. Migrant waterfowl utilize area marshes during winter months. Occasional pelagic species might occur when offshore storms push birds inland. According to eBird.org, an online database administered by the Cornell Lab of Ornithology, 339 bird species have been observed in Vermilion Parish. The USGS (2020) bird surveys indicate that as many as 107 bird species breed in the LVRW.

The Fish and Wildlife Conservation Act (1988) mandates the USFWS to identify species, subspecies, and

populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973. Those species, known as birds of conservation concern (BCC), are species that represent the highest conservation priority beyond those listed as threatened or endangered under the ESA. The USFWS IPaC database (November 26, 2024) indicates that twenty-five BCC have potential to occur in the LVRW (**Appendix 3.7.3**); there are documented sightings for nineteen of those species in the LVRW between 2010 and 2022 (Cornell 2022). Most are migrant species that occur during spring and fall migration, but do not breed in the project area. Of those listed, bald eagle, chimney swift, dickcissel, king rail, little blue heron, painted bunting, and prothonotary warbler, have potential to occur in the LVRWP area.

The LDWF–Rare Species and Natural Communities database identifies seventeen species with state and global ranks that occur in Vermilion Parish. Of those, (**Table 21 LDWF Rare Species and Natural Communities in Vermilion Parish**), bald eagle and sandhill cranes have potential to occur in the LVRWP area, but are unlikely to occur within the areas of proposed activity.

Forty bird species were observed in the LVRWP area (**Table 22 Migratory bird species observed in the LVRWP area)** during field investigations. Numerous green herons and passerines were observed nesting along the west pump-off canal during the June 18, 2020 field visit.

Nesting season for most bird species along the Louisiana Gulf Coast is considered to be February 15 – September 1. However, weather patterns from year to year can cause earlier or later nesting dates. Rookery locations can change from year to year; annual surveys are necessary to provide accurate data regarding rookery activity/occurrence.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668(a); 50 CFR 22) prohibits taking and establishes penalties for the unpermitted taking of bald and golden eagles. Bald eagles are a migratory species that occur and breed in Louisiana from September through May. There is also a resident, year-round population. Bald eagles require very large trees for nesting, generally within proximity to open water areas. They are opportunistic foragers and prey on fish, turtles, waterfowl, nutria and other live prey, as well as carrion. The LVRWP area provides abundant high-quality foraging habitat for bald eagles. Cornell (2019) indicates bald eagle sightings in the LVRWP area. No eagles or suitable nest trees were observed in areas that would be directly impacted by the proposed alternatives.

Table 21. LDWF Rare Species and Natural Communities in Vermilion Parish

Common Name Scientific Name	Global Rank	State Rank	Habitat Notes	Observed in LVRWP	Suitable habitat in LVRWP
Birds*					
Bald Eagle *Haliaeetus leucocephalus*	G5	S3	Nests in large trees, open water, marsh, shoreline	No	Forage
Roseate Spoonbill *Platalea ajaja* (=*Ajaia ajaja*)	G5	S3	Forages in shallow ponds or sloughs in saline to freshwater marshes; nests over standing water in shrubs and small trees with other colonial birds.	Yes	Forage
Waterbird Nesting Colony	—	—	Depends on species, trees, small trees or shrubs over open water	Yes	Yes
Reptiles†					
Western Chicken Turtle *Deirochelys reticularia miaria*	G5T5	S2	(Notes as for *D. reticularia*. No info re: subspecies *miaria*); shallow ponds and lakes with thick vegetation, cypress swamps, ditches, temporary pools; usually not in flowing water. Wanders overland, especially in spring.	No	Yes
Fish†					
Saltmarsh Topminnow *Fundulus jenkinsi*	G3	S3	Freshwater; estuarine habitats: tidal flat/shore, herbaceous wetland, lagoon.	No	Yes

S2: imperiled due to rarity (6 to 20 known extant populations) or because of some factor(s) making it vulnerable to extirpation
S3: rare and local throughout the state or found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations)
G3: either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction throughout its range (21 to 100 known extant populations)
G5: demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery (1000+ known extant populations)
T5: subspecies rank 5

*****LDWF (2020)
†NatureServe (2019)

Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act

The LVRWP area is within the Mississippi Flyway, one of four North American migration routes between nestingand wintering areas for neotropical birds. Proximity to the coast and the relatively undeveloped setting combinedwith the variety of habitat types in the project area produce high potential habitat for a vast array of migrant andresident bird species of nearly every guild. Raptors, wading birds, rails, gallinules, and passerine songbirds occurin the project area as year-round residents and also as seasonal or migrant habitués. Resident terns and gulls occurnear open water areas. Migrant waterfowl utilize area marshes during winter months. Occasional pelagic speciesmight occur when offshore storms push birds inland. USGS (2020) breeding bird surveys within the LVRWP indicate as many as 107 bird species occur in the LVRW.

The Migratory Bird Treaty Act of 1918 (MBTA) (16 U.S.C. 703–712), administered by the USFWS, prohibits the taking (including killing, capturing, selling, trading, and transport) of protected migratory bird species. The USFWS IPaC database (November 26, 2024) indicates that 19 migratory bird species, have potential to occur inthe LVRW (**Appendix E)**; and there are documented sightings for each in the LVRWP area between 2010 and 2020 (Cornell 2019). Most are migrants that occur during spring and fall migration, but do not breed in Louisiana. Of those listed, bald eagle and king rail, have potential to occur in the LVRWP area, but are unlikelyto occur in areas of direct impact.

The LDWF–*Rare Species and Natural Communities* database lists six bird species with state and global ranks inVermilion Parish. Two of those species (Table 19**)**, bald eagle and king rail, have potential to occur in the LVRWP area, but are unlikely to occur within the areas of proposed activity.

The Bald and Golden Eagle Protection Act (16 U.S.C. 668(a); 50 CFR 22) prohibits taking and establishes penalties for the unpermitted taking of bald and golden eagles. Bald eagles are a migratory species that occur andbreed in Louisiana from September through May. There is also a resident, year-round population. Bald eagles require very large trees for nesting, generally within proximity to open water areas. They are opportunistic foragers and prey on fish, turtles, waterfowl, nutria and other live prey, as well as carrion. The LVRWP area provides abundant high-quality foraging habitat for bald eagles. No eagles or suitable nest trees were observed during the June 18 or September 29, 2020 field investigations. Cornell (2019) indicates bald eagle sightings in the LVRWP area.

Numerous green herons were observed (June 18, 2020) nesting along the west pump-off canal. No other wading birds were observed nesting in the project area, however potential for other species to occur is highgiven availability of suitable habitat. Nesting season is considered to be February 15 – September 1, however weather patterns from year to year can cause earlier or later nesting dates. Rookery locations can change from year to year; annual surveys are necessary to provide accurate data regarding rookery activity/occurrence.

Table 22. Migratory bird species observed in the LVRWP area.

Species	JUN 18	SEP 29	Marsh	Ag. Fields Flooded	Levees	Upland Forest	Open Water
Black-bellied Whistling-duck (*Dendrocygna autumnalis*)	X	X	X	X	X		
Fulvous Whistling Duck (*D. bicolor*)		X		X	X		
Blue-winged Teal (*Spatula discors*)		X	X	X			
American Coot (*Fulica americana*)	X		X				
Common Moorhen (*Gallinula galeata*)			X	X			
Purple Gallinule (*Porphyrio martinica*)	X		X				
Black-necked stilt (*Himantopus mexicanus*)		X		X			
Double-crested Cormorant (*Phalacrocorax auritis*)	X		X				X
Anhinga (*Anhinga anhinga*)	X		X				X
White Ibis (*Eudocimus albus*)	X	X	X	X	X		
White-faced Ibis (*Plegadis chihi*)	X	X	X	X	X		
Roseate Spoonbill (*Platalae ajaja = Ajaia ajaja*)	X	X	X	X			
Great Blue Heron (*Ardea herodias*)	X	X	X	X			
Great Egret (*A. alba*)	X	X	X	X			
Snowy Egret (*Egretta thula*)	X	X	X	X			
Little Blue Heron (*E. caerulea*)	X	X	X	X			
Cattle Egret (*Bubulcus ibis*)	X	X		X	X		
Green Heron (*Butorides virescens*)	X	X	X	X	X		
Yellow-crowned Night-heron (*Nyctanassa violacea*)		X		X	X		
Osprey (*Pandion haliaetus*)	X	X					X
Cooper's Hawk (*Accipiter cooperii*)		X		X		X	
Red-tailed Hawk (*Buteo jamiacensis*)		X				X	
Black Vulture (*Coragyps atratus*)	X					X	
Mourning Dove (*Zenaida macroura*)	X					X	

Species	JUN 18	SEP 29	Marsh	Ag. Fields Flooded	Levees	Upland Forest	Open Water
Yellow-billed Cuckoo (*Coccyzus americanus*)	X					X	
Belted Kingfisher (*Megaceryle alcyon*)	X	X					X
American Crow (*Corvus brachyrhynchos*)	X	X		X			
Fish Crow (*C. ossifragus*)	X	X				X	
Red-winged Blackbird (*Agelaius phoeniceus*)	X	X	X	X	X		
Boat-tailed Grackle (*Quiscalus major*)	X	X	X				
Common Grackle (*Q. quiscula*)		X		X	X	X	
Brown-headed Cowbird (*Molothrus ater*)	X			X	X		
Downy Woodpecker (*Dryobates pubescens*)		X				X	
Barn Swallow (*Hirundo rustica*)		X				X	
Loggerhead Shrike (*Lanius ludovicianus*)		X		X		X	
Blue Jay (*Cyanocitta cristata*)		X				X	
N. Mockingbird (Mimus polyglottos)		X				X	
Gray Catbird (Dumetella carolinensis)		X				X	
Blue-gray Gnatcatcher (Polioptila							
caerulea)		X				X	
Black-and-white Warbler (Mniotilta varia)		X				X	
King Rail (Rallus elegans)							
Total species observed (n=40)	24	31	17	21	10	15	4

3.3.2 Threatened and Endangered Species and Critical Habitat

The ESA and the Marine Mammal Protection Act of 1972 (MMPA) (16 U.S. Code CHAPTER 31) mandate that all federal agencies ensure their actions not jeopardize the continued existence of listed species, or adversely modify critical habitat of listed species. The ESA, administered by the USFWS, protects terrestrial species and aquatic species within inland waters or where NOAA NMFS jurisdiction does not apply. The MMPA (16 U.S.C. §§ 1361 et seq.), administered by NMFS, established policy to prevent marine mammal species and populations from declining beyond a point where they cease to be significant functioning elements of the ecosystems of which they are a part. The MMPA prohibits the "taking" of any marine mammal species in U.S. waters. This section provides information in compliance with: CFR 7 650.22 Rare, threatened, and endangered species of plants and animals., NECH 610.26 Endangered and Threatened Species, Subpart G – Appendices (usda.gov), NWPM 501.39 - Consultation, Coordination, and

Public Participation, and CFR 40 1501.8 Cooperating Agencies, 40 CFR § 1501.8 Cooperating agencies - Code of Federal Regulations (ecfr.io),

To provide the most comprehensive list of threatened, endangered, candidate and other special status species that are known to or have potential to occur in the LVRW, information searches were conducted via the agency portals listed below. In order for this Plan-EA to remain in compliance with ESA and the MMPA, information regarding protected species must be updated at 90-day intervals up to and until the proposed activities have been initiated on the ground.

- USFWS IPaC online database
  https://ecos.fws.gov/ipac/

- USFWS Lafayette Ecological Services Field Office
  https://www.fws.gov/southeast/pdf/fact-sheet/louisiana-ecological-services-field-office-t-and-e-species.pdf

- NOAA NMFS online consultations
  https://www.fisheries.noaa.gov/southeast/consultations/louisiana

- LDWF Wildlife Diversity Program *Rare Species and Natural Communities*
  https://www.wlf.louisiana.gov/page/rare-species-and-natural-communities-by-parish

USFWS ESA-listed Species

Eighteen federal-listed species have been identified via the above portals. In addition, the LDWF *Rare Species and Natural Communities* (2022) database also identifies fourteen species with global and state ranks known to occur in Vermilion Parish. (Global ranks, assigned by NatureServe; and state ranks, designated by LDWF, are indicative of a species' population stability on global and local levels. The LDWF Wildlife Diversity Program tracks species populations to support management efforts and to inform state and federal listing decisions. A total of thirty-two species have been considered within the scope of this EA. Of those, seven have potential to be affected by the project, and are discussed in detail to support determinations of effects provided in Chapter 5. A comprehensive list of all species considered in this EA is provided in **Appendix E.**

Monarch Butterfly (*Danaus plexippus plexippus*) (Candidate)
D. p. plexippus is specific to North America and unique in its multi-generational migration between southern overwintering sites and its northern breeding range. As many as five successive generations are necessary to complete the annual cycle of migration which begins in early spring and progresses northward through summer, synchronized with the growing season of milkweed (*Asclepias* spp.). Adult monarchs may occur anywhere there is open habitat (fields, prairies, grasslands, pasture, croplands) with flowering plants that provide nectar. However, monarchs are absolutely dependent upon milkweed for egg deposition and caterpillar

development. Upon hatching, caterpillars ingest the foliage, assimilating toxic compounds which provide a biochemical defense to predation in adults.

Potential exists for monarchs to occur in the project area. The USGS Guide to Plants of Louisiana (https://warcapps.usgs.gov/PlantID/ 2022) identifies six species of milkweed (*A. lanceolata, A. A. longifolia, A. tuberosa, A. verticilliata, and A. viridis*) in Vermilion Parish. Though no *Asclepias* were observed during field investigations, suitable habitat for *Asclepias* is present within the LVRWP area. Though not considered part of the primary breeding range for monarchs, potential exists for monarchs to occur in the LVRWP area where *Asclepias* occurs, and in areas that provide suitable habitat for nectaring adults during migration.

Eastern Black Rail (EBR) (*Laterallus jamiacensis subsp. jamaicensis*) (Threatened)
They can occur in a range of marsh types—tidal, non-tidal, salt, brackish, fresh—but occupy a very specific niche, with habitat structure, more than plant species composition, considered to be the most important element in predicting suitability. EBR occur within higher areas in the marsh, with dense herbaceous vegetation that allows movement underneath the canopy. Incidence of occurrence generally decreases with percent woody vegetation in the canopy. Soils are moist to saturated (occasionally dry) and interspersed with or adjacent to very shallow water. Ideally, the water level is 1 to 6 cm, although less than 3 cm (1.18 in) is ideal for foraging and chick rearing. Because the chicks are unable to fly, adult EBR fly very little during the breeding and wintering seasons, and therefore require elevated refugia to survive high-water events. (85 Fed. Reg. 2020)

Ongoing studies in Louisiana currently indicate this species to be associated with higher areas that exhibit stabilityover time. Studies indicate positive correlation between habitat structure and probability for occurrence in areas where Gulf Cordgrass (*Spartina spartinae*) is the dominant cover species (ideally >25% cover), and/or areas of *Spartina patens* mixed with *Baccharis, Distichilis,* and/or *Borrichia* (Johnson and Lehman 2021; PERS.Com. Director of Bird Conservation, Audubon Louisiana, E. Johnson 1/26/22). The EBR has been documented at Paul J. Rainey Wildlife Refuge located within fifteen miles south of the LVRWP area (PERS. Com. Johnson 1/26/22). As of April 2020, discussions with USFWS biologists indicate no nesting records in Vermilion Parish (PERS. Com. B. Vermillion). Habitat in the project area does not exhibit vegetative community structure as that described above, which indicates that the project area is unlikely to support eastern black rail. There is no designated critical habitat for this species in Louisiana. No eastern black rails were observed during the field investigations; however, this species is extremely difficult to locate without intensive surveying efforts.

West Indian Manatee (*Trichechus manatus*) (Threatened)
West Indian manatees are protected under both the ESA and the MMPA. The West Indian manatee is a large herbivorous aquatic mammal that occurs in warm (>68°F) coastal waters, primarily fresh and brackish riverine systems, but also marine habitats where forage is adequate and/or when moving between areas (USFWS 2014). Manatees frequent shallow water (4ft. – 7ft.) where they forage on a wide variety of submerged, floating, and emergent vegetation. The

primary population of this species is concentrated in Florida, but (during warmer months) ranges along the entire Gulf coast to southern Texas. There is no designated critical habitat for this species in Louisiana.

None were observed during the field investigations, but the potential exists for manatees to occur in the project area. There is suitable foraging habitat and three records of manatees in the LVRWP area: 1) two records in the GIWW near Leland Bowman lock (2014, 2021); and, 2) in the Vermilion River near Palmetto Island State Park (2010). There is also one record in Little White Lake (1995) less than 3 miles southeast of the LVRWP area (Dauphin Island Sea Lab 2022). There is potential for them to occur in area of historic records such as the GIWW or the Vermilion River. There is also potential for manatees to occur in the deeper channels such as Hebert Canal and areas where submerged aquatic vegetation (Hebert Canal, East and West Pump-off canals) provides suitable foraging habitat. Occurrence is most likely during warmer months, but also possible at other times of the year.

Whooping Crane (*Grus americana*) (Endangered, Experimental Non-essential)
This species is listed as "endangered wherever found" except for reintroduced populations, such as those in Louisiana, which are classified as "Experimental Non-essential". This designation affords protection under the ESA, but allows flexibility when managing the species on private lands. There is no critical habitat designated for experimental populations.

The historical range of whooping cranes included southern Louisiana until 1950 when the last birds were translocated to a natural flock in Texas. In 2011, the USFWS and LDWF began a reintroduction program at the White Lake Wetlands Conservation Area (WLWCA) in Vermilion Parish, approximately 15 miles west of the LVRWP area. The goal of that program is to re-establish a self-sustaining population of whooping cranes in southern Louisiana, and to downgrade the species' status from endangered to threatened. A self-sustaining population requires approximately 120 individuals and 30 productive pairs, maintained for 10 years without additional restocking. The LDWF 2020-2021 Louisiana Whooping Crane Report states that there are 66 birds located in 10 parishes in Louisiana; and 13 nesting events in Vermilion Parish during the 2020-2021 nest season. The nests were located in marsh habitat on the WLWCA and on private property, and on private agricultural properties (nearly all of which were actively crawfished). Nesting season dates ranged from early February to June. There are no records of this species within the LVRWP area (PERS. COM. S. Zimorsky 2022).

The LVRWP area contains marsh habitats and rice and crawfish ponds that provide potential suitable foraging and nesting habitat for whooping cranes. As the Louisiana experimental population increases, there is potential for the nesting population to expand eastward from the WLWCA. As this is a highly monitored and documented species, it is anticipated that any whooping crane occurrence in the LVRW would be noted. Regular coordination with the LDWF is necessary to carefully track whooping crane activity in and around the LVRW.

Sea Turtles
Since 1977, NMFS and the USFWS have shared jurisdiction of sea turtles listed under the ESA.

NOAA leads the recovery and conservation efforts for turtles in the marine environment, and the USFWS leads efforts on nesting beaches.

Green Sea Turtle (*Chelonia mydas*) (Threatened)
Green sea turtles occur in tropical and subtropical areas and utilize beach, inshore, nearshore, and marine deep-water habitats. Green sea turtle habitat requirements occur in phases: 1) beaches for nest/egg stage, 2) open ocean pelagic as a hatchling/juvenile for several years, and 3) nearshore foraging grounds in shallow coastal habitats, where they mature to adulthood and spend the remainder of their lives. Adults migrate every 2 to 5 years from their coastal foraging areas to the waters off the nesting beaches where they originally hatched to reproduce. Primarily herbivorous, their diet consists mainly of algae and seagrasses, though they may also forage on sponges, invertebrates, and discarded fish. (NOAA 2022).

This species is found inshore and nearshore from Texas to Massachusetts (NOAA 2020). LDWF database indicates potential occurrence in all coastal parishes. There are no nesting records for Louisiana (LDWF 2004). There is potential for occurrence in the deeper channels in the LVRW such as the GIWW, the Vermillion River, and Hebert Canal.

Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) (Endangered)
A few records exist elsewhere, but adult Kemp's ridleys primarily occupy nearshore coastal (neritic) habitats in the Gulf of Mexico that include muddy or sandy bottoms where their preferred prey (crab) is found. (NOAA 2022) Hatchlings spend 1 to 2 years in the open ocean associated with Sargassum algae, after which they migrate to shallow coastal areas. Habitats used by this species include warm bays, tidal rivers, estuaries, seagrass beds, and beaches (nesting). Kemp's Ridley are not known to nest in Louisiana, but there are numerous accounts along coastal Louisiana (TAMU 2011). Estuarine and offshore waters may afford key feeding and developmental sites. Deep-water channels and estuaries may provide hibernation sites (LDWF 2009). There is potential for occurrence in the deeper channels in the LVRW such as the GIWW, the Vermillion River, and Hebert Canal.

Loggerhead Sea Turtle (*Caretta caretta*) (Threatened)
Loggerhead turtles are found worldwide, primarily in subtropical and temperate regions, in marine waters, marshes, bays, tidal passes, especially in areas with seagrass beds; and coastal dunes (nesting). Juvenile loggerheads spend 7 to 15 years in the open ocean then migrate to neritic habitats for several more years, until mature (NOAA 2022). In coastal waters, juveniles and adults eat mostly mollusks and crabs. There are nesting records from Grand Isle (LDWF 2016) and the Chandeleur Islands (LDWF 2009). There is one documented sighting in Vermilion Bay in September of 2018. There is potential for occurrence in the deeper channels in the LVRW such as the GIWW, the Vermillion River, and Hebert Canal.

LDWF listed Species

Four State-listed species that occur in Vermilion Parish have been identified to reside within the project area:

- Eastern Black Rail – (discussed above)
- West Indian Manatee – (discussed above)
- Piping Plover (*Charadrius melodus*) (Endangered) occurs along coastal beaches and mud flats. No suitable habitat for this species occurs in the project area.
- Smalltooth Sawfish (*Pristis pectinata*) (Endangered) occur in coastal waters with varying habitat requirements. The NMFS online database does not indicate smalltooth sawfish to occur in Louisiana (NMFS 2020). The NOAA NMFS has review oversight regarding fish and aquatic mammals (when occurring primarily in open ocean habitat).

3.7.5 Invasive Wildlife Species

This section is prepared in compliance with EO 13112 Invasive Species (1999) and EO 13751 (2016). Information regarding invasive species was gathered from the LDWF WAP (2019) and the USGS Nonindigenous Aquatic Species (NAS) (2022) interactive mapping program. The LDWF WAP (revised in 2019) provides a list of all invasive species known to occur in the state, and that have potential to become established in Louisiana by 2029. The WAP categorizes invasive species into four tiers according to the level of threat to SGCN and their habitats. Tier I and II species have potential to cause severe to moderate threats to SGCN and their habitats. Tiers III and IV present no significant threat or are not currently in the state. Due to the potential for negative impacts, only Tier I and Tier II species that are known to occur in the project area or that have potential to be introduced into the area via activities associated with the proposed action are considered in this EA (**Table 23**).

Table 23. List of LDWF WAP (2019) Tier I and Tier II Invasive Species with Potential to Occur in the Project Area.

Common Name (*Scientific Name*)	Proximity to LVRWP	Potential for impacts associated with Action
TIER I		
Applesnail (*Pomacea canaliculata & P. maculata*)	LVRWP	Potential to be spread via construction vessels
Argentine Ant (*Linepithema humile*)	Vermilion Parish	Construction and implementation do not provide suitable means or high probability of transport.
Red Imported Fire Ant (*Solenopsis invicta*)	Likely	Possible spread through earth-moving equipment.
Rio Grande Cichlid (*Herichthys cyanoguttatus*)	HUC 8	Not likely to be introduced or spread
Grass Carp (*Ctenopharyngodon idella*	No records	Not likely to be introduced or spread
Common Carp (*Cyprinus carpio*)	15 miles	Not likely to be introduced or spread
Silver Carp (*Hypophthalmichthys molitrix*)	LVRWP 7th Ward Canal	Not likely to increase or spread
Bighead Carp (*H. nobilis*)	No records	Not likely to be introduced or spread
Black Carp (*Mylopharyngodon piceus*)	No records	Not likely to be introduced or spread

Common Name (*Scientific Name*)	Proximity to LVRWP	Potential for impacts associated with Action
Lionfish (*Pterois volitans* & *P. miles*)	No records	Unlikely to be introduced
European Starling (*Sturnus vulgaris*)	LVRWP	established in area; no change in status
House Sparrow (*Passer domesticus*)	LVRWP	established in area; no change in status
Norway Rat (*Rattus norvegicus*)	LVRWP	Established in developed areas; unlikely increase associated with action
Black Rat (*Rattus rattus*)	LVRWP	Established in developed areas; unlikely increase associated with action
Nutria (*Myocastor coypus*)	10 miles	Range expansion and establishment unrelated to activities associated with project
Feral/Domestic Cat (*Felis catus*)	LVRWP	Likely established in developed areas; Unlikely change in occurrence relative to action
Feral Hog (*Sus scrofa*)	Vermilion Parish	Range expansion and establishment unrelated to activities associated with project
TIER II		
Asian Clam (Corbicula fluminea)	HUC 8	Potentially spread in bilge waters
Zebra Mussel (Dreissena polymorpha)	No records	Potentially spread in bilge waters
Brown Widow (Latrodectus geometricus)	Likely in developed areas	Not likely to be spread associated with action
Water Flea (Daphnia lumholtzi)	No records	Potentially spread via bilge and ballast, and aquatic plants associated with trailers; fresh water with moderate pulses in salinity
Asian Tiger Shrimp (Penaeus monodon)	10 miles	Unlikely transport/spread via action
Formosan Termite (Coptotermes formosanus)	Likely in developed areas	Unlikely transport/spread via action
Asian Tiger Mosquito (Aedes albopictus)	No records	Unlikely transport/spread via action
Tawny Crazy Ant (Nylanderia fulva)	Unknown	Potential to be introduced or spread via equipment
European Honeybee (Apis mellifera)	Likely	Unlikely transport/spread via action
Cactus Moth (Cactoblastis cactorum)	Out of range	Unsuitable habitat in LVRWP
Puerto Rican Coqui		
(Eleutherodactylus coqui)	No records	Not likely to be transported via action
Rio Grande Chirping Frog (Eleutherodactylus cystignathoides)	Lafayette Parish	Not likely to be transported via action
Greenhouse Frog (Eleutherodactylus planirostris)	Lafayette Parish	Not likely to be transported via action
Florida Softshell (Apalone ferox)	No records	Unlikely effects associated with action
Brown Anole (Anolis sagrei)	Lafayette Parish	Not likely to be transported via action
Rock Pigeon (Columba livia)	Likely	Unlikely to be associated with action
Eurasian Collared-Dove (Streptopelia decaocto)	Likely	Unlikely to be associated with action
House Mouse (Mus musculus)	Likely	Unlikely to be associated with action

USGS NAS Queries

The USGS NAS database was queried to develop a list of invasive species that have been recorded in the LVRWP area and surrounding areas, that have potential to become established in the project area, and species that may be introduced or spread as a result of activities associated with the proposed action. Queries were conducted for the specific LVRWP project area, and also for five-, ten- and fifteen-mile radii from the approximate center (29°48'40.37"N, 92°11'22.39" W) of the project area. A query of the Vermilion River watershed (HUC-8 08080103) was also conducted to identify species that have potential to move into the project area via hydrologic connectivity. The NAS database indicates one species, silver carp, in the LVRWP project area, two subspecies of applesnail within five miles, Asian tiger shrimp and nutria within ten miles, and common carp within 15 miles (documented in the HUC 8 08080202 Mermentau watershed). The NAS indicates a total of ten species recorded from the HUC 8 Vermilion River watershed— applesnail, Asian clam, Asian tiger shrimp, silver carp, Mexican tetra, Rio Grande cichlid, Rio Grande chirping frog, greenhouse frog, Cuban tree frog, and nutria. Of the invasive species that occur in the HUC 8 Vermilion River watershed, six are LDWF WAP Tier I, four are Tier II, and two are not ranked (**Table 24**).

Table 24. USGS NAS Database Query Results (USGS 2022)

Area Queried	Species	Most Recent Year on Record	Parish	LDWF WAP Tier
LVRWP Project Area	Silver Carp (*Hypophthalmichthys molitrix*)	2014	Vermilion	I
5-Mile Radius	Applesnail (*Pomacea cf. canaliculata/maculata*)	2017	Vermilion	I
	Giant Applesnail (*Pomacea maculata*)	2017	Vermilion	I
10-Mile Radius	Asian Tiger Shrimp (*Penaeus monodon*)	2009	Vermilion	II
	Nutria (*Myocastor coypus*)	1977	Vermilion	I
15-Mile Radius	Common Carp (*Cyprinus carpio*)	1957	Vermilion	I
HUC 8 08080103	Applesnail (*Pomacea cf. canaliculata/maculata*)	2020	Vermilion	I
	Giant Applesnail (*Pomacea maculata*)	2020	Vermilion	I
	Asian Clam (*Corbicula fluminea*)	1989	Lafayette	II
	Asian Tiger Shrimp	2009	Vermilion	II
	Mexican Tetra (*Astyanax mexicanus*)	1977	Iberia	Not ranked
	Rio Grande Cichlid (*Herichthys cyanoguttatus*)	1977	Iberia	I

Area Queried	Species	Most Recent Year on Record	Parish	LDWF WAP Tier
	Silver Carp	2014	Vermilion	I
	Rio Grande Chirping Frog (*Eleutherodactylus cystignathoides*)	2008	Lafayette	II
	Greenhouse Frog (*E. planirostris*)	2000	Lafayette	II
	Cuban Tree Frog (*Osteopilus septentrionalis*)	2020	Lafayette	Not ranked
	Nutria	1977	Vermilion	I

The USGS NAS data was cross-referenced with the LDWF Tier I and II species (**Table 22**) to develop a comprehensive list of species that have potential to occur in the LVRWP area. A total of 37 species were identified. Of those, six species have potential to be introduced into the project area or be spread elsewhere as a result of the action (**Table 24**). The other species are not considered as potential threats relative to the proposed action because either the species are already established within the LVRWP and surrounding areas and would not be introduced, increase, or spread as a result of the proposed action, or the species are not known to occur in the project area and would not be introduced due to project implementation.

Asian clam, zebra mussel, applesnail, and water flea, are invertebrate aquatic species that can be spread via bilge or ballast waters and as hitchhikers that attach to vessels, boat trailers, and aquatic vegetation that may get carried along on equipment. Asian clam is known from the Vermilion River watershed. Though there are no records for zebra mussel in the HUC 8 watershed, its widespread distribution and ease with which the species is spread indicates potential for the species to impact the LVRWP. Records of applesnail, an extremely invasive species, have been documented within the LVRWP in 2021 (Database search conducted April 15, 2022 at https://www.inaturalist.org). Water flea is an aquatic species that may be readily spread via bilge and inadvertently transported with vegetation caught on boat trailers. Two terrestrial species, tawny crazy ant and red imported fire ant have potential to be introduced or spread via equipment that may carry soils from other locations. Due to its widespread distribution throughout Louisiana, it is likely that red imported fire ants already occur in residential and industrial areas within the LVRWP. Potential exists for this species to be spread within the LVRWP via equipment use. Tawny crazy ants have been recorded in the Vermilion River watershed in Lafayette Parish and has potential to be spread via equipment.

Table 25. Invasive Wildlife with Potential to Yield Negative Effects in Association with the Proposed Action.

Common Name (*Scientific Name*)	LDWF WAP Tier	Proximity to LVRWP	Potential Impacts
Asian Clam (*Corbicula fluminea*)	II	HUC 8	Spread in bilge waters, vegetation on trailers, etc.
Zebra Mussel (*Dreissena polymorpha*)	II	No records	Potential spread in bilge waters, vegetation on trailers, etc.

Common Name (*Scientific Name*)	LDWF WAP Tier	Proximity to LVRWP	Potential Impacts
Applesnail (*Pomacea canaliculata & P. maculata*)	I	LVRWP	Spread in bilge waters, vegetation on trailers, etc.
Water Flea (*Daphnia lumholtzi*)	II	No records	Spread in bilge waters, vegetation on trailers, etc.
Tawny Crazy Ant (*Nylanderia fulva*)	II	Unknown	Possible spread through earth-moving equipment
Red Imported Fire Ant (*Solenopsis invicta*)	I	Likely	Possible spread through earth-moving equipment.

3.8 Human Use

3.8.1 Cultural and Historic Resources

Cultural and historic resources are part of the environment potentially affected by proposed undertakings. Theseresources are referred to as historic properties in the National Historic Preservation Act (NHPA) of 1966 (P.L. 89-665; 80 Stat. 915; 16 U.S.C. 470, as amended) and include prehistoric and historic archaeological sites, standing structures, such as historic buildings and bridges, cemeteries, earthworks, historic districts, and landscapes. Federal regulations pertaining to Section 106 of the NHPA stipulate that federal agencies take into consideration the potential effects of funded, licensed, permitted, or assisted undertakings on historic properties listed, or eligible for listing on the National Register of Historic Places (NRHP). The Section 106 review processis initiated whenever a federal or federally assisted project has the potential to affect historic properties.

The Advisory Council on Historic Preservation (ACHP) issues regulations on federal guidance for the Protectionof Historic Properties (36 CFR Part 800) under Section 106 of the NHPA. The Section 106 review process involves consultations with interested parties, including but not limited to the State Historic Preservation Officer(SHPO), Tribal Historic Preservation Officers (THPO), representatives of local governments, and the public. The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), takes cultural resources into consideration, along with soil, water, air, plants, and animals, in undertaking or assisting conservation practices and planning, in compliance with the NHPA and the National Environmental Policy Act of 1969 (NEPA) (P.L. 91-190; 83 Stat. 852; 42 U.S.C. 4321). The U.S Army Corps of Engineers (USACE), NewOrleans District, likewise acts as a steward of natural and cultural resources when issuing permits for environmental restoration and planning, in compliance with NEPA and other federal and state laws and regulations.

The Division of Historic Preservation and Division of Archaeology in the Louisiana Office

of Cultural Development (OCD) are responsible for implementing guidelines for historic preservation and cultural resources management (CRM), as well as maintaining a list of historic properties listed, or eligible for listing in the NRHP. The OCD maintains an interactive, state-wide GIS Cultural Resource Map of recorded historic properties, archaeological sites, NRHP listings, a historic standing structures survey, and previous CRM investigations. A cultural resource assessment was conducted for the alternatives proposed for the LVRWP, involving the restoration and installation of water control structures, elevation of the northern bank of the Gulf Intracoastal Waterway, and rehabilitation of the perimeter levee system. The assessment was conducted to determine if the proposed alternatives have the potential to affect historic properties listed, or eligible for listing, in the NRHP. The assessment encompassed the project area, focusing on the area of potential effect (APE) and adjacent areas associated with the proposed alternatives. The APE are defined as locations where the proposed undertakings have the potential to affect historic properties, including archaeological sites, standing structures, and other cultural resources.

NRCS determined APE for cultural resources was limited to direct APE, or areas of ground disturbance from proposed undertakings. The Cultural Resources Assessment of the APE was conducted by Dr. Mark Rees, University of Louisiana at Lafayette. SHPO has determined that no cultural resources and/or historic properties will be adversely affected by the planned project activities. The APE has not been recently surveyed. Survey was not recommended due to extensive disturbance noted by previous investigators. Extensive ground disturbances from intensive agricultural practices (tilling, land leveling, etc.), industrial sites with extensive grading and infrastructure development (pipeline installation, drilling, topsoil stripping, etc.), or heavily developed urban areas with multiple construction phases have a high probability of rendering surveys largely ineffective and a costly expense. In addition, natural disturbances such as flooding, erosion, landslides, fires, windstorms, and other disturbances could also create and/or acerbate conditions that could ultimately affect the quality and abundance of cultural resources. As such, extensive ground disturbances on landscapes leave the potential of finding significant cultural resources as minimal.

The Louisiana OCD cultural resources database was reviewed for recorded archaeological sites, standing structures, cemeteries, NRHP listed properties, and previous CRM investigations within, or adjacent to, the APEfor the proposed alternatives. There have been 19 previous CRM investigations within or adjacent to the project area. Several of these investigations were conducted more than 40 years ago, involving archaeological surveys ofthe Vermilion River (Gibson 1975), the GIWW (Galiano et al. 1975), and Louisiana's Coastal Plain (McIntire 1954). Six of the ten investigations conducted since 200 resulted in negative findings for cultural resources. Thereare 22 recorded archaeological sites within the project area. Thirteen of these sites (16VM13, 16VM34, 16VM66,16VM128, 16VM130, 16VM131, 16VM132, 16VM133, 16VM134, 16VM135, 16VM136, 16VM137, 16VM138) are located along or near two previously surveyed pipeline corridors in the northern portion of the project area (Goodwin et al. 1990; Thomas and Laird 2007). Two sites (16VM70 and 16VM127) are

within Palmetto Island State Park (Palmer 2012, 2013; Ryan 1998). The remaining seven sites (16VM16, 16VM33, 16VM35, 16VM36, 16VM46, 16VM59, and 16VM146) are located along the Lower Vermilion River and Gulf Intracoastal Waterway. (Galiano et al. 1975; McGimsey 1998; McGimsey et al. 1999; Palmer 2010,2011; Saunders 1994).

One of these sites, the Vermilion Bayou site (16VM16) is located approximately 250 meters to the southeast of the proposed restoration of the Meaux's Ditch water control structure. It was recorded in 1952 as a pre-contact village and shell midden with Coles Creek (AD 700-1200) and Plaquemine (AD 1200-1700) components (Gibson1975). By 1979, Site 16VM16 was described as having been destroyed by dredging. Site 16VM16 lies outside ofthe APE for the proposed alternatives and will not be affected by the proposed restoration of the Meaux's Ditch structure. The Vermilion Lock on the Gulf Intracoastal Waterway is located south of a proposed alternative location for the Hebert Canal water control structure. The Vermilion Lock was constructed in 1933 and operatedfor 52 years until it was replaced by the Leland Bowman lock in 1985. The Vermilion Lock was evaluated and recommended to be not eligible for listing in the NRHP (Treffinger 1988). It is located outside of the APE and will not be affected by the proposed Hebert Canal water control structure.

Many of the canals and ditches within the APE are over 50 years old, however, after each element was identified and individually evaluated, were found to not be eligible for listing on the NRHP per the Cultural Resource Assessment by Dr. Mark Rees. These elements of the cultural landscape are not associated with significant historical events or persons, do not represent distinctive characteristics or the work of a master, and have little potential to produce information important to history or prehistory.

There are four historic cemeteries within the project area: at Mouton Cove, the community of Esther, Briggs cemetery, and at Briggs Chapel. Five historic standing structures in the community of Esther have been recordedwith the Louisiana Historic Standing Structures Survey (LHRI 57-00662, 57-00625, 57-00626, 57-00627, and 57-00628). There are no historic properties, districts, or recorded archaeological sites listed, or eligible for listingin the NRHP, within the APE for the LVRWP alternatives. The installation of one of the control structures, Hebert Canal, the construction of 0.5 miles of new levee construction, and the 11 miles of levee reinforcement on existing levee structures all have been assessed as having low probability for cultural resources. Two of the proposed installation structures, Meaux's Ditch and the "Unnamed Canal" have the potential to be in areas of high probability for cultural resources due to their proximity to the Vermilion River. However, NRCS State Archaeologist Dr. Aubra "Butch" Lee, after reviewing the Cultural Assessment by Dr. Mark Rees, has determined that no cultural resources and/or historic properties will be adversely affected by the planned project activities nor that any additional surveys are needed (Appendix A). Pursuing new surveys for the AOI is also not recommended due to extensive ground disturbances noted by previous investigators. As such, the potential of finding any cultural

resources around Meaux's Ditch and the "Unnamed Canal" is determined as minimal. As of December 2024, consultation letters have been sent to all appropriate Indian tribes with claims of ancestral land within the AOI. No comments or concerns have yet to be received. The cemeteries, standing structures, and recorded sites are located outside of the APE for the proposed alternatives. The LVRWP will potentially benefitthese cemeteries, structures, and sites through flood prevention and protection from storm surge.

3.8.2 Land Use

Using QGIS and USDA data sources, the land use and cover in the project area was mapped and evaluated (USGS 2011). The total acreage of the watershed is 45,834 acres and is categorized by eight main typesof land use. The breakdown of the watershed's land use and percentages are depicted in Table 26, below.

Table 26. Land Use in the Lower Vermilion River Watershed (2 HUC 12 sub watersheds)

Land Use	Acres	Percentage of Watershed
Open Water	2035	4%
Agricultural	17468	38%
Forested Land	709	2%
Developed Land	1297	3%
Wetlands	23856	52%
Grassland/Herbaceous	193	0.4%
Shrub land	209	0.5%
Barren	66	0.1%
Total	**45,834**	**100%**

According to the U.S. Census Bureau Statistical Abstract of the United States from 4.7 % percent of Louisiana'sland ownership is State/Federally owned (U.S. Census Bureau, 2018). See **Table 27**

Table 27. Federal land ownership: Overview and data (2018)

Federal	Total Federal Acreage	Total Acreage in State		Federal Acreages % of State	
Louisiana	1,353,291	28,867,840		4.7%	
State	**Bureau of Land Management**	**Forest Service**	**Fish & Wildlife Service**	**National Park Service**	**Dept. Of Defense**

Federal	Total Federal Acreage	Total Acreage in State		Federal Acreages % of State	
Louisiana	2,043	608,546	582,342	17,690	142,670
Source: https://fas.org/sgp/crs/misc/R42346.pdf					

In 2022, 76.5% of housing units in Vermilion Parish were owned by the occupants, with 67.6% of homeowners having a mortgage. Within the project area, approximately 19 housing units have been identified; including residential camps for recreational fishing and hunting activities. A list of property owners, and acres owned, associated with the locations of alternative actions, such as water control structures and levee installations and improvements, can be found in **Table 28.**

Table 28. Landowner Listing and for Implementation of Preferred Alternative

Parcel #	ID	Property Owners	Physical Address	Mailing Address	Total Acres Owned
R7231800	24917	Richard Arnold Hebert		12434 Wildwood Way Abbeville, La 70510-0326	17.44
R7126400	24989	Winnie Kibbe, LLC	23536 LA HWY 333	6711 Wilson Rd Maurice, LA 70555	160
R7150800	24547	Donnie Wayne Dooley		P.O Box 547 Delcambre, LA 70528	112.5
R7302800	32390	Mary Catherine Lynch		324 N Wilderness Trail Carencro, LA 70520	58.97
R7417600	25763	SBM Land Management, LLC Kimble Sagrera		10427 U S Hwy 167 Abbeville, LA 70510	147.22

Recreation

According to Outdoor Industry Association (OIA), outdoor recreation generates $12.2 billion in consumer spending annually and over 103,000 jobs in Louisiana. Residents of the 3rd Congressional District (associated with the Lower Vermilion Watershed) spend $1.49 billion on outdoor recreation each year (Outdoor Industry Association, 2017). The most popular recreational activities in this district include fishing, camping, and off- roading.

3.8.3 Scenic Beauty and Visual Resources

NRCS policy at 190-GM, Part 410, Subpart B, Section 410.24, requires consideration of

landscape visual resources when planning, with the objective being to preserve or contribute to scenic beauty. 7CFR § 650.24(d)2directs the NRCS to place emphasis on measures that preserve the natural beauty or contribute to the quality of the visual resource, when providing assistance to watershed development Sponsors. Visual resources are described in terms of landform, water, vegetation, and structures. Scenic beauty is qualitative and described in terms of texture, visual movement, light, reflectivity, distinctiveness and uniqueness. Evaluation of this resourceand assessment of potential effects takes into consideration the existing conditions and the degree or intensity of change to the visual elements upon implementation of the project alternatives. Visibility—the numbers and frequency of observers—is also taken into consideration when evaluating overall impacts to visual resources. Adverse impacts occur when visually pleasing elements are degraded or removed and/or when incongruent and contrasting elements are introduced or constructed within the viewshed. Beneficial effects occur when unaesthetic elements are removed or rehabilitated.

General Watershed Viewshed

For the purpose of evaluating project impacts to visual resources, the LVRWP can be discussed as three distinct sub-viewsheds—southern, central and northern. The southernmost zone encompasses more than 7,500 acres of intermediate marsh south of the GIWW. The main visual elements include expansive marsh broken by curvilinearbayous, open water areas, and few oilfield canals. Taller elements of scrub-shrub vegetation and trees line someof the canal banks. The northernmost zone is bounded by Bancker Canal, 7th Ward Canal, Hwy 82, Hwy 333, and the Vermilion River. Agricultural fields in this region provide a pastoral and geometric regularity delineatedby turnrows and ditch-lined gravel roads. Residential homes and farmsteads provide visual contrast to fields, punctuating roadways along higher ridges in the area. This zone contains the visually and geologically distinctivemeander scars from ancient Vermilion River channels, which create an undulating ridge-swale formation across the landscape. Palmetto Island encompasses over 2,200 acres of bottomland hardwoods and cypress swamp, where the concentric ridges create a rhythmic curvilinear element defined by the vegetative variations between swamp and bottomland hardwoods. Swamps provide high visual contrast of trees in open, typically dark clear waters. The motion of foliage and mosses, and reflectivity of light on water create a visually dynamic scene. Little Bayou and a network of canals provide elements of water and light throughout the region. There will be no changes to visual resources in either the northern or southern zones, therefore these regions will not be furtherdescribed or evaluated in this Plan-EA.

The primary area of concern with regards to visual resources is the central portion of the LVRW, between the Hwy 82 – Hwy 333 corridor and the GIWW. This region has two primary sub-viewsheds—agricultural fields north of the schoolboard levee and expansive marshlands south of the schoolboard levee. Agriculture creates a geometric pattern of expansive mono-culture fields edged and divided by linear elements of turnrows and gravelroads, typically lined by drainage ditches. Though crops may vary from field to field, the pattern of fields providesa visually placid component. Marshlands provide expansive views with an open grassland or prairie feel, brokenby the movement of light and water elements of linear canals,

curvilinear bayous, and open water areas. Taller visual components of trees line banks of Hebert Canal, and both the east and west pump-off canals provide visualbreaks on the field of view.

Specific Viewshed Components

Hebert Canal is a linear water feature that provides motion and light along a north-south tangent through the center of the central LVRWP viewshed. For much of its length south of the schoolboard levee, Hebert Canal is lined with forested bankline. Further north, the banklines are cleared to the water's edge. Though a manmade feature, bankline vegetation has grown in and provides a natural soft edge of varying colors, shapes and textures.

Meaux's Ditch is a linear water feature that provides motion and light elements westward from Hwy 333 throughthe pattern of agricultural fields in the north half of this viewshed. Ditch-banks are generally maintained and littlevegetation breaks the visual edge of this component from surrounding fields.

East and west pump-off canals run east-west across this zone and generally provide a linear distinction between agricultural fields to the north and marshlands to the south. During field investigations conducted during summer months, these canals were nearly covered with floating aquatic vegetation, creating a linear element of textural form instead of the reflectivity of light and water.

Schoolboard levee creates an east-west linear feature that segregates agricultural fields to the north from marshlands to the south. Vegetation on side slopes of the levee soften the contrast between the short herbaceousvegetation on the levee-top and water and/or floating aquatic vegetation in the canals that flank the levee.

Bayou Chene and open water areas provide a non-linear element that provides a visual interest amidst the expanseof marsh east of Hebert Canal. Reflectivity and motion of water is a highly engaging visual element, at once holding the attention of the viewer while moving the eye across the landscape.

LA Hwy 82 and LA Hwy 333 provide a hard line along the northern edge of this sub-viewshed. Hwy 333 createsa boundary between agricultural areas and a miscellaneous mix of land use elements between it and the VermilionRiver. At its southernmost extent, Hwy 333 creates strong visual contrast and delineation between the GIWW and marshlands. Running along higher ground, highway shoulders are punctuated by residential and industrial development, as well as port facilities further south along the Vermilion River and the GIWW.

3.8.4 Socioeconomic Conditions

Social and economic demographic data such as income, education, and median age were assessed usinginformation from the U.S. Census, USDA National Agricultural Statistics

Service (NASS), and Bureau of Economic Analysis, and depicted in **Table 28** by Parish. This information assisted with identifying watershed areas that may need more assistance and outreach as part of planning and implementation in order to account for any presence of Historically Underserved (HU) communities in the watershed. U.S. Census Bureau 2018 estimate. This data is not available by watershed but on a parish or community basis. Information presented is for Vermilion Parish.

Vermilion Parish is a predominately rural parish with a population of 59,511 people. Agriculture, petroleum recovery and related service industries, and commercial fishing are the largest industries. The median household income for the parish is $50,690, which is slightly higher than the state median of $47,942. The percentage of people in Vermilion living below the poverty level is 18.3 percent, which is lower than the state percentage of 18.6. The unemployment rate for was 5.2 percent statewide and 5.3 percent for Vermilion Parish. There are approximately 1,304 farms in the parish with an average size farm of 314 acres.

Agricultural Statistics

Table 29 summarizes agricultural information for Vermilion Parish from the 2017 USDA Census of Agriculture(USDA 2017). The top crop produced in Vermilion Parish by acreage is rice. The next two largest crops producedare sugarcane and forage (defined as all hay and haylage, grass silage, and green crop).

Table 29. (USDA): Agricultural Statistics by Parish

Vermilion Parish	**2012**	**2017**	**Percent change since 2012**
Number of Farms	1,184	1,304	+10
Land in Farms (Acres)	283,658	409,698	+44
Average Size of Farm (Acres)	240	314	+31
Market value of products sold ($1,000)	141,141	117,260	-17
Government payments ($1000)	6,832	13,719	+101
Average per Farm (dollars)	53,577	89,923	+68
Farm-related income ($1,000)	2,895	5,536	+91
		Sales ($1,000)	**Rank in State**

Vermilion Parish	2012	2017	Percent change since 2012
Crop sales ($1,000)	98,433	67,011	12
Livestock, poultry, and their products Sales ($1,000)	42,708	50,249	6
Source: USDA 2017 https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Louisiana/cp22 113.pdf			

Population demographics

Table 30 below presents the total population with percent breakdowns for gender and age for Vermilion Parish, the state of Louisiana, and the United States for comparison from the 2019 U.S. Census (USCB V2019). The totalpopulation of Vermilion Parish in 2019 was 59,511, accounting for 1.3 percent of the state's total population.

Table 30. Population Characteristics by County, State, and U.S. (V2019 Census)

Population		Vermilion	Louisiana State	United States
Total Population		59,511	4,648,794	327,167,434
Gender	Percent Female	51.6%	51.2%	50.8%
	Percent Male	48.4%	48.4%	49.2%
Age	Percent Under 5 years	6.6%	6.6%	6.1%
	Percent under 18	25.5%	23.5%	22.4%
	Percent 65 and older	15.2 %	15.4%	16.0%
Source: USCB V2019				

Ethnicity and race are shown for the study area in **Table 31** and **Table 32** below. Vermilion Parish contains a greater percent of persons identifying as Non-Hispanic or Latino than the

state average, and lower percent of persons identifying as Black or African American compared to the states averages. The project area is primarily located in census tract (#9511). Data from the US Census block groups show the population criteria to be 97% white alone, not Hispanic or Latina. This percentage shows an approximately 1% of minorities within this tract. The percentage of white alone, not Hispanic or Latina as compared to the parish and state shows a 18 % difference from the parish percentage and a 38% difference from the State. This shows a lack of ethnic diversity of in this tract vs the parish/state.

Table 31. Ethnicity by Census Tract, County, State, and U.S. (2019 Census).

Population Criteria		Census Tract #9511	Vermilion Parish	Louisiana (State)	United States
Total Population		1,324	59,511	4,648,794	328,239,523
Hispanic or Latino	Percent	0%	3.7%	5.2%	18.3%
White alone, Non-Hispanic or Latino	Percent	97%	78.4%	58.6%	60.4%
Black or African American	Percent	1%	14.4%	32.7%	13.4%
	Source: USCB V2019				

Table 32. Race by County, State, and U.S. (2019 Census)

Population Criteria		Census Tract #9511	Vermilion Parish	Louisiana (State)	United States
White alone, not Hispanic or Latino	Percent	97%	81.4%	62.9%	76.5%
African American	Percent	1%	14.4%	32.7%	13.4%
Asian	Percent	0%	2.1%	1.8%	5.9%
American Indian	Percent	0%	.4%	.8%	1.3%
Native Hawaiian or Pacific Islander	Percent	0%	Z	.1%	.2%
Identifies Two or more Races	Percent	0%	1.6%	1.7%	2.7%
	Source: USCB V2019				

Employment, Income and Poverty

Table 33 below demonstrates labor force characteristics for Vermilion Parish and Louisiana. The unemploymentrate is higher in Vermilion Parish than the states average.

Table 33. Labor Force Characteristics (2019)

Indicator	Vermilion Parish	Louisiana (State)
Labor Force	**24,087**	**2,119,991**
Employment	**22,870**	**2,021,948**
Unemployment	**1,217**	**98,043**
Unemployment Rate	**5.1**	**4.7**
Source: USBLS 2019 https://www.bls.gov/regions/southwest/louisiana.htm#eag		

Household income and poverty rate is summarized in **Table 34** (CENSUS 2019). Information presents fortwo income indicators: median household income and per capita income. Incomes for the parish are higher than the state, but lower than the nation. The percent of persons living in poverty level in Vermilion Parish is lower than the state level yet higher than the national level. Census Tract #9511 is located within the project study area and shows a 16.3% persons of poverty. This percentage is less than both the parish and the state percentage of poverty.

Table 34. Income and Poverty Rates (2019)

Indicator	Census Tract #9511	Vermilion Parish	Louisiana (State)	United States
Median Household Income, 2015-2019 (in dollars)	$49,781	$51,945	$49,469	$62,843
Per Capita Income in the past 12 months , 2019 (in dollars)	$26,196	$34,103	$25,342	$27,923
Persons in Poverty (percent)	16.3%	17.0%	19.0%	10.5%
Source: USCB 2019				

Table 35 summarizes employment by major industry classification in 2019. The primary sectors of employment in Vermilion Parish include: “Mining”, “Retail Trade”, “Trade, Transportation, and Utility”, “Educational and Health Services”.

Table 35. Annual Employment by Major Industry (2019)

Employment Sector	Vermilion Parish	Louisiana (State)
Agriculture, Forestry, Fishing and Hunting	335	9,119
Mining	1,138	44,052
Construction	669	142,033
Manufacturing	633	137,729
Wholesale Trade	506	69,095
Retail Trade	1,861	223,316
Trade, Transportation, and Utility	2,707	376,026
Information	114	22,427
Finance activities	570	84,791
Real estate, rental and leasing	146	30,673
Professional and business services	617	216,009
Scientific research and development	N/A	771
Management and technical consultation services	127	9,917
Administrative and waste management services	191	103,974
Educational and health services	1,656	305,742
Arts, entertainment, and recreation	100	29,295
Accommodation and food services	1,048	208,174
Other services, except public administration	276	46,391
Source: USBLS 2019 U.S Bureau of Labor and Statistics https://data.bls.gov/pdq/SurveyOutputServlet		

3.8.5 Public Health and Safety

The local producers in the area express safety concerns regarding emergency evacuation during storm event. During a storm, LA 333 (near Leland Bowman Locks in the Gulf GIWW) and HWY 82, regularly floods during abnormal high tides and storms making it more difficult to evacuate livestock and other essential assets. As a result of the 2020 storms, 28 local producers came together and calculated the amount of land and crop damage to rice, crawfish, and cattle. This included soil remediation, storm water pump off, and costs to repair, rebuild and replace equipment. They estimated a total of approx. $7.5 Million in land costs to repair/rebuild after the storm. Crop damage for rice/crawfish and cattle/hay was also calculated. The total for crop/product loss is approx. $4.9 Million. (see Appendix D for Loss/Cost estimate from 2020)

4. ALTERNATIVES

4.1 Formulation Process

The need for watershed management options was initially recognized in the 2006 HC Resource Plan (Appendix D) and then formulated into preliminary alternatives as identified by the SLO in the Lower Vermilion River Basin Hydrologic Restoration and Flood Prevention Proposal (LVR Proposal) (October 9, 2019). Five action alternatives were developed from the LVR Proposal. Three alternatives were selected by the NRCS to be analyzed in the Plan-EA: the No Action Alternative, and two alternatives that entail the expenditure of PL-566 funds toward construction of water control structures and levees to fulfill the purpose and need for the LVRWP. The alternatives presented in this Plan-EA have been developed in cooperation with the VSWCD, VPPJ, and the 7th Ward GDD. Comments and input from partners, stakeholders, subject matter experts and local producers gathered during the scoping process have also been considered with regards to alternatives selection. The process of formulating alternatives for the LVRWP followed the USDA-NRCS NWPM (NRCS 2015) Parts 501.37, USDA-NRCS NWPH (NRCS 2018) Parts 606.19 and 606.21, 40 CFR §1502.14, and 1508.1.

4.2 Alternatives Considered but Eliminated from Detailed Study

Several alternatives were considered but are not analyzed in detail as feasible alternatives because of limited area of benefit, potential adverse consequences, and general lack of local support. A brief summary of the alternatives considered but eliminated from detailed study is provided below.

Alternative 4 – 3,588 acres protected
Install water control structures at two locations: Site A – Hebert Canal (HC) - one mile south of the existing structure just north of Hwy 82; Site B – Meaux's Ditch (MD) at HWY 333. Reinforce the existing levee between the two control structures near School Board property. This alternative was eliminated from further consideration due to the small protection area and lack of local support.

Alternative 5 – 5,415 acres protected
This alternative includes the same components as Alternative 4 above (two control structures and a levee) with the addition of raising the elevation of Agnes Plantation Road near the Vermilion River. This alternative was eliminated because raising the road would cause flooding in communities on the river side of the road, and lack of local support.

Alternative 6 – 2,780 acres protected
Install a control structure in HC one mile south of the existing structure, as in Alternative 4 and

5, above. Reinforce the levee near School Board property, as in Alternative 4, above. Restore the existing MD structure. Construct a 0.5-mile levee along the GIWW east of the Leland Bowman lock. This alternative was eliminated due to the small protection area; lack of local support and because the levee along Hwy 333 would be ineffective without also having a control structure to close HC during high tides and storm events.

4.3 Alternatives Chosen for Detailed Study

As discussed in Chapter 1, the study area has a high-water table and near level topography, which impedes effective drainage of agricultural lands. The current system of low agricultural levees, gravity-fed drainage channels and the single water control structure in MD neither allows for adequate drainage nor prevents flooding and salt water intrusion. The SLO and proponents have determined that structural components must be designed and strategically located to mitigate, prevent or otherwise resolve these problems. Upon assessment of the resources within the study area, two reasonable alternatives have been selected for further study and are discussed along with the (compulsory) No Action alternative. Both selected alternatives would use NRCS PL-566 funds to address three of the purposes listed in Title 390, NWPM 500.4.B.:

- Flood Prevention (Flood Damage Reduction) – water control structures and levees will reduce/prevent flooding from tidal inundation and storm surges; and from abnormally high precipitation events by facilitating more efficient disposal of surface waters.

- Agricultural Water Management – structures will reduce potential saltwater contamination of freshwater supplies. By regulating saltwater intrusion, the project will provide more consistent reliable fresh water for crops and livestock

4.3.1 Alternative No.1 - No Action/ Future without Project - 0 acres protected

Under the No Action alternative, the project would not take place, no NRCS PL-566 funds would be utilized, and environmental conditions in the LVRWP area would continue as is. Current data and trends indicate that area-wide flooding would continue and likely worsen, exacerbating public safety concerns related to the inability to evacuate affected residents, and escalating impacts associated with crop, livestock, equipment, and property losses. There would also be additional recurring soil salination and loss of agricultural productivity. The No Action alternative is not the preferred alternative. This alternative is required by NEPA to provide a basis of comparison of effects between the future without the project to that with the proposed alternatives. The No Action alternative does not meet the needs or fulfill the purpose of the project.

4.3.2 Alternative No.2 - Preferred Action - 12,610 acres protected

Alternative 2 proposes a combination of water control structures and levee system to manage the

entire study area. Water control structures would be installed at three locations: 1) HC at the GIWW, 2) MD at Hwy 333, and 3) an Unnamed canal at Hwy 333. A ± 0.5-mile levee would be constructed along the north bank of the GIWW, east and west of the proposed HC-GIWW water control structure. The primary component of Alternative 2 is the HC-GIWW water control structure and levee system. The structure and levee would benefit the largest portion of the project area and yield the most drastic potential for flood and saltwater management. The MD and Unnamed canal structures will provide flood and saltwater management for smaller subregions that have been isolated from surrounding areas by low levees and largely converted from natural to agricultural and/or residential cover types. Whereas those components play an important role in the LVRWP, the area affected and potential for impacts is less than that associated with the HC-GIWW control structure and levee. The HC-GIWW structure and levee component is also the major difference between Alternatives 2 and 3.

Alternative 2 fulfills the purpose and need, provides flood protection for 12,610 acres, manages water resources by regulating saltwater intrusion and supports marsh protection and coastal resilience. Alternative 2 is consistent with the Vermilion Parish Comprehensive Resiliency Plan, and the Louisiana CPRA 2017 and 2023 Coastal Master Plans to reduce flood risk, promote sustainable ecosystems, support economics, and implement projects that provide benefit despite sea level rise and provide risk reduction at the community or regional scale. Relative to Alternative 3, Alternative 2 incurs less cost, provides greater overall benefits with lesser adverse impacts. Alternative 2 encompasses the area protected by Alternative 3, plus an additional 6,355 acres of fresh and intermediate marsh. Protecting the marsh supports regional resiliency by protecting the marsh buffer between developed lands north of the school board levee and the GIWW. This alternative was selected as the preferred alternative because it fulfills the project purpose and need of the agricultural producers and land users in the watershed, contributes to the NED objective, and exceeds the area of potential management as provided for in Alternative 3.

Current Situation and Existing Structures

The study area encompasses 12,610 acres bounded by the GIWW (south), 7th Ward Canal (west), Hwy 82 (north), and Hwy 333 (east). It is roughly divided by the School Board levee, with 6,355 acres of marsh to the south, and 6,255 acres of agricultural lands to the north. It is hydrologically connected to the Vermilion River by MD and the Unnamed canal. HC spans the entire study area (±4.30 miles), and hydrologically connects the GIWW to the East and West Pump-off canals, Mouton Canal, 7th Ward Canal (via Mouton Canal), and the network of interior drainage channels. HC runs 6.3 miles from its confluence with the GIWW to its northern terminus at Tucker Road. From mile 0.00 (GIWW) to 0.57, it follows a natural channel of Bayou Chene. From mile 0.57 to 04.30, it is a straight manmade conduit providing drainage and fresh water conveyance. There is a control structure at ±04.30, just north of Hwy 82 which crosses HC at 04.27. The Hwy 82 roadbed (at elevation ±6 ft NAVD88) together with that control structure, form the northern boundary of the study area. The structure manages flow and drainage from areas north of Hwy 82 and does not play a role in the management of water resources within the study area. HC is ±145 ft wide at its confluence with the GIWW, narrows to roughly ±80 ft

along Bayou Chene, and to ±60 ft thereafter.

HC is an open channel to the GIWW. It facilitates drainage from the study area and is also a source of fresh water for irrigation and cattle. During high tides and storms, it becomes a saltwater inlet. Tides and tropical storm/flood conditions overtop HC banklines and flood the study area. Flooding also occurs when tides or storm surge exceed the GIWW bankline and Hwy 333 roadbed at the southern limit of the study area. The GIWW bankline is at elevation ±3 ft NAVD88. The Hwy 333 roadbed is at elevation ±2 ft NAVD88. Marsh elevations to the north of Hwy 333 are ≤2 ft NAVD88. Surges above ± 3ft NAVD88 overtop the GIWW bankline and flood the study area. Once in the area, floodwaters are held in behind until drained via HC.

MD provides drainage for approximately 2,765 acres agricultural fields in the northeast quadrant of the study area. Its total length is 4.28 miles, and there is a three-gated water control structure ±1.7 miles from its confluence with the Vermilion River. The structure is primarily left closed to prevent saltwater influx from the river. It provides protection from storm surge for approximately 2,000 acres. Ditch-bank elevations downstream from the structure range between +3-5 ft NAVD88. Storm surge pushing in from the Vermilion River ≥3 ft NAVD88 overtops the levees, making the structure virtually useless during storms.

The Unnamed canal provides drainage for approximately 690 acres of pasture lands and some residences between the Bayou Chene marsh and Hwy 333. Unnamed canal flows beneath Hwy 333 and connects to the Vermilion River approximately 0.85 mile north of the GIWW. There are two flap-gated culverts located 0.19 mile west of Hwy 333 that allow drainage and prevent some backflow from the Vermilion River. There is an access road at ±6 ft NAVD88 along the south side of the canal, but the north bankline is at ±3 – 6 ft NAVD88 and allows flooding from surge to circumvent the structure. This Unnamed canal is ±25 ft wide at the proposed structure site.

HC-GIWW Water Control Structure and Levee System

Installing a structure in HC at the GIWW and a levee along the northern bankline, would provide a key point of control of tidal surge and allow for the management of water levels and saltwater intrusion into the main part of study area. Having a ±6 ft levee and ability to close the HC would provide protection from surges ≤6 ft NAVD88, reduce the amount of and duration of flooding associated with surges that exceed ±6 ft NAVD88, and reduce effects of salinity in area soils.

Structure A – HC at GIWW

The proposed water control structure is a reinforced concrete and aluminum structure that will span the entire channel (157 ft) at its confluence with the GIWW. The design includes a series of ten bays: nine 10’ X 14’ flap-gate bays; and a single 12’ X 14’ boat bay to allow passage of recreational type vessels. Wingwalls at each end anchor the structure to the bankline. The structure will be supported by a deep pile foundation with bottom bracing set at ± -8.0 NAVD 88, the approximate channel bottom elevation of HC.

Each flap-gate bay will be fitted with a hinged gate that allows flow or drainage out of the study

area and controls backflow or tidal surge into the area. The flap-gates operate independently so that the number of bays open or closed can be adjusted according to conditions. The gates can swing freely or be secured in various positions. A cantilevered beam and cable winch assembly will provide manual control for raising and lowering the gates, to allow more or less volumetric flow through each individual bay. The gates can be chained fully open to allow free flow up- and down- stream through the structure. When unchained, the head differential between water inside and outside of the gates will determine gate angle. Higher water upstream will push the gates open. Higher water downstream, or outside of the structure, will force the gates closed and prevent flow into the area. The seated position (closed) of the gates is angled downstream to facilitate the tightest possible gate closure. The gates cannot be locked closed, so that the capability to evacuate flooding upstream is unrestricted.

Levee at the GIWW

A levee will be constructed along the bank of the GIWW, seaward of the Hwy 333 corridor. The levee will be integral with the HCwater control structure to provide flood protection to ±6 ft NAVD88. The total length of the levee will span approximately one-half mile total, beginning at the Leland Bowman lock and ending near or at the ±6 NAVD88 elevation mark off Hwy 333. The average height of the levee will be ±6 ft NAVD88. The average top width will be ±10 ft. The approximate side slope will be ±3.

Structure B – MD at LA 333

The MD structure is designed, and will be operated to provide maximum protection of water resources for agricultural producers in the study area. The structure, in conjunction with Hwy 333, would essentially act as a levee allowing closure of the area during tidal surges and reduce potential and duration of major flood events. This structure has the potential to prevent flooding up to ±6 ft NAVD88, and drastically lessening flood duration of flooding above ±6 ft NAVD88. A structure at Hwy 333 would provide water management for an additional 760 acres.

The proposed water control structure is a reinforced concrete and aluminum structure that will span the entire ±60 ft channel. The design includes three, 6’ X 6’ bays, with wingwalls on either side to anchor the structure to the bankline. Each bay includes a a flap-gate on the downstream side to allow drainage and prevent saltwater intrusion from the Vermilion River. The structure will be supported by a deep pile foundation. The flowline of the new structure will be set at ± -6.3 ft. NAVD 88 to match the elevation of the culvert invert at the LA 333-MD cross-drain, located approximately 50’ downstream of the proposed structure.

Each flap-gate bay will be fitted with a hinged gate that allows flow or drainage out of the study area and controls backflow or tidal surge into the area. The flap-gates operate independently, so that the number of bays open or closed can be adjusted according to conditions. The gates can swing freely or be secured in various positions. A cantilevered beam and cable winch assembly will provide manual control for raising and lowering the gates, to allow more or less volumetric flow through each individual bay. The gates can be chained fully open to allow free flow up- and down- stream through the structure. When unchained, the head differential between water inside and outside of the gates will determine gate angle. Higher water upstream will push the

gates open. Higher water downstream, or outside of the structure, will force the gates closed and prevent flow into the area. The seated position (closed) of the gates is angled downstream to facilitate the tightest possible gate closure. The gates cannot be locked closed, so that the capability to evacuate flooding upstream is unrestricted.

Structure C – Unnamed Canal at LA 333

The proposed water control structure will be operated to provide maximum protection of water resources for agricultural producers in the study area. The proposed structure is a flap-gate culvert structure that will allow flow in one direction, out of the project area, and prevent flow into the project area. The flap-gate(s) can be locked open to allow free flow in both directions. Culvert sizes are not yet designed. This structure will allow management of agricultural water for 690 acres.

4.3.3 Alternative No.3 – 6,255 acres protected

Alternative 3 proposes a combination of water control structures and levee system to manage approximately 6,255 acres north of the School Board levee. Water control structures would be installed at two locations: 1) HC at the School Board levee, 2) MD at Hwy 333. A ±1.7-mile levee would be enhanced along the School Board property. Approximately 7.8 miles of levee would be enhanced along the 7th Ward Canal and the West Pump-off canal. The HC control structure in concert with the levee enhancements are the primary component, forming the east-west boundary between the agricultural lands to the north and the marsh to the south.

Alternative 3 would fulfill the purpose and need as identified by the SLO, provides flood protection to areas north of the School Board levee and manages water resources by regulating saltwater intrusion. Alternative 3 is consistent with the Vermilion Parish Comprehensive Resiliency Plan to reduce flood risk, and would also utilize NRCS PL-566 funds to address the same Title 390, NWPM 500.4.B purposes as those addressed by Alternative 2: flood prevention and agricultural water management. Compared to Alternative 2, this alternative does not enable water control of 6,355 acres of marshlands, and would not provide protection for the 690 acres managed by the proposed Unnamed Canal structure.

Current Situation and Existing Structures

The area encompasses 6,255 acres that is primarily in agricultural management. It is bounded by 7th Ward Canal (west), Hwy 82 (north), and Hwy 333 (east). Levees associated with 7th Ward Canal range from ±3 – 5 ft NAVD88. The southern boundary of the area is delineated by levees that provide a ±6 ft NAVD88 buffer from the Bayou Chene marsh complex.

Raising the existing levees within the interior would bolster the existing system of levees that currently protect agricultural fields north of the levee from floodwaters that come in from the south via HC. Raising the levees presents a costly logistical problem of finding suitable material to raise the levee elevation to 6 ft. NAVD88. 7th Ward GDD officials and maintenance staff report that due to years of levee embankment maintenance, there is little-to-no native material left along the levees to strengthen (raise) this levee alignment to the proposed elevation. This

results in the reality that that any materials for levee construction must be brought in from outside sources via barge or truck. Installing a water control structure in HC at the School Board levee provides a point of water control within the interior of the study area. The proposed structure would be approximately ½-mile south of an existingstructure located just north of Hwy 82. The proposed structure, in concert with raising the school boardlevee, would create an effective block to flooding from the south, protecting agricultural lands and residences to the north of the structure.

Structure A – HC at School Board Levee
The proposed water control structure is designed, and will be operated to provide maximum protection of water resources for agricultural producers in the area. The proposed water control structure is a reinforced concrete and aluminum structure that will span the entire ±65 ft channel. The design includes three, 6' X 6' bays, with wingwalls on either side to anchor the structure to the bankline. Each bay includes a flap-gate on the downstream side to allow drainage and prevent saltwater intrusion. The structure will be supported by a deep pile foundation. Bottom bracing will be set at ± -8 ft. NAVD 88, the approximate elevation of HC. This structure has the potential to prevent flooding up to ±6 ft NAVD88, and drastically lessen flood volume and duration of surge above ±6 ft NAVD88. The structure, in conjunction with proposed levee enhancements would allow closure of the area during tidal surges and reduce potential and duration of major flood events. The flap-gate design and mechanisms are the same as those described in Alternative 2 – Structure B.

Structure B – MD at LA 333
The proposed structure is the same structure included in Alternative 2.

Levee Improvements
Levee improvements consist of elevating the existing 7th Ward Levee (which currently ranges in elevation from 3-4ft, in some areas to elevation 6ft). The total length of levee improvements will span approx. ±11 miles, beginning at School Board Rd and MD and ending near 7th Ward Canal. The levee is an integral part of the protection barrier. Providing additional protection, along with the structure, to provide ±6 ft NAVD88 of flood protection. The average height of the levee will be ±6 ft NAVD88. The average top width will be ±10 ft. The approximate side slope will be ±3:1 horizontal to vertical.

4.4 Summary and Comparison of Alternatives

Table 36 provides the economic comparison of the two alternatives considered reasonable per NEPA requirements.

Table 36. Summary and Comparison of Alternative Plans.

	Item of concern	Alternative 1No Action	Alternative 2(Preferred)	Alternative 3
	Total Cost	-	**$**10,158,180.76	$10,456,201.35

	Item of concern	Alternative 1No Action	Alternative 2(Preferred)	Alternative 3
NED Account	**Annual Costs**	-	$396,268.36	$407,418.44
	Annual Damage Reduction Benefits	-	$847,288.55	$593,101.99
	Annual Net Benefits	-	$437,436.15	$169,44.55
	Benefit-Cost Ratio	-	2.14	1.46
EnvironmentalQuality Account	**Soil and Sedimentation**	Continued soil salinization and productivity loss	Minor, short-term and adverseimpacts	Moderate, short-term impact, about 11 miles of levee improvements of fill material during construction activities.
	Prime Farmland	No impacts to the amount or location	No impacts to amount of farmland classification as prime: effect if protected by flooding	No impacts to amount of farmland classification as prime: potential effects if protected by flooding
	Water - Surface - Quality - Surface - Quantity - Groundwater - Quantity - Waters of US - Floodplain Management - Wetlands	Continued flooding and saltwater intrusion will occur in the study area and impact water resources negatively	Major long-term, beneficialimpacts to water quality. Minor negligible impact to wetlands. Average annual reduction ofsalinity of 42% and 17% water level	Minor long-term, beneficial impact to waterquantity. Average annual reduction of 99% salinityand 31% water level
	Air	No impacts for reasonably foreseeable future	Negligible, short-term impacts during construction.No long-term impacts.	Negligible, short-term impacts during construction. No long-term impacts.

	Item of concern	Alternative 1No Action	Alternative 2(Preferred)	Alternative 3
	Plants - Invasive Species - Riparian Areas	Potential for minor adverse impacts to salt-intolerant plant species	Minor, adverse, short-term impacts to wetlands during construction of control structures and levee. Potentialfor long-term beneficial impacts to state-listed plants.	Minor, adverse, short-termimpacts of wetland during construction of control structures and levee improvements. Potential for long-term beneficial impacts to state-listed plants.
	Animals - Fish Habitat - Wildlife Habitat - T&E Species	No impacts	Minor, short-term and temporary impacts during construction of the Proposed Action. Minor adverse effectsto estuarine fisheries access.	Minor, short-term and temporary impacts duringconstruction of the Proposed Action. Very Minor adverse effects to estuarine fisheries access.
	Flood Damages	Considerable flood impacts to +200,000 acres costing $3-6 million	Moderate reduction in flooddamages, and occurrence on +10,000 acres	Moderate reduction inflood damages and occurrence on +5,000acres
	Historic, Cultural, Scientific Resources	No change	No sites jeopardized	No sites jeopardized
	Portable Water Supply	No Impacts	No Impacts	No Impacts
Other Social Effects Account	**Public Health/Safety**	Flood and storm impacts pose public health and safety risk during and following a disaster event.	Impacts during flood/storm events will be minimized WSE during event and also to prevent salt water intrusion	Impacts during flood/storm events will be minimized WSE during event and also to prevent salt water intrusion
	Tribal, religious, sacred, or cultural site	No change	No sites jeopardized	No sites jeopardized

4.4.1 Ecosystem services Tradeoffs and Economics

After a preliminary screening of the initial alternative using the project objectives and constraints, a preliminary economic and ecosystem services analysis was conducted to determine if other initial alternatives could be furthered screened out. Economic analyses were based upon approximate estimates of costs and benefits based upon previous projects in similar conditions, professional judgement, and knowledge of watershed resources and conditions. **Table 37 Benefit-Cost Analysis by Alternative** displays the outcome for these analysis for each alternative.

Table 37. Benefit-Cost Analysis by Alternative

Criterion	Alternative 1	Alternative 2	Alternative 3
Total Project Investment	$0	$9,800,000	$40,600,000
Annual O&M Costs	$0	$0	$0
Annual Project Investment	$0	$195,000	$810,000
Monetized Ecosystem Service Costs			
Toal Lifetime Costs	$18,500,000	$140,000	$18,800,000
Provisioning	$370,000	$0	$360
Regulating	$0	$1,000	$130,000
Cultural	$0	$215	$30,000
Information	$0	$1,500	$215,000
Total Annual Costs	$370,000	$3,000	$375,000
Monetized Ecosystem Service Benefits			
Total Benefits	$0	$16,000,000	$16,000,000
Provisioning	$0	$0	$0
Regulating	$0	$320,000	$320,000
Cultural	$0	$0	$0
Supporting	$0	$0	$0
Total Annual Benefits	$0	$320,000	$320,000
Benefit-Cost Results			
Annual Benefit-Cost Ratio	-	1.61	0.27
Total Annual Net Benefits*	-$370,000	$120,000	-$865,000
Total Lifetime Net Benefits*	-$18,500,000	$6,000,000	-$43,300,000

5. ENVIRONMENTAL CONSEQUENCES

The purpose of this section is to provide a comparison of effects under each of the alternatives being carried forward for further analysis in the Plan-EA, in addition to, measuring the effects the alternatives have on existingconditions (no-action). The current LVRWP Alternatives consist of, 1) Alternative 1 – No Action, 2) Alternative2 – Preferred Structures and Bulkhead, and 3) Alternative 3- Structures and Levee Reinforcement.

5.1 Soils

Soils

Evaluation of potential flood mitigation and water quality improvement in an area requires analysis of soil impacts associated with implementation of proposed actions. Protection of soils and geographical features are to be evaluated.

Alternative 1 - No Action

Under the No Action alternative, soil conditions would remain the same as existing conditions (See Section 3.3). Agricultural soils will continue to degrade due to increased long-term inundation of saltwater caused by abnormal high tides and storm surges. Flooding of agricultural lands after a natural or human induced levee breach can alsohave a large and persistent effect on soils. Salinization, sediment deposition in drainage and road ditches, and lossof soil productivity are the most severe damages to soils on agricultural lands.

Alternative 2 – Preferred

Under the preferred alternative, the installation of three water control structures (Hebert Canal, Meaux's Ditch, "Unnamed" Canal) and levee construction would result in minor soil disturbances during the installation period. However, these minor disturbances are predicted to be short-term and localized to the structural installation site. Levee construction can cause significantly more soil disturbance when compared to levee improvements, as new structures require large-scale excavation and filling requirements for new levees. The type of disturbances that could be expected include erosion, soil compaction, and disruption of natural drainage areas. Erosion could occur through excavation work and by sedimentation. Soil compaction could occur from the use of heavy machinery in structural construction efforts and with borrow pits (areas where soil is extracted to build new levees). Disruption of natural drainage could be caused by disconnecting waterways from their natural floodplain, reducing the amount of groundwater recharge and levels in the surrounding area.

Construction BMPs would be implemented to minimize soil erosion, soil compaction, and natural drainage disruptions during construction efforts. Plans for controlling erosion, compaction, and drainage would be developed and implemented during construction of the structures. Examples include saving and redistributing topsoil after the completion of construction activities, reducing compaction, grading, and clearing activities, and installing straw wattles, dikes, and other suitable erosion control measures to minimize and prevent soil erosion during construction efforts. Under Alternative 2, the Plan of Operation after the installation of the water control structures is for the gates to be left "open". This would allow natural access of both water and sediment movement during normal tidal flow between areas within the AOI, and yield the least number of changes to drainage and groundwater recharge areas.

High levels of salinity can have a negative impact on soil; both in its morphology and biogeochemical processes. Excessive salt in soil can affect the negative charge of clay particles, disrupting and weaking soil structure, increasing soil compaction, and limiting the water holding capacity of soil. This increase in salinity can also affect the pH of soil by disrupting the balance of ions on soil particles, which can lead to negative changes in soil microbial communities, nutrient cycling and availability, and organic matter degradation. These changes in soil health would, in turn, have a cascading effect on vegetation, wildlife, and potentially human health through the contamination of drinking water.

With the installation of the proposed structures, these actions would be beneficial in reducing high-water and salinity levels by minimize the impact from storm surges and abnormally high tides coming through the Hebert Canal, Meaux's Ditch, and the "Unnamed" Canal. This reduction in salinities would, in turn, reduce salinity levels in the soil.
The acreage of disturbed soils for each structure location are as follows:

- Hebert Canal – approx. 0.23 acres
- Meaux's Ditch – approx. 0.1 acres
- Unnamed Canal – approx.0.07 acres
- GIWW Bulkhead Levee – approx.0.34 acres

Alternative 3 – Structures and Levee Reinforcement

Under Alternative 3, the installation of two water control structures (Hebert Canal and Meaux's Ditch) and levee improvements in the form of raising existing levee structures by 2 ft. would result in minor soil disturbances during the installation period, as these effects are predicted to be short-term and localized to the structural installation site. Levee improvements, like reinforcing existing structures or raising existing structures, typically have a smaller footprint and less drastic soil disturbance than new levee construction. However, levee improvements can still alter sediment transport patterns and deposition. The type of disturbances that could be expected include erosion, soil compaction, and disruption of natural drainage areas. Erosion could occur through excavation work and by sedimentation. Soil compaction could occur from the use of heavy machinery in structural construction efforts. Disruption of natural drainage could be caused by disconnecting waterways from their natural floodplain, reducing the amount of groundwater recharge and levels in the surrounding area.

Similar to Alternative 2, construction BMPs would be implemented to minimize soil erosion, soil compaction, and natural drainage disruptions during construction activities. Plans for controlling erosion, compaction, and drainage would be developed and implemented during construction of the structures. Examples include saving and redistributing topsoil after the completion of construction activities, reducing compaction, grading, and clearing activities, and installing straw wattles, dikes, and other suitable erosion control measures to minimize and prevent soil erosion during construction efforts. Areas that have been disturbed by construction

and improvement efforts would be smoothed, shaped, contoured and reseeded to as near their pre-project conditions as practicable. Under Alternative 3, the Plan of Operation after the installation of the water control structures is for the gates to be left "open". This would allow natural access of both water and sediment movement during normal tidal flow between areas within the AOI, and yield the least number of changes to drainage and groundwater recharge areas.

High levels of salinity can have a negative impact on soil; both in its morphology and biogeochemical processes. Excessive salt in soil can affect the negative charge of clay particles, disrupting and weaking soil structure, increasing soil compaction, and limiting the water holding capacity of soil. This increase in salinity can also affect the pH of the soil by disrupting the balance of ions on soil particles, which can lead to negative changes in soil microbial communities, nutrient cycling and availability, and organic matter degradation. These changes in soil health would, in turn, have a cascading effect on vegetation, wildlife, and potentially human health through the contamination of drinking water.

With the installation of the proposed structures, these actions would reduce high-water and soil salinity levels from storm surges and abnormal high tides through the Hebert Canal, Meaux's Ditch, and the rehabilitation of existing levee systems in areas north of the existing schoolboard and 7th ward levee boundary. This reduction in salinities would, in turn, reduce salinity levels in the soil.
The acreage of disturbed soils for each structure location are as follows:

- Hebert Canal – approx. 0.23 acres
- Meaux's Ditch – approx. 0.1 acres
- Levee raising 2 ft. (6ft. total) -approx. 200 acres

Compliance and Best Management Practices

The following BMPs are recommended to reduce the effects on soils associated with installation and implementation of the proposed alternatives during construction activities. Design features and BMPs that would be applied during the proposedproject are described below:

- Compaction, grading and clearing activities will be minimized to the extent practicable.
- During construction, topsoil would be saved and then redistributed after completion of construction activities.
- Straw wattles, silt curtains, cofferdams, dikes, straw bales, or other suitable erosion control measures would be used to minimize soil erosion and prevent soil erosion from entering water bodies during construction.
- Disturbed areas would be smoothed, shaped, contoured and reseeded to as near their pre-project conditions aspracticable. Lands previously in agricultural production would be returned to agricultural production following construction.

Cumulative Impacts

Geographic and Temporal Extent of Analysis

Because the proposed action would not impact soils resources outside of the project area, the geographic scope used to analyze cumulative impacts on soils is the LVRWP project area. The proposed action would not affect geology. Therefore, there is no cumulative impacts analysis for that resource. The temporal scale used to analyze cumulative impacts is the life of the project (fifty years).

Past Actions

- Agricultural practices (aquaculture, cattle grazing, chemical fertilizer, herbicides and pesticides, tilling and compaction)
- Leveeing and channeling to manage water (aquaculture, drainage)
- GIWW, a conduit for saltwater

Present Actions

- Agricultural practices
- Leveeing and channeling continue to affect the resource
- Saltwater intrusion from the GIWW continues to affect the project area

Future Actions

- Agricultural practices
- Leveeing and channeling effects continue
- GIWW
- Operations of the proposed action into the future past year one.

Alternative 1 – No Action

Without intervention nor action plans, there would be little cumulative impacts from construction equipment or design with Alternative 1 on land cover types. Lasting impacts would result in continued changes in wetland habitats and vegetation biodiversity; eventually leading to open water due to increasing salinity levels and impacts from storm erosion.

Alternative 2 - Preferred

Cumulative Impacts During Construction

Direct impacts to soils during construction will be negligible and mitigated with BMP. Therefore, there are no cumulative impacts associated with construction of the project.

Cumulative Impacts During Operations

Hebert Canal Structure and Levee at GIWW

Along with the proposed Meaux's Ditch and Unnamed Ditch structures, existing structures, roads and levee systems, the Hebert Canal structure and levee along the GIWW will effectively complete the impoundment of the LVRWP project area. Providing a system to close the area during storm surges and abnormal high tides is the primary stated purpose of the proposed action. Managing salinity and water levels is expected to offset the adverse effects of saltwater intrusion associated with ongoing and future operations of the GIWW within the entire LVRWP project area (13,278 acres).

Soils resources north of the School Board levee (7,800 acres) have already been impacted by agricultural practices, aquaculture impoundments, drainage channels. It is anticipated that soil degradation (chemical applications, nutrient loading, salinization) associated with past, current, and future surface-use practices would be offset to some degree by a more consistent freshwater regime. However, hydrologic impoundments and flood prevention plans have been correlated with reduced vertical accretion of soils, decreased sedimentation and diminished soil-building process (Boumans and Day, 1994; Bryant and Chabreck, 1998; Cahoon, 1994; Graham, 2021; Reed, et. al. 1997). Therefore, adverse impacts (soils compaction, tilling) associated with agriculture would continue and could possibly be exacerbated by the cumulative effects associated with flood prevention aspects of the proposed action.

Soils resources south of the School Board levee have been impacted somewhat by cattle grazing (nutrient loading), and drainage channels and pipeline canals that allow saltwater into the interior of the area. The primary conduit into the area is Hebert Canal via the GIWW. Operations of the Hebert Canal structure in concert with the proposed levee along the GIWW will impound over 5,478 acres of marsh south of the School Board levee and 7,800 acres of (primarily) agricultural lands to the north of the School Board levee. The structure will restrict flow, reducing sediment deposition and decreasing the area's ability to rebuild soils structure in the marsh, which will in turn accelerate subsidence and increase potential cumulative effects associated with relative sea level rise.

As the effects of flow restriction accumulate over the course of the project life, operations of the structure over time will accumulate adverse impacts associated with reduced sediment. Reduction of sediment recruitment into the LVRWP project area is likely to reduce accretion and lessen soil building processes over the life of the project, consequently exacerbating the effects of subsidence and relative sea-level rise, and the adverse impacts associated with ongoing and future agricultural practices (soils loss via erosion and compaction, physical and chemical changes to soils structure, and reduction of soils viability).

The structures would be managed to prevent saltwater intrusion and mitigate flooding in support of agricultural surface use. Soil degradation (chemical applications, nutrient loading, salinization) associated with past, current, and future surface-use practices would be offset to

some degree by the more consistent freshwater regime. However, as noted above, hydrologic impoundments and flood prevention plans have been correlated with reduced vertical accretion, decreased sedimentation and diminished soil-building process. Therefore, adverse impacts (soils compaction, tilling) associated with agriculture could possibly be exacerbated by the cumulative effects associated with flood prevention aspects of the proposed action.

Because these structures are intended to remain closed 100% of the time for the life of the project, operations of these structures will prevent sediment-laden waters from entering the project aera and preclude the soils building process that occurs during flood events. The area that would be affected by these structures is already partially impounded. The proposed action would effectively complete the impoundment, preventing tidal influence except under flooding events that exceed the levee and control structures. Consequently, it is likely that the areas behind the structures and inside the impounded areas would continue to subside over the life of the project. Cumulative impacts associated with these structures would be adverse and long-term over the course of the project life.

Alternative 3 – Structural and Levee Reinforcement

Cumulative Impacts During Construction

Direct impacts to soils during construction will be negligible and mitigated with BMP. Therefore, there are no cumulative impacts associated with construction of the project.

Cumulative Impacts During Operations

Hebert Canal Structure

The Hebert Canal structure and levee will complete the impoundment of 7,800 acres of agricultural lands north of the School Board levee. The structure will be operated in the closed position to provide consistent freshwater. Soils resources north of the School Board levee (7,800 acres) have already been impacted by agricultural practices, aquaculture impoundments, drainage channels. It is anticipated that soil degradation (chemical applications, nutrient loading, salinization) associated with past, current, and future surface-use practices would be offset to some degree by a more consistent freshwater regime. However, adverse impacts (soils compaction, tilling) associated with agriculture would continue and could possibly be exacerbated by the cumulative effects associated with flood prevention aspects of the proposed action. As noted above, hydrologic impoundments and flood prevention plans have been correlated with reduced vertical accretion of soils, decreased sedimentation and diminished soil-building process, which hinders an areas capability to offset subsidence. However, much of this area has been impounded and impacts associated with the Hebert water control structure would be minor.

Meaux's Ditch Water Control Structure

Impacts to soils resources associated with the proposed Meaux's Ditch structure are the same

as those discussed under Alternative 2 above.

5.2 Water

5.2.1 Water Quality

The watershed analysis used a "box" model to estimate water and salinity levels within the study area. A box model utilizes a mass-balance approach (Storage = Inflow – Outflow) to estimate material exchanges into and out of the study area. Materials in this analysis are water and salinity. The model domain utilizes 2018-era LiDAR elevation data as the basis for the stage-storage analysis routine. The model accounts for and utilizes the following boundary conditions: rainfall hyetographs; daily evapotranspiration estimates; northern freshwater inflow from the Hebert Canal; and downstream stage hydrographs from the GIWW.

The model is limited to analysis at the boundary and assumes level pool routing. Two precipitation/tidal years were analyzed for Alternative 2, a "representative" non-hurricane year (2018), and a year with multiple hurricanes (2020). Alternative 3 was only analyzed for a single non-hurricane year. Details, equations and data used as model inputs can be found in the full H&H report (See Appendix D).

Alternative 1 - No Action

The Alt 1- No Action would result in continued widespread flooding of agricultural lands and salinity contamination from abnormal high tides and storm surges. If unaddressed, flooding and saltwater intrusion from storm surges and abnormal high tide events will likely continue to encroach further inland, with resultant saltwater-related water quality impacts worsening as flood waters encroach on the project area's limited freshwater supply, which flows from the north. During the dry season (July - October) salinity levels increase in the northern watershed due to a combination of abnormal high tides and lack of freshwater flowing downstream from the Vermilion River. Should existing conditions persist; salinities will continue to significantly and negatively affect water salinity levels in the LVRW. (See **Figure 14**)

Alternative 2 – Preferred

The proposed alternatives described in **Section 4.3** were developed to address the salinity, and drainage issues indicated in previous sections. Under current trends, relative sea level rise will continue to push rising water and salinity further north into the project area, and the proposed alternative will serve to mitigate these impacts. The hydrologic model and report were developed to further refine and evaluate the potential salinity mitigation benefits and anticipate impacts associated with the preferred alternative. Each proposed structure location was analyzed separately due to lack of hydraulic connection between them.

Below is a list of the structures and their locations:

1. Proposed Structure #1 – Hebert Canal (HC)
2. Proposed Structure #2 – Meaux's Ditch (MD)
3. Proposed Structure #3 – Unnamed Canal (UC)

Control Settings (Gate configuration).

The purpose for the different control settings is to mitigate any impacts to marine organisms assess to essential fish habit within the project area. The control settings **Figure 14** shows the predicted results of 2018 daily modeled conditions for Alternative 2 – Preferred, set during a representative year (2018). The Hebert Canal existing conditions for "No Action" were analyzed against the following Hebert Canal (S1) structural settings for the Alt 2 proposed action.

- HC Setting "Default" (S1) – This setting will be designed, managed and operated in the fully open position (10 – 14' tall x 10' wide gates open), which allows for an approximately 30% increase in flow area under the default setting. These are the settings by which the HC structure shall be operated under "average conditions". Average Conditions here are defined to mean any time during the year other than those described below (i.e. tropical storm/hurricane events, or dry season) to achieve and maintain unrestricted ingress and egress of marine organisms within the LVRW.
- HC Setting "Seasonal" (S2) – This setting will be managed and operated to maintain salinity and water level criteria as follows: salinity levels at-or-below 3 ppt., and maximum water level at 3.5 ft. NAVD88 (1.4 ft. MLG). The S2 setting consists of 6 /10 bay gates "open", including the boat bay. This setting is estimated to be used approximately 30-40 days, or roughly 10%, throughout the year, particularly during the dry/low water level season (Jul - Nov).

See Appendix D for Operations Plan details

The default setting (S1) was determined to accommodate the need for fisheries access and maintain the greatest ecological connectivity at the proposed location for the longest amount of time possible (approximately 90% of the year). The results of the model show a reduction in predicted average salinity and decrease in maximum salinity. **Figure 14** below shows the model's salinity results for S1 Default compared to the No Action. As shown in **Table 33**, the greatest predicted change in salinity occur in the month of August, which is a reduction of 0.30 ppt. The impact from this setting is minimal.

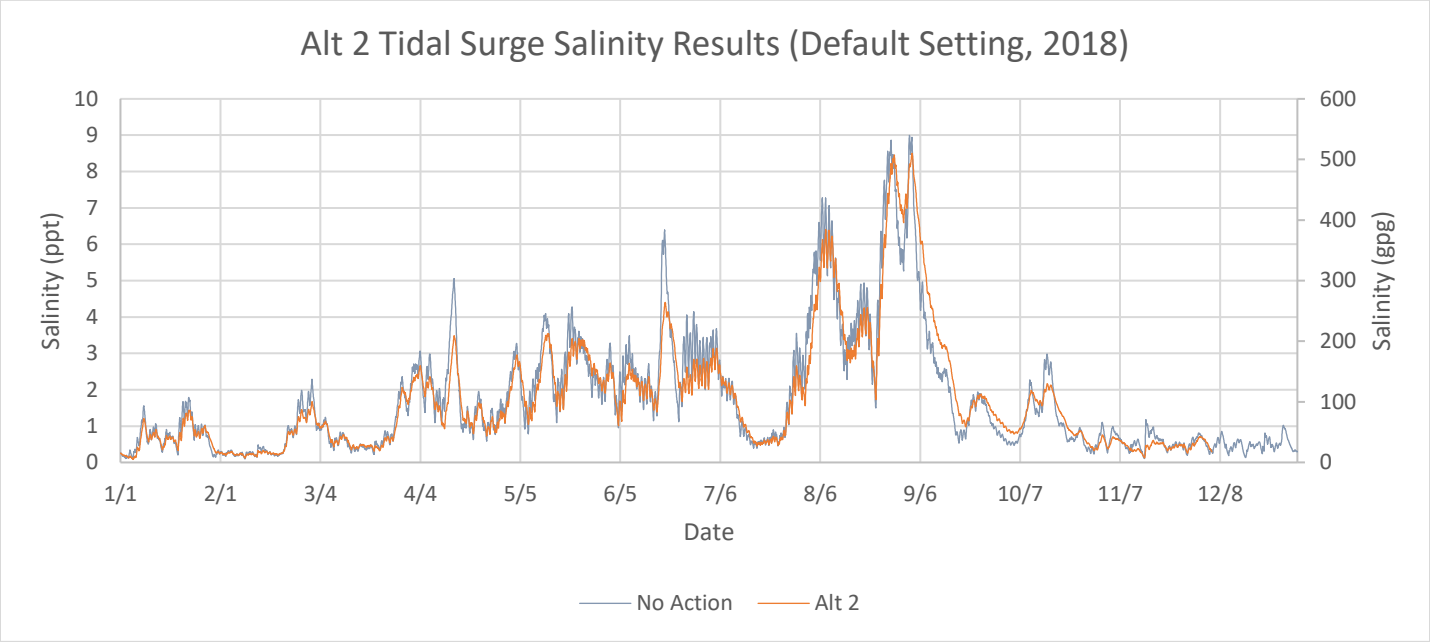


Figure 14. Alt 2 Modeled Salinity Results (HC S1 Default)

The seasonal setting (S2) was designed and analyzed with a goal of maintaining lower and average, yet reducing maximum, salinity levels. Additionally, this setting will accommodate the need for fisheries access and maintain the greatest ecological connectivity at the proposed location for the longest amount of time possible (approximately 90% of the year). The results of the model predict little impact to low and average salinity and a decrease in maximum salinities. **Figure 14**. below shows the model's predicted salinity results for S2 Seasonal compared to the No Action alternative. As shown in **Table 38**, the greatest change in salinity level is predicted to occur in the month of August, which is a reduction of 0.73 ppt. The impact from this setting is low, due to salinity remaining well above the amount needed to support marine organisms.

Table 38. Alt 2 Modeled Salinity Comparison (HC No Action, S1, S2)

Salinity (ppt)			
Month	No Action	Alt 2 (S1 Default)	Alt 2 (S2 Seasonal)
Jan	0.70	0.64	0.61
Feb	0.53	0.47	0.44
Mar	0.84	0.81	0.78
Apr	1.87	1.65	1.58
May	2.56	2.45	2.38
Jun	2.73	2.38	2.28

Jul	1.56	1.47	1.42
Aug	4.98	4.68	4.25
Sep	2.73	3.33	3.23
Oct	1.06	1.15	1.13
Nov	0.57	0.46	0.47
Dec	0.50	0.44	0.44

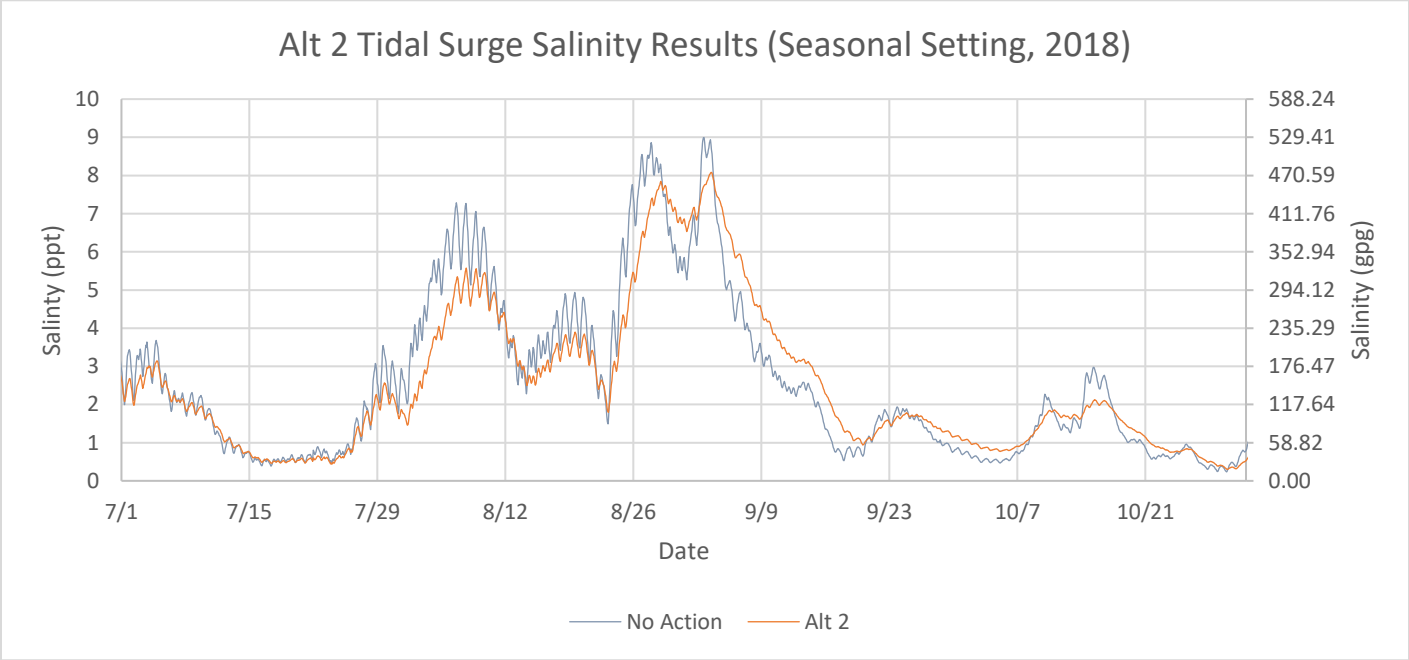


Figure 15. Alt 2 Modeled Salinity Results (HC S2 Seasonal)

Modeled Salinity Results –Storm Event

Figure 16 depicts the model analyses for the year 2020, when Hurricanes Laura and Delta made landfall on the southwest Louisiana coast in late August and early October, respectively. There was also an abnormal high tide event in mid-September. The modeled scenario utilized the structural storm setting (S3) with 100% gate closures for the period two days before until two days after each hurricane. All gates act as flap gates to allow outflow during closure. The model predicts that peak salinity is reduced during the peak of the surge, and that salinity levels reduce slower immediately following a storm event as compared to the no action alternative. It is believed that the predicted slow drawdown of the salinity level is due to the levee improvements which are part of this project. That levee hardens a portion of LA 333, which is regularly overtopped today during tidal events and tropical storm surges. Results show the project area remains protected during the abnormal high tide event seen in late July and mid-September. The impacts to salinity in the project area are low.

- HC Setting “Storm” (S3) - Within two to three days of a storm surge event, all gates

(10/10) will be closed to prevent storm surge from entering the canal. Flap-gates will remain unlocked to allow water to flow downstream, or out of the system. Once practically safe to do so, the gates will be re-opened to it's default setting. Historically, surges have taken as long as 3 weeks to subside following major hurricanes, though one week is typical.

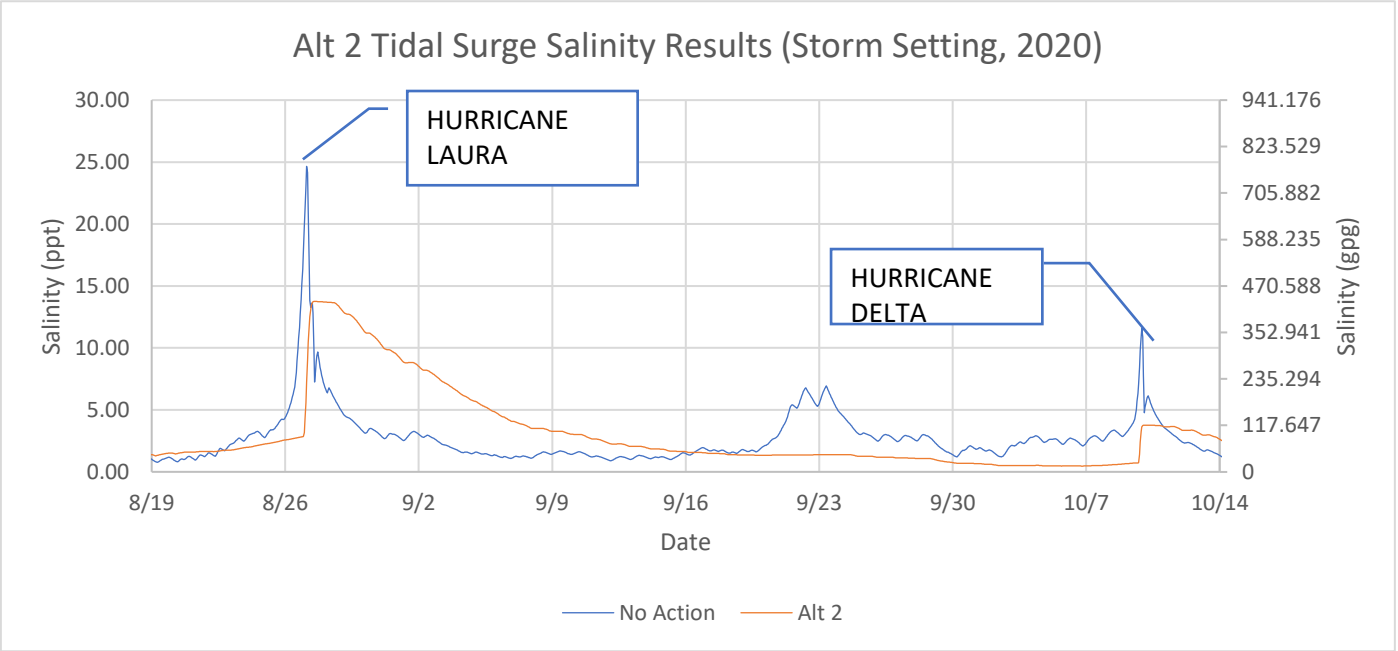


Figure 16. Alt 2 Modeled Salinity Results- (HC S3 Storm 2020)

Hebert Canal Structure Summary of Impacts (Alt 2 – S1, S2, S3)

Based on the modeled results for each of the following settings, implementation of Alt 2 would have low impacts to water quality.

- S1 - Default: During a representative year (2018), the level of impact is low due to very little reduction in channel flow area
- S2 - Seasonal: During the seasonal period of July to Nov 2018, the level of impact is low, due to reductions in salinity of approximately 15% - 20%. Salinity remains well above the minimum required to sustain marine organisms
- S3 - Storm: During an extreme storm event year (2020), the level of impact is moderate due to tropical storm surges able to overtop the levee and structure control elevation of 6 ft. NAVD88

HC structure and protection levees would provide protection from tidal events and storm surges up to 6 ft. NAVD88, thus maintaining slightly reduced salinity levels within the HC watershed. However, Alt 2 (under the S3 setting) would not provide protection against hurricanes, tropical storms or tides that exceed 6 ft. NAVD88. The model indicates that flood protection levees at the GIWW would hold high salinity floodwaters inside the project area, resulting in a temporary adverse effect to salinity. The model predicts that during a tropical storm surge event, the control structure and levee improvements reduce the peak salinity, but the drawdown in salinity is more gradual than the No Action alternative, and takes approximately 2-3 weeks to return to normal levels. The protection elevation of 6 ft. NAVD88 matches the existing protection system of the region, and local officials feel this elevation provides the proper benefit and associated cost to their constituents who are the producers, residents, and stakeholders of the region.

Meaux's Ditch/Unnamed Canal (PS1) Impacts

Meaux's Ditch and Unnamed Canal are not hydraulically connected to the HC, except during extreme tropical storm surges which overwhelm the entire project area. The predicted salinity impacts to the Meaux's Ditch and Unnamed Canal are low, and are expected to be comparable to the impacts seen to the project area upstream of the HC. The preceding are based upon the engineer's opinion upon analysis of the elevation data for the project area. Sampled fisheries species here are limited to catfish, which can survive in fresh and brackish water.

Salinity Impacts to Adjacent Areas

The salinity impacts to adjacent areas from the proposed action are insignificant. The time-to-rise of tides and storm surges are long allowing these slow-moving waves time to disperse to other coastal areas before local increases in water surface elevation relative to No Action.

Alternative 3 - Structure and Levee Reinforcement

Alt 3 was analyzed for a single representative year (2018). Details, equations and data used as model inputs can be found in the full H& H report (See Appendix D).

Modeled Salinity Results – Representative (2018)

Alt 3 is a protection option for the portion of the project area lying north of the schoolboard levee. This protected area is mostly agricultural land, and is bisected by the HC. Model predictions are that Alternative 3 will reduce salinity to 0 ppt (see **Figure 17**). This is due to the preferred structural operational setting of 100% closed all year long. As shown in the figure below, Alternative 3 will have a significant impact on salinities levels in the protected area. The reduction in salinity levels will provide agricultural producers with fresh surface water throughout an average year.

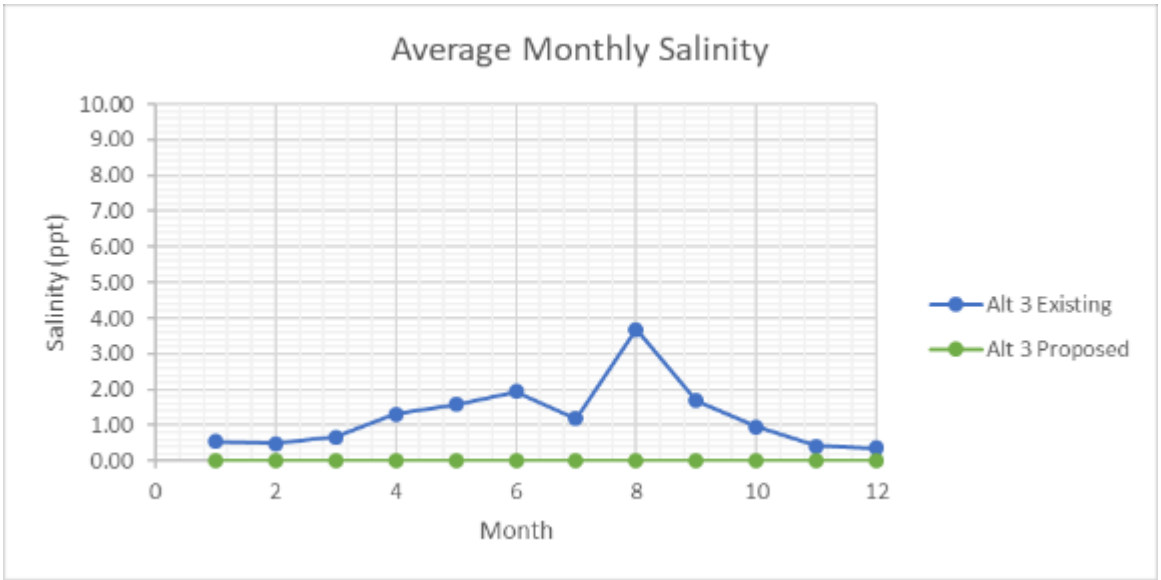


Figure 17. Alternative 3 - Average Monthly Salinity Comparison

(See Appendix D for hydrologic analysis report)

5.2.2 Water Quantity

Alternative 1 – No Action

The existing, No Action, conditions with respect to water levels will have significant impacts to the project area. During the hurricane season (June-November) water levels will continue to negatively impact the study area due to an increase in tidal levels caused by tropical storms and hurricanes.

Alternative 2 – Preferred

Modeled WSE Results – Representative (2018**Figure 18** shows the predicted (2018) daily water surface elevation (WSE) for Alternative 2 – Preferred, set during a representative year. The Hebert Canal predictions for "No Action" were compared against the three Hebert Canal structural settings for the Alt 2 proposed action (S1, S2, S3).

The default setting (S1) was designed to accommodate the need for fisheries access and maintain the greatest ecological connectivity at the proposed location for the longest amount of time possible (approximately 90% of the year). Model results predict a small decrease in average WSE and decrease in maximum WSE (**Figure 18)**. Below are shown the model's predicted WSE results for S1 Default compared to the No Action. As shown in **Table 35**, the greatest predicted change in average monthly WSE is a small increase in the months of March. The impact from this control structure setting on WSE is low.

Figure 18. below shows the modeled WSE results for S2 Seasonal compared to the No Action For the seasonal setting (S2), the results of the model predict a reduction in average WSE and a decrease in maximum WSE. As shown in **Table 39**, the greatest predicted change in average monthly WSE occur in the months of December. The impact on water quantity from this setting low.

Table 38. Alt 2 Modeled WSE Comparison (HC No Action, S1, S2)

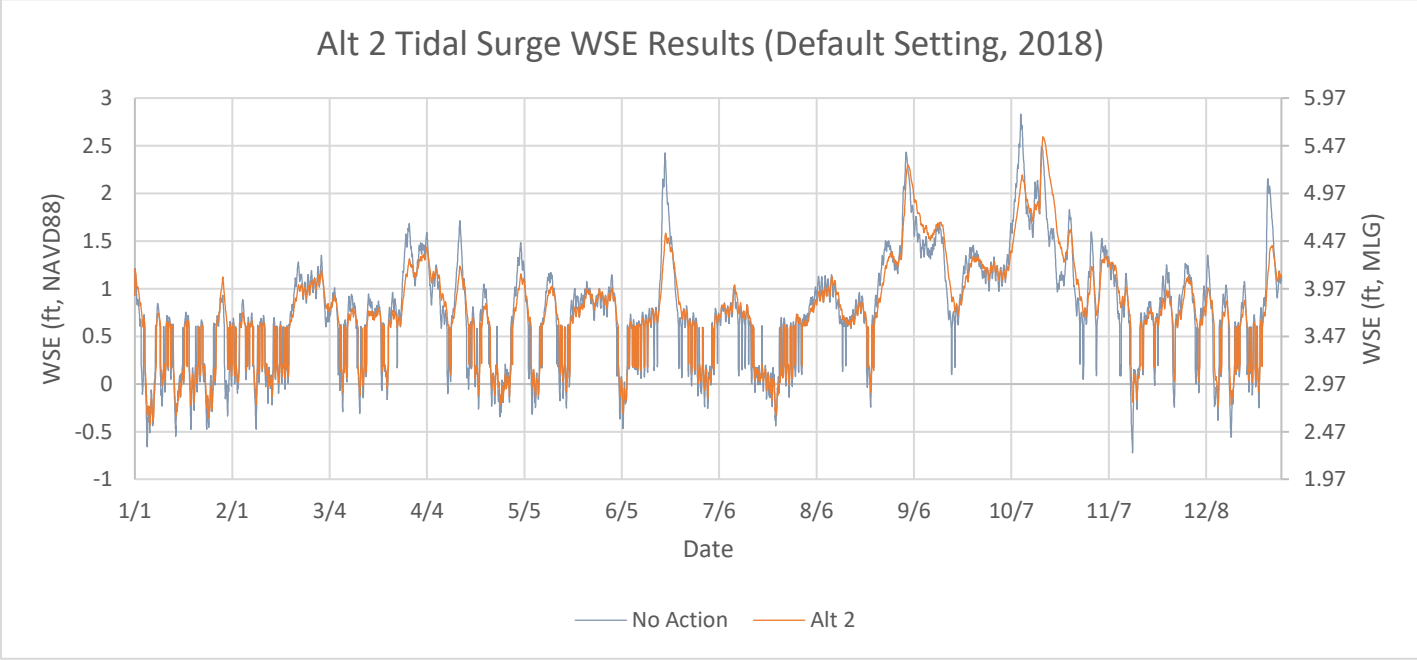
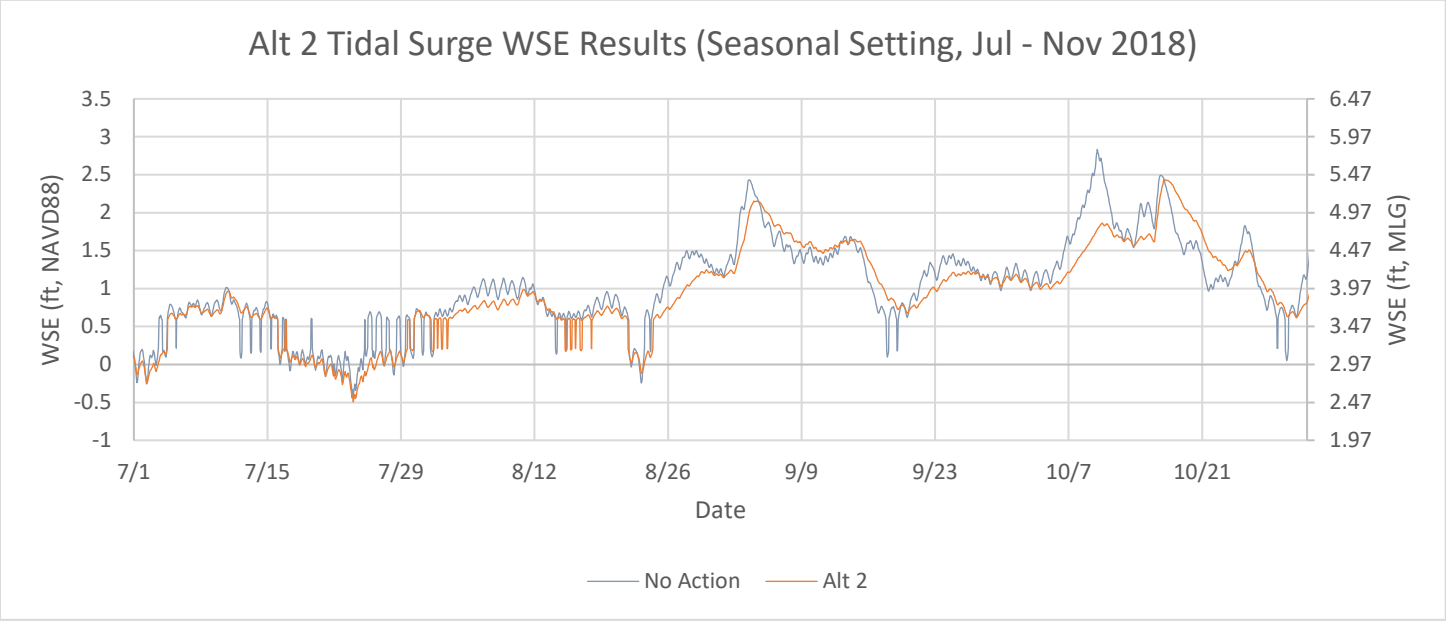


Figure 18. Alt 2 Water Surface Elevation Results for Hebert Canal (S1 Default 2018)

Figure 19. Alt 2 Water Surface Elevation Results for Hebert Canal (S2 Seasonal 2018)



The preferred alternative imparts a moderate impact to water levels within the LVRW that would otherwise be influenced by unpredictable high tides. **Figure 19** shows the model's prediction that during storm events similar to Hurricanes Laura and Delta in 2020, the control structure will decrease the peak WSE from the storm surges. For storm surges greater than 6 ft. NAVD 88, the slower drain-down following the peak surge causes a moderate increase in WSE on the descending limb of the hydrograph. The model predicts the study area remains protected during the abnormal high tide event seen in late July and mid-September. The protection elevation of 6 ft. NAVD88 matches the existing protection system of the region, and local officials feel this elevation provides the proper benefit and associated cost to their constituents who are the producers, residents, and stakeholders of the region.

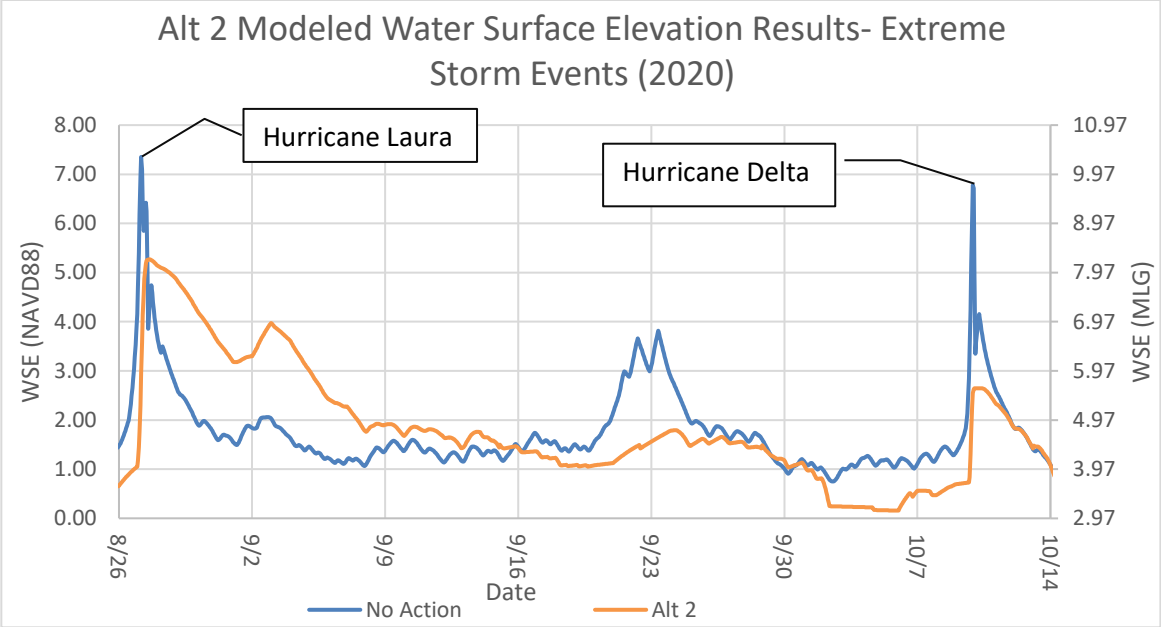


Figure 20. Alt 2 Modeled Water Surface Elevation Results- Extreme Storm Events (2020)

Overall, Alternative 2 will would protect a larger area during a non-hurricane year more effectively than a hurricane/storm year. As depicted in **Figure 20,** this alternative will not protect the project area from hurricanes orstorm related events that exceed the 6 ft. NAVD88. If the proposed structure is left in the "closed" position (all gates closed) for the duration of the storm, and opened up 100% (all gates open) after the storm, the inundation period after the storm will be longer and water levels will be higher than existing conditions. During tidal surges less than 6ft NAVD88, shown **in Figure 18** from late July and mid Sept, the water levels will remain at a constantaverage marsh level range of 1.4 – 2ft NAVD88.

Meaux's Ditch/Unnamed Canal Structure Impacts (Alt 2 – Water Level)

Meaux's Ditch and Unnamed Canal are not hydraulically connected to the HC, except during extreme tropical storm surges which overwhelms the entire project area. The predicted WSE impacts to Meaux's Ditch and Unnamed Canal are low, and are expected to be comparable to the impacts seen to the project area upstream of the HC. Specifically, it is predicted that the peak WSE from hurricanes or storm related events that exceed the 6 ft. NAVD88 elevation will be reduced, but there will be a delayed drain down of the surge flood. The preceding is based upon the engineer's opinion upon analysis of the elevation data for the project area.

Impacts to water levels in adjacent areas

The impacts to water level in adjacent areas from the proposed action are insignificant. The time-to-rise of tides and storm surges are long allowing these slow-moving waves time to disperse to other coastal areas before local increases in water surface elevation relative to No Action.

Alternative 3 – Structure and Levee Improvements

Modeled results

This alternative will have a moderate effect on the water levels upstream of the Alt 3 control structure. A comparison of "No Action" and the proposed Alternative 3 WSE results are shown in **Figure 21.** Monthly average WSE results are shown in **Figures 22.** It is expected that less ecological connectivity is required in this area and therefore all gates were modeled as closed for the duration of the year.

Impacts to water level from the following actions are as follows:

- Proposed Hebert Canal Structure/levee improvements - Moderate
- Proposed Meaux's Ditch Structure - Low
- Proposed Unnamed Canal Structure - Low

Note: It is predicted that the structures and levees for Alternative 3 will reduce the peak WSE from hurricanes or storm related events that exceed the 6 ft. NAVD88 elevation, but there will be a delayed drain down of the surge flood.

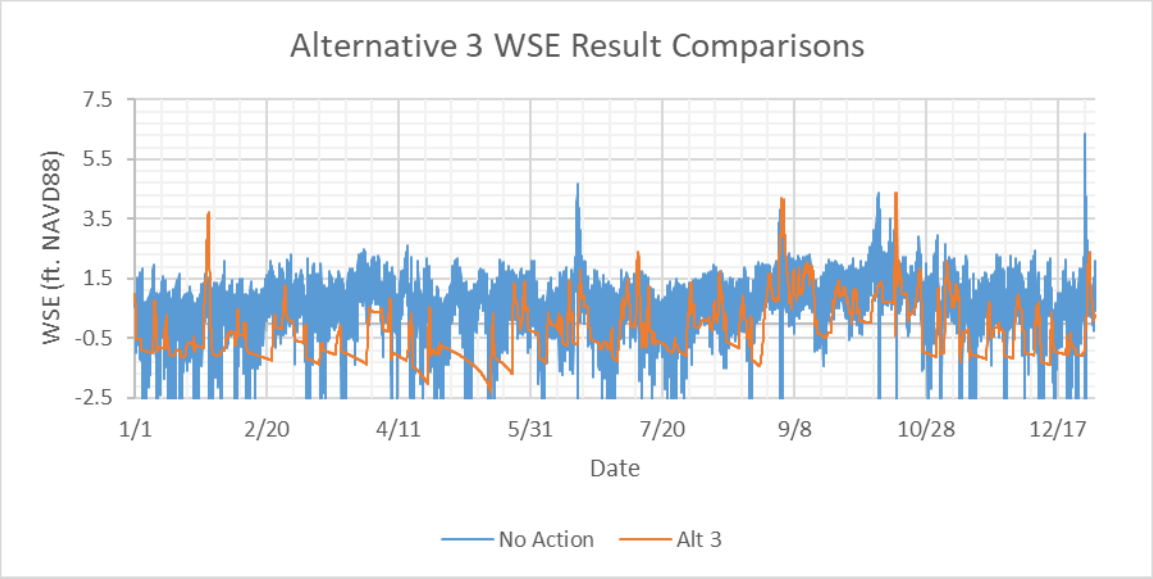


Figure 21. Alternative 3 Model WSE Result Comparisons

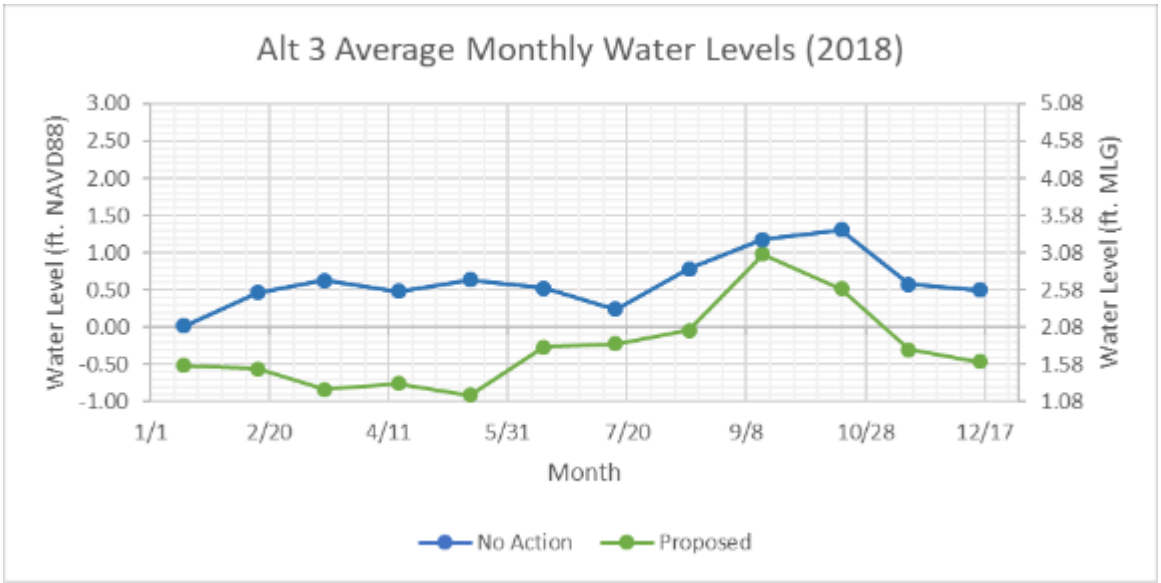


Figure 22. Alternative 3 Average Monthly Water Levels

The Alternative 3 model shows similar results to Alternative 2. Average monthly WSE and salinity were reduced for all months. This was expected due to the limited hydraulic connectivity caused by closing all of the gates. Maximum WSE within the study area are higher at some times than on the exterior. This is due to rain events within the study area increasing WSE faster than the drainage capacity of the structures. (See **Appendix D** for hydrologic analysis report)

Cumulative Impacts
Water Resources
Geographic and Temporal Extent of Analysis

Because impacts to water resources are anticipated to be localized within the project area, the geographic scope of this analysis is the LVRWP project area. The temporal scope used in this analysis is the life of the project (fifty years).

Past Actions

- Channelization (GIWW, Hebert Canal, Meaux's Ditch, interior channels in LVRWP)
- TVFWD operations
- Agricultural practices (water withdrawal, nutrient runoff) alter salinity and water levels

Present Actions

- Channelization continues to provide conduits to saltwater
- TVFWD management of water flow in the Teche-Vermilion basin.
- Agricultural practices (water withdrawal, nutrient runoff) alter salinity and water levels

Future Actions

- Channelization noted above will continue to act as conduits for saltwater intrusion
- TVFWD will continue to manage water levels in the LVRW
- Water Quality

Alternative 1 – No Action

Without intervention nor action plans, water quality in the project area would be impacted. Lasting impacts would include a decrease in overall water quality due to an increase in salinity levels and sedimentation from storm erosion, and transitional changes in water quality further north through channels leading into inland waterways.

Alternative 2 – Preferred

Cumulative Impacts During Construction

Impacts to water quality during construction would be negligible. Therefore, no cumulative impacts are considered for the construction phase of the project.

Cumulative Impacts During Operations

In conjunction with the past, present and future effects, it is anticipated that the project would serve to increase beneficial effects of water quality improvements associated with the Teche-Vermilion Freshwater District. It is anticipated that the project would offset the saltwater intrusion issues associated with navigation and drainage channels in the LVRWP area. It is also expected that by managing salinity and water levels, that the effects of the proposed action would moderate adverse effects associated with water withdrawals for agricultural use.

Alternative 3 - Structure and Levee Improvements

Cumulative Impacts During Construction

Impacts to water quality during construction would be negligible. Therefore, no cumulative impacts are considered for the construction phase of the project.

Cumulative Impacts During Operations

The proposed action is anticipated to affect only the area north of the school board levee, maintaining water levels and reducing salinity to 0 ppt for agricultural use, and providing some flood protection. The project is anticipated to enhance the beneficial components provided by the freshwater management of the TVFWD and further regulate water availability and movement within the interior canals (Meaux's Ditch, Hebert Canal and associated drainage channels). The project effects are anticipated to offset saltwater intrusion via Hebert Canal, and moderate the impacts of agricultural water withdrawals within the area by maintaining 0 ppt at a consistent WSE.

Water Quantity

Alternative 1 – No Action

Without intervention or action plans, there would be negative impacts to water quantity within the project area. The frequency of flooding and tidal surges would be predicted to increase with rising sea levels, and transition of landscapes from intermediate wetlands to open water.

Alternative 2 - Preferred

Cumulative Impacts During Construction

Impacts to water quantity during construction would be negligible. Therefore, no cumulative impacts are considered for the construction phase of the project.

Cumulative Impacts During Operations

The action would offset adverse effects of past, present and future navigation and drainage channels by managing water levels and salinity more consistently. Alternative 2 will have negligible or increase beneficial effects associated with the TVFWD operations. It is anticipated that the action would offset adverse impacts associated with agricultural water withdrawals.

Alternative 3- Structure and Levee Improvements

Cumulative Impacts During Construction

Impacts to water quantity during construction would be negligible. Therefore, no cumulative impacts are considered for the construction phase of the project.

Cumulative Impacts During Operations

The proposed action would affect areas north of the school board levee, maintaining water levels for agricultural use, and preventing some flood events. The project is anticipated to enhance the beneficial components of the TVFWD operations and further regulate water availability and movement within the interior canals (Meaux's Ditch, Hebert Canal and associated drainage channels). The project effects are anticipated to offset saltwater intrusion via Hebert Canal, and moderate the impacts of agricultural water withdrawals within the area by managing water levels. The action is designed to offset adverse water quantity issues associated with the primary conduits (GIWW, Hebert Canal, Meaux's Ditch) to storm surge and tidal flooding. However, models indicate that the action has potential to periodically exacerbate water quantity issues, showing higher WSE inside the structure due to rain events that increase the WSE faster than the drainage capacity of the structures.

5.3 Air Quality

Alternative 1 - No Action

The No Action alternative would require occasional use of mobile emissions sources for the continued operationsand maintenance (e.g., mowing, localized levee repairs) of existing levees and structures.

Determination: The No Action Alternative would result in occasional temporary minor localized adverseimpacts to air quality. There would be no change to air quality status in the project area.

Alternative 2 – Preferred

Implementation of the proposed action will require the use of mobile emissions sources including, but not limitedto passenger vehicles and trucks, tractor trailers, machinery and heavy equipment (bulldozers, cranes, backhoes, etc.), boats, and possibly non-mobile sources/generators. Emissions will occur during all phases of project implementation (clearing and site preparation, staging, construction, clean-up, plantings, final inspections). Emissions sources will primarily be operated on site, but also in transit to locations and between staging and construction areas. Timing of construction activities is rarely predictable or patterned, thus emissions are likely to be intermittent throughout the day. Construction activity can also be interrupted by weather delays. Emissions are anticipated to be intermittent and concentrations varied depending upon the number of sources in operation simultaneously.

Clearing and site-preparation that result in exposed soils and soil disturbance where surface conditions are dry have potential to increase suspended particulate matter (PM) and dust, causing localized increase of PM2.5 and PM10 concentrations. Operation of mobile sources will result in localized increase in concentrations of NationalAmbient Air Quality Standard (NAAQS) with potential to adversely affect air quality within close proximity to the source; however, levels will dissipate within a short time as wind evacuates emissions, and/or with cessationof engine/source activity. Emissions sources associated with the action are identified by the LDEQ as immeasurable and minimal sources of pollutants, and as such do not require an LDEQ Air Quality Permit.
Continuing operations and maintenance will require mobile sources of emissions over the life of the project. Regular monitoring and management of water control structures, maintenance of structures, and levee maintenance and repairs will require appropriate service vehicles and equipment. Emissions associated with operations and maintenance will produce similar effects as those described above.

Determination: The proposed action will result in immeasurable and intermittent adverse effects to air quality within highly localized areas during operation of emissions sources.

Effects will be short-term and are not anticipated to cause non-attainment within the project area or region. No long-term impacts are anticipated as a result of the proposed action. The proposed action would not result in significant adverse effects to air quality.

Alternative 3 - Structure and Levee Improvements

Similar to Alternative 2, implementation of the proposed action will require the use of mobile emissions sources including, but not limitedto passenger vehicles and trucks, tractor trailers, machinery and heavy equipment boats, and possibly non-mobile sources/generators. Emissions will occur during all phases of project implementation. Emissions sources will primarily be operated on site, in transit, and between staging and construction areas. Timing of construction activities is rarely predictable or patterned, and so emissions are likely to be intermittent throughout the day. Emissions are anticipated to be intermittent and concentrations varied depending upon the number of sources in operation simultaneously.

Similar to Alternative 2, clearing and site-preparation for the two water control structures and for the construction of new levee systems may result in exposed soils and soil disturbance. When surface conditions are dry, these will have potential to increase suspended particulate matter (PM) and dust; causing localized increase of dust particles of PM2.5 and PM10 concentrations. Operation of mobile sources will result in localized increase in concentrations of NationalAmbient Air Quality Standard (NAAQS) with potential to adversely affect air quality within close proximity to the source; however, levels will dissipate within a short time as wind evacuates emissions, and/or with cessation of engine/source activity. Emissions sources associated with the action are identified by the LDEQ as immeasurable and minimal sources of pollutants, and as such do not require an LDEQ Air Quality Permit.

Continuing operations and maintenance will require mobile sources of emissions over the life of the project. Regular monitoring and management of water control structures, maintenance of structures, and levee maintenance and repairs will require appropriate service vehicles and equipment. Emissions associated with operations and maintenance will produce similar effects as those described above.

Determination: The proposed action will result in immeasurable and intermittent adverse effects to air quality within highly localized areas during operation of emissions sources. Effects will be short-term and are not anticipated to cause non-attainment within the project area or region. No long-term impacts are anticipated as a result of the proposed action. The proposed action would not result in significant adverse effects to air quality.

Compliance and Best Management Practices

Best management practices (BMP) to reduce temporary impacts during construction include:

- Minimize idling time between active work periods.
- Application of water to abate dust in areas of ground disturbance.

- Insure proper exhaust mechanisms on all machinery and equipment.

5.4 Vegetation

5.4.1 Wetlands Habitat and Riparian Areas

Alternative 1 - No Action

Effect on wetlands habitat and vegetation communities resulting from implementation of the proposed subwatershed improvements (described in **Section** 4.3.2) would be direct and indirect, short-term and long-term. In assessing the anticipated wetland impacts with and without the project, the Wetland Value Assessment Community Model was used to calculate both cumulative and annualized impacts in habitat units. The current emergent marsh habitat site index (HSI) was calculated at a 0.81 value.

Impacts to wetlands and riparian habitat from the no action alternative is minimal. Despite the previous development of numerous canals, levees, and roads over the years, a review of historical imagery of the VermilionRiver – Frontal Intracoastal Waterway watershed does not depict a substantial loss of total wetland habitat in thisarea. A review of the Coastal Reference Monitoring System (CRMS) vegetation type changes within the study area from 1973 to 2013; however, depict a transition from freshwater marsh habitat to intermediate and brackishmarsh habitat, likely due to increased salinity levels. A continued shift from freshwater marsh habitat to intermediate or brackish marsh habitat will likely persist if no action is to occur to control the ingress of saltwater. Not implementing any of the proposed alternatives will likely result in a continued hydrologic connection betweenthe existing wetlands, the Gulf Intracoastal Waterway (GIWW), and surrounding waters along with an increasinginflux and encroachment of saltwater intrusion. The no action alternative would cause a marginal, yet persistent decrease in the overall percentage of emergent marsh vegetation and aquatic species due to increasing salinity levels and impacts from storm erosion. It could be predicted that with decreased species richness, a dominance of salt-tolerant vegetation would persist until marsh habitats would eventually become open water due to rising sea levels and changes in water quality. Invasive species, such as hydrilla and water hyacinth, would have the potential to out compete other native species as environmental conditions changed overtime; eventually resulting in salt marsh die-back. Powdery thalia, freshwater special status plant, populations would potentially decrease as well as suitable habitat disappeared. From an economic standpoint, the increasing salinity levels will likely result in a diminished rice crop in the adjacent agricultural areas. Recreational fishing of freshwater species may also be negatively affected due to the increased salinity within Hebert Canal and Meaux Ditch. Invasive species may block waterways and impede navigation for boats and other aquatic crafts traveling in the area.

The anticipated emergent marsh HSI without project implementation is 0.81 after year 1 and 0.71 after year 20. The decline in habitat quality is mainly attributed to a reduction in the overall percentage of emergent marsh, increased water depth in open water areas, and the increased salinity levels. Moreover, the open water HSI showed similar results. The open water HSI was calculated at 0.50 after year 20 without project implementation versus an HSI calculation o 0.57 after year 20 with project implementation.

Alternative 2 – Preferred Action

Impacts to wetlands and riparian habitat from the construction and operation of the preferred Alternative 2 may be both short- and long-term (more than 5 years). The proposed location of the Hebert Canal water control structure near its confluence with the GIWW may pose long-term impacts to the surrounding wetlands. The current Plan of Operations for Alternative 2 is that the control structure at the Herbert Canal will be left "open" to allow access to both fisheries and aquatic ecosystems. This "open" position means that the flap gates are placed in the raised position to allow tidal flow. This provision would yield the least change to water flow, water levels, and salinity and provide maximum ingress/egress access for fisheries. Operational criteria which will cause the structure to be "closed" are based on specific circumstances (storm events, tidal surge, salinity levels) which support the project purpose of flood reduction/prevention. This is to prevent the high probability of saltwater intrusion further up the channel system; by which soil and vegetative conditions would be affected. On an average, low-risk day, this water movement encouraged by an "open" system would allow and create soil and water conditions for the germination of desirable plants, control nuisance vegetation, promote the production of estuarine fish and invertebrates, and make foods available for wildlife that depends on wetlands. With sustaining current marsh conditions, invasive plant species, such as hydrilla and water hyacinth, would be deterred from populating within the AOI as these species require more saline habitats in order to thrive. Other vegetation, such as powdery thalia (Special Status Plant), grow in freshwater habitats and so would have a higher potential to reproduce in marshes with lower saline conditions.

The anticipated emergent marsh HSI with project implementation is 0.76 after year 1 and 0.78 after year 20. This increase is a result of the anticipated growth of emergent marsh areas and aquatic vegetation as well as a reduction in overall salinity levels. The results of the model show a net increase in annualized emergent marsh habitat units with the project verves without the project.

The Lower Vermilion River Watershed Plan structure operation schedule proposed to reduce salinities to no higher than 3 parts per thousand (ppt) conducive to the maintenance of fresh to intermediate marshes. Intermediate marshes are characterized by salinities of 0 to 5 ppt, and fresh marsh is characterized by salinities of0 ppt (CWPPRA 2016

(cwppra.wordpress.com/tag/intermediate).

The closest Coastwide Referencing Monitoring System (CRMS) station, located about 2 miles SE of the mouth of the Hebert Canal south of the GIWW, has had an average salinity of 2.4 ppt from 2008 to May 2021 (https://www.lacoast.gov/crms_viewer/Map/CRMSViewer, CRMS Station 2041). The proposed operational plansalinity target for the project area is for salinities to be no higher than 3 ppt. Therefore, the project is not expectedto reduce salinities significantly below current conditions. If salinities are not significantly reduced below currentconditions, there may be little chance the existing fresh-intermediate marshes will convert to total fresh marshes.Current intermediate project area marshes are capable of withstanding short-term storm-induced salinity increaseswithout marsh loss. This is evidenced by the lack of project-area marsh loss except the storm scoured open waterarea north of Bayou Chen from tidal surges from hurricanes Katrina and Rita in 2005.

Higher salinity waters pushed into the project area from tropical storms and hurricanes could increase project areasalinities to levels not tolerated by fresh marsh vegetation. The result would be vegetation die-back and conversion of the affected area from marsh to open water. This would occur because more salt tolerant intermediate marsh vegetation would not have time to invade the areas killed by the higher salinities. This scenario would likely happen because current project area levees are not high enough to prevent tidal surges over4-6 feet. Tidal surges recorded in the Watershed equaled greater than 6 feet in late August 2020 as a result of Hurricane Laura (https://www.lacoast.gov/crms_viewer/Map/CRMSViewer, CRMS Station 2041).

Therefore, reducing salinities in the project area significantly below 3 ppt would lead to the gradual conversion of the area fresh-intermediate marshes to fresh marshes that will be less likely able to survive increased storm- induced salinities. With continued marsh loss, the agricultural areas north of the current intermediate marshes would be more susceptible to water level and salinity increases during storms.

Economically, a decrease in salinity levels would allow continuation of rice and crawfish production within the area, as soil conditions and water quality support rice and crawfish agriculture. Soil conditions for pasture land would also be sustained, and would eliminate the need for producers to move livestock to other pasture land or reallocate resources to fix soils with salinity issues. Recreational fishing of freshwater species would most likely be sustained within the Hebert Canal and Meaux Ditch.

Possible short-term impacts from Alternative 2 include potential erosion from the construction sites, access, andtemporary uses during construction. There is also a potential for spills or leaks of industrial fluids during construction which could impact wetland and riparian vegetation, fish, wildlife, and soils. Construction and ground disturbance could result in the introduction or spread of invasive weeds into adjacent wetland and riparian

habitats.

Mitigation of Impacts: It is estimated that approx. 0.5 acres of possible wetlands may need mitigation in order to construct the HC control structures access levee. Estimated cost of mitigation is expected to be around $80,000. The cost for mitigation may be split between NRCS and the SLO.

Alternative 3 - Structures and Levee Reinforcement

Impacts to wetlands and riparian habitat from Alternative 3 will likely be minimal. The proposed water control structure within Hebert Canal is adjacent to an existing levee at the agriculture/marsh interface. This location would allow water to freely flow from the GIWW north into the Hebert Canal and into the surrounding marshes.No new restrictions of flow would occur within the wetland area, except to approximately 50 acres of intermediatemarsh west of Hebert Canal and south of the West Pump Off Canal.

The improvements of the levee system should also have a minimal to no long-term impact on the surrounding wetlands. The current levee system is north of the wetland area and does not affect the hydrologic flow from theGIWW and surrounding waters to the marsh. Levee reinforcement should not result in an indirect loss to wetlandhabitats or functions.

Similar to Alternative 2, vegetation biodiversity would have the potential to increase due to lower salinity levels and protection from storm erosion in channels. With higher biodiversity, marsh habitats could support a wider array of wildlife; both terrestrial and aquatic. If improved conditions are sustained native vegetation would be able to have greater success in competing with invasive species for resources such as sunlight, water, and nutrients. Special Status Plants, such as powdery thalia, would have the potential in reproducing and thriving as marsh and water quality conditions more closely resembled those that these species prefer.

Economically, a decrease in salinity levels would allow continuation of rice and crawfish production within the area, as soil conditions and water quality support rice and crawfish agriculture. Soil conditions for pasture land would also be sustained, and would eliminate the need for producers to move livestock to other pasture land or reallocate resources to fix soils with salinity issues. Recreational fishing of freshwater species would most likely be sustained within the Hebert Canal and Meaux Ditch.

Possible short-term impacts from Alternative 3 include potential erosion from the construction sites, access, andtemporary uses during construction. There is also a potential for spills or leaks of industrial fluids during construction which could impact fish and wildlife, wetland and riparian vegetation and soils. Construction and ground disturbance could result in the introduction or spread of invasive weeds into adjacent wetland and riparianhabitats.

See BMP’s mentioned in Ch7.3.2 Preferred Alternative

Alternative 1

With no action, no construction impacts will occur. Lasting impacts would result in continued changes in wetland habitats and vegetation biodiversity; eventually leading to open water due to increasing salinity levels and impacts from storm erosion.

Alternative 2 - Preferred

Impacts During Construction

Impacts to wetlands associated with construction would be negligible, therefore there would be no cumulative impacts during construction.

Impacts During Operations

It is anticipated that operations would moderate saltwater intrusion, yielding beneficial effects on 5,478 acres of emergent marsh, and offsetting the adverse effects of saltwater intrusion associated with navigation canals, specifically the GIWW. The action will have cumulative beneficial effects with past, present and future marsh restoration and management projects in SWLA that are designed to reduce the impacts of saltwater intrusion and restore coastal marshes. There is potential for salt scald and die-off of fresh marsh vegetation associated with flood events that exceed the proposed levee and structure, which would counter the effects of marsh management and restoration efforts in the SWLA coastal zone and exacerbate adverse effects of past, present and future operations of navigation and drainage channels that allow saltwater intrusion into region, causing vegetation type changes and die-offs. Cumulative effects are anticipated to occur over the course of the project life of fifty years.

Alternative 3- Structures and Levee Reinforcement

Cumulative Impacts During Construction

Reinforcing the School Board levee would potentially result in permanent or long-term conversion of marsh habitat associated with dredging and spoil placement. Impacts associated with construction would increase the adverse effects to wetlands that have occurred and will occur from past, present and future actions in the SWLA coastal zone. Cumulative impacts associated with conversion of marsh to open water would continue for the life of the project.

Cumulative Impacts During Operations

Impacts associated with operations of Alternative 3 would be negligible. Therefore, there would be no cumulative impacts associated with operations of Alternative 3.

5.4.2 Vegetation and Community Cumulative Impacts

Because of similarity in resource issues and potential effects from past, present and future actions, Land Cover Types, Special Status Plants, and Wetlands and Riparian Zones have been analyzed based on the geographic and temporal scales, and the past, present and future actions noted below.

Geographic and Temporal Extent of Analysis

The geographic scope of this analysis is the southwestern Louisiana (SWLA) coastal zone. The temporal scale used in this analysis is the project life (fifty years).

Past Actions

- The CPRA lists 88 projects in the Chenier Plain involving marsh management, hydrologic restoration, bankline or shoreline stabilization, levee improvements and diversions.
- USDA Farm Service Agency (FSA) 2007 Coastal Prairie Restoration Conservation Reserve Enhancement Program
- Leland Bowman lock
- Channelization – navigation channels (GIWW, Calcasieu Ship Channel, Freshwater Bayou, 4-Mile Canal) and oil and gas field canals and pipelines are conduits for saltwater resulting in erosion, and marsh conversion to open water
- Leveeing, drainage or diversion systems
- Conversion to cattle pasture and cropland, industrial and residential development, road and utilities rights-of-way cause habitat loss and fragmentation, and pollution

Present Actions

- Ducks Unlimited marsh restoration plan in Bayou Chene marsh
- Twelve CPRA projects pending in the Chenier Plain.
- USDS FSA Coastal Prairie Restoration Conservation Reserve Enhancement Program ongoing to restore 28,000 acres of native prairie.
- GIWW and regional channelization continues to increase adverse impacts associated with saltwater intrusion
- Ongoing agricultural practices and industrial activities continue to increase pollutants

Future Actions

- Calcasieu-Sabine Large-scale Marsh and Hydrologic Restoration Project
- Calcasieu Ship Channel Salinity Control Measures Hydrologic Restoration - increasing sustainability by reducing tidal action and interior salinity to marshes and water bodies
- Freshwater Bayou North Marsh Creation project - to build around 9,000 acres, create wetland habitat, maintain hydrologic barriers between inland lakes and navigation channels; and prevent Freshwater Bayou from continuing to enlarge and further erode interior marshes.
- Southwest Louisiana Coastal Master Plan
- NRCS marsh restoration project within the LVRWP project area
- GIWW continues to operate, providing a conduit for saltwater intrusion

5.4.3 Land Cover Types

Alternative 1

Without intervention nor action plans, there would be little cumulative impacts from construction equipment or design with Alternative 1 on land cover types. Lasting impacts would result in continued changes in wetland habitats and vegetation biodiversity; eventually leading to open water due to increasing salinity levels and impacts from storm erosion.

Alternative 2-Preferred

Cumulative Impacts During Construction

Affects during construction would be negligible. Therefore, there would be no cumulative impacts associated with construction of Alternative 2.

Cumulative Impacts During Operations

Of the land cover types in the LVRWP project area (see Chapter 3.5.2), the proposed action would primarily affect emergent herbaceous wetlands south of the School Board levee. The operations plan provides for management that supports the current land cover type (fresh-intermediate marsh). Therefore, the action would align with and increase the benefits of the marsh management and marsh restoration plans to manage for and restore emergent herbaceous wetlands throughout the SWLA coastal zone. There is potential for salt scald and die-off of fresh marsh vegetation associated with flood events that exceed the proposed levee and structure, which would counter the effects of marsh management and restoration efforts in the SWLA coastal zone and exacerbate adverse effects of past, present and future operations of navigation and drainage channels that allow saltwater intrusion into region, causing vegetation type changes and die-offs.

Other cover types in the LVRWP area (discussed in Chapter 3.5.2 Table 9) will not be appreciably affected by the action. Therefore, there would be no cumulative impacts to those cover types. Operations of the proposed Meaux's Ditch and "Unnamed" Canal structures would not add to cumulative effects, because the land cover types affected by those structures have already been converted from emergent herbaceous vegetation to agricultural lands.

Alternative 3- Structures and Levee Reinforcement

Cumulative Impacts During Construction

Impacts associated with construction would increase the adverse effects to land cover types that have occurred and will occur from past, present and future actions in the SWLA coastal zone. Construction would result in direct loss of ±2.5 miles of forested bankline habitat, ±7 miles of scrub-shrub bankline habitat and permanent or long-term conversion of as much as 80 acres of marsh habitat associated with the dredging and spoil placement. Cumulative impacts associated

with loss of forested and scrub-shrub habitat will occur for 30 years, if and until forested areas are allowed to revegetate, and possibly permanently if the levees are to be maintained. Conversion of marsh to open water would be permanent loss of marsh habitat in the Chenier Plain.

Cumulative Impacts During Operations

The land cover types in the area to be affected by Alternative 3 have already been converted for agricultural development. This alternative would have essentially no effect on land cover types and therefore, there would be no cumulative impacts.

5.4.4 Special Status Plant Species Federal/State Species

There are no state-listed threatened or endangered plant species within the watershed. There are nine state and/orglobal-ranked species that have potential to occur in the LVRWP area **Table 13.** One species, powdery thalia (*Thalia dealbata*) was observed, in an impounded area west of the Hebert Canal, during field investigations, however, not within an area of direct surface disturbance.

Alternative 1 – No Action

No federal-listed plant species or candidates for listing occur in the project area

Determination: No effect.

Under the No Action alternative, water regimes and salinity levels would continue to occur as they are now. Should those species listed in **Table 13** occur in the area, it is likely that continued and repeated inundation withhigh-salinity flooding would eventually cause salt-intolerant species to die off over time.

Determination: Potential for minor adverse impacts to salt-intolerant species.

Alternatives 2 - Preferred

Should LDWF-listed species occur in the LVRWP area, changes in water regimes and salinities would potentiallyresult in beneficial effects as the species in **Table 13** are associated with freshwater habitats.

Determination: Potential for long-term beneficial impacts to state-listed plants.

Alternative 3 - Structures and Levee Reinforcement

Similar to Alternative 2, should LDWF-listed species occur in the LVRWP area, changes in water regimes and salinities would potentiallyresult in beneficial effects as the species in **Table**

13 are associated with freshwater habitats.

Determination: Potential for long-term beneficial impacts to state-listed plants.

Compliance and Best Management Practices

Pre construction BMPs to reduce potential impacts to plants should they occur the area of impact include:

- Field surveys of all direct areas of impact prior to clearing and site preparations, and removal/transplantingspecimens to avoid adverse impacts

Cumulative Impacts

Alternative 1

Without intervention nor action plans, there would be little cumulative impacts from construction equipment or design with Alternative 1. Lasting impacts would result in continued changes in wetland habitats and vegetation biodiversity; eventually leading to open water due to increasing salinity levels and impacts from storm erosion.

Alternatives 2- Preferred

Impacts During Construction

Construction of Alternative 2 would have no effects on state and global ranked plant species. Therefore, there would be no cumulative impacts during construction.

Impacts During Operations

Operations of Alternative 2 have potential to yield long-term beneficial effects on state or globally ranked plant species, should they occur in the project area. The proposed action would add to the beneficial effects occurring via marsh and prairie restoration efforts throughout the Chenier Plain and the Coastal Prairies. There is potential for salt scald and vegetation die-offs during operations. Should that occur, the project would add to the negative impacts associated with navigation and drainage channels throughout the SWLA coastal zone. Cumulative impacts would occur throughout the life of the project.

Alternative 3- Structures and Levee Reinforcement

Impacts During Construction

Construction of Alternative 3 has potential to impact state or global ranked plant species, should they occur in the areas of direct impacts. Any loss of state or global ranked plants would further increase adverse effects to this resource throughout the SWLA coastal zone. Complete surveys of all areas of potential impact would be necessary to fully assess potential for cumulative impacts. Duration of cumulative impacts would depend upon the extent of impacts to plants and the range and distribution of plants in the SWLA coastal zone.

Impacts During Operations

Operations of Alternative 3 would have no effects on state and global ranked plant species. Therefore, there would be no cumulative impacts during construction.

5.5 Fish and Wildlife

5.5.1 Fisheries

Alternative 1 - No Action

Direct Effects

Under the No Action alternative, fisheries access to the project area will continue within the constraints of the existing water control structures, levees, and pump-off areas. The current control structures and levees reduce fisheries access to the northern portion of the project area north of the East-West Pump-off canals and the leveed agriculture area south of the west Pump-off Canal. The areas north of those canals consist of leveed agriculture lands with no current fisheries access. The No Action Alternative will have no impacts on Essential Fish Habitat of white shrimp and red drum species able to access the project area.

Indirect Effects

Over time, salt and brackish fisheries access will not be affected. The marsh condition will degrade due to continued storm surge and extreme high tide impacts to the project area, and conversion to saline marsh. This will affect the quality of the spawning habitat of the project area as evidenced by the fresh and intermediate water fisheries species sampled.

Cumulative Effects

The cumulative effects of other actions have led to the conversion of the project area's freshwater/brackish marsh to saline marsh. Anthropogenic changes to the region include the GIWW development, construction of the 4 Mile Cut, and construction and dredging of various, numerous oil and gas production canals. These developments have allowed the intrusion of saltwater further inland including into this project area. These projects have allowed the continual conversion of these marshes, and the No Action alternative will continue that trend.

Alternative 2 - Preferred

The Preferred Alternative will have slight to moderate impacts to estuarine fisheries and aquatic organism access into the watershed project area. This alternative will not alter the existing marsh and mud bottom

habitat therefore would have minor to moderate impacts to white shrimp and red drum estuarine fisheries species or their EFH. This was determined by evaluating the reduced fisheries impacts of the revised HC structure (Structure #1) on these species as well as other estuarine fisheries species. The proposed HC structure will provide access to the marsh and associated mud bottom habitats required by those species for approximately 90% of the year. This is primarily due to the design and operation of the Hebert Canal (HC) water control structure proposed to be located in the HC approximately 100 feet north of the Hwy 333 Bridge, north of the GIWW. We will discuss the effects from this alternative according to each construction activity listed below (See Appendix B for a project map of the proposed activity:

- Structure #1 - Proposed HC water control structure at GIWW
- Structure #2 - Proposed Meaux's Ditch (MD) structure at Hwy 333
- Structure #3 - Proposed Unnamed Canal structure at Hwy 333
- GIWW Levee - Levee along the GIWW/Hwy 333 (0.5 miles)

The following are details describing the potential impacts from installation, operation, and methods of minimizing/mitigating impacts to EFH, by each proposed structure under the default, seasonal, and storm settings.

Direct Effects

Structure # 1 (Hebert Canal)

Installation, Operations, and Design: Installing the HC structure in conjunction with the LA 333 levee may only slightly reduce estuarine fisheries access to fresh marsh habitat north and west of the proposed structure. As shown in the Operations Plan, this structure has multiple settings (S1 – S3) for various times of the year and environmental conditions.

S1 Default

The proposed HC structure design would allow that channel to remain 100% "open" during the normal operation period (approximately 90% of the year). This is based upon a design structure width of 100 feet, at a point 100 feet +/- north of the HC and the GIWW intersection. The structure, under its default setting with 9 bays and the single boat bay "open", would provide a cross sectional area for fisheries passage of 1,479 ft^2. The HC existing channel 100 feet north of Hwy 333 where the HC structure is proposed is currently 95-feet-wide. Thus the HC structure is approximately 5 feet wider than the existing 95-foot-wide HC channel. The HC structure would allow the channel to be "open" greater than 100% (1,479 ft2 vs. 1,084 ft2 = 7% greater flow area than existing) at the proposed structure location (Lower Vermilion River Watershed Structure Operation and Maintenance Plan 2022).

S2 Seasonal (Partial)

The structure would be partially open (6 of 10 bays open including the 12-foot-wide boat bay) during parts of the dry and/or low-water seasons, when high salinities are historically most negatively impactful to the project area. This period is an approximately 6 non-consecutive week per year period typically stretching from October through February, when salinities periodically exceed the 3 ppt target level. It is estimated that this "partial closure" period would occur approximately 10% of the time annually. See **Table 39.** for number of salinity readings greater than 3ppt

Table 39. Corps of Engineers Hebert Canal Salinity Data from 2016 to 2022

Year	Number of Salinity Readings > 3 ppt	Location
2022	8	HC @ Semmes (to Sept 22, 2022)
2021	1	HC @ Semmes, Jan 2021
2020	8	HC @ Hwy 82 (no readings at HC/Semmes)
2019	0	HC @ Hwy 82 (no readings at HC/Semmes)
2018	0	HC @ Hwy 82
2016	0	HC @ Hwy 82 (Very few readings)

(Corps of Engineers, Leland-Bowman Lock 2022)

Therefore, based on discrete Corps of Engineers' salinity data taken over a 3-year period (2020 to 2022), the total number of salinity readings greater than 3 ppt taken at the HC-Semmes Bridge or HC-Hwy 82 stations averaged 5.7 readings per year which equals to an average of 6 weeks a year because the reading were taken at intervals of 1 week apart. See **Table 39.**

S2 Storm

For this setting, the structure would be closed during major storms (tropical storms and hurricanes) for approximately 1 week for each tropical storm and 2 weeks for each hurricane (Operation and Maintenance Plan Agreement for the Lower Vermilion River Watershed, Vermilion Parish, LA, 2022). It is estimated that the major storm closure period would last approximately one month a year, closing the structure for approximately 5-8% of the year. Since this setting is designed to not reduce estuarine fisheries access to the project area, except immediately preceding and during tropical storms and hurricanes and during limited high salinity and water level periods, the structural storm setting would have slight to moderate impacts on estuarine fisheries and invertebrate species entering and leaving the LVRW project area.

<u>Structure # 2 (MD)</u>

Installation, Operations, and Design: Installing a water control structure in MD 0.25 mile west from the Vermilion River would only slightly impact fisheries because MD is already constrained by levees and roads to ±6 ft NAVD88 which prevent fisheries ingress/egress to surrounding areas. Lands adjacent to MD are leveed agricultural fields, which provide no fisheries habitat; there are no hydrologic connections to area marshes. Therefore, implementation of the action would reduce estuarine fish and invertebrate access to 1.5 miles of open water canal between the proposed structure and the existing MD structure. This is an area equal to 8.2 acres (~1.5 miles X 45-ft-wide) of canal open water and mud bottom habitats, which is not considered ideal fisheries habitat. Freshwater fish would be able to survive in the canal open water habitat post construction. This activity would cause very little impacts to estuarine fisheries or their EFH..

Structure # 3 (Unnamed Canal)

Installation, Operations, and Design: The environmental consequences to fisheries access caused by placing a control structure in the "Unnamed" Canal at Hwy 333 would be minimal. There is an existing dam with pump-off culverts 0.2 miles west of Hwy 333, and habitat adjacent to the canal consists of leveed agricultural lands, not currently accessible by fisheries. The proposed action would restrict fisheries access to approximately 0.5 acres of canal water column and mud bottom between the proposed structure and the existing dam. This activity would cause very little impacts to estuarine fisheries or their EFH.

Levee along the GIWW/Hwy 333 (0.5 miles)

There is currently no levee north or south of Hwy 333 along the GIWW. The current ground elevation adjacent to that road is about +2 ft NAVD88. Hwy 333 (±3 ft NAVD88) effectively acts as a levee between the GIWW and the interior marshes, allowing fisheries access to the marsh only during extremely high tide events and storm surges. Constructing a ±6 ft NAVD88 levee south of Hwy 333 would not further reduce fisheries access except under extreme high-water events. If the levee is planned to be constructed north of Hwy 333, impacts to intermediate marsh caused by spoil placement for levee construction could cover about 2.4 acres of marsh with a levee base of 40-feet-wide. Impacts to estuarine fisheries access would be very low to non-existent with GIWW levee construction except for temporary turbidity caused by construction activities.

The Preferred Alternative would have minor to moderate impacts to white shrimp and red drum estuarine fisheries species and their EFH, because the proposed HC water control structure design and operations will provide for access to the marsh and associated mud bottom habitats required by those species for at least 11 months (92%) of the year.

Essential Fish Habitat

White shrimp and red drum are two of the three Federally managed fish species are likely to inhabit the Lower Vermilion River Watershed project area, according to the Magnuson-Stevens Fishery Conservation and Management Act. The Preferred Alternative will not alter the existing marsh and mud bottom habitat. The primary challenge for those fisheries would be accessing the project area through the HC control structure. However that structure is planned to be operated with 90% (9 of 10) of its 10-foot-wide bays, as well as the single boat bay, in the open position. As stated previously, this provides more flow area for water and results in an increase of fisheries access as compared to the existing channel cross-section. This is an improvement of fisheries access to the intermediate marshes within our project area.

A best management practice and mitigating factor would be for the Plan of Operations to provide for the structure to remain in the totally "open" position without variable crest weirs for the greatest amount of time possible over the course of a year. This "open" position means that the flapgates are placed in the raised position to allow tidal flow. This provision would yield the least change to water flow, water levels, and salinity and provide maximum ingress/egress access for fisheries. Operating criteria are based on specific circumstances (storm events, tidal surge, salinity levels) which support the project purpose of flood reduction.

Minimization of Impacts

The purpose of the current HC structure design and operation is to minimize the impacts of the total

structure closure during major storms and the partial closure period during higher salinity and water level periods to estuarine fisheries organisms and EFH species and their habitats. HC structure impacts are minimized because the Plan of Operations provides for the structure to remain in the "open" position, without variable crest weirs, for the greatest amount of time possible during the course of the year (10 months or more). The "open" position means that the flap gates are placed in the raised position to allow complete tidal flow in and out of the project area. This provision would yield the least change to water flow, water levels, and salinity and provide maximum ingress/egress access for fisheries. The total and partial closure operating criteria is based on specific circumstances (storm/tidal surge events and salinity levels) which support the project's purpose of flood reduction/prevention.

Impacts During Construction

During construction, short-term impacts are expected to occur to fishery resources. The direct effects of dredging existing canals for levee construction or refurbishment will increase turbidity, reduce dissolved oxygen and temporarily destroy some benthic species. Impacts associated with construction of the levee along the GIWW, and structures in MD and the Unnamed Canal would have minimal adverse effects to estuarine fisheries or their EFH. The water control structures will be constructed "in-the-dry" that is they will be constructed within coffer dams with the water pumped out to dry the bottom substrate during construction.

Indirect Impacts

Installation of the preferred alternative may have an impact on fisheries species, yet the Operations Plan as developed will minimize those impacts. It is difficult to predict indirect affects, which may occur later in time and further away from the project site. Potentially, the project area may become more habitable to fresh and brackish water fish species, which we believe historically, utilized the project area. It is unlikely that any impacts will occur at different, further away, geographic areas.

Cumulative Impacts

Installation of the preferred alternative will counteract the coastal encroachment caused by the cumulative effects of coastal development such as the GIWW development, construction of the 4 Mile Cut, and construction and dredging of various, numerous oil and gas production canals. NOAA NMFS, as referenced in Vestal and Rieser (1995), states that among other causes, extensive losses of coastal fisheries habitats are attributable to a cumulative pattern of environmental degradation, repeated in numerous small alterations, but adding up to profound loss of ecosystem functioning. Among the effects listed are: thousands of [f]ederal projects and permit approvals along the Southeast Atlantic and Gulf of Mexico coasts; extensive marsh deterioration in Louisiana and Texas due to canal dredging, flood control levees, and water control structures for marsh management; and coastal pollution such as organic chemicals and trace metals in urbanized and industrial areas, toxic pesticides from agricultural areas, and other contaminants from inadequate septic systems, sewage discharge, and urban runoff. The geographic scope of the analysis is the LVRWP area. The temporal scale used in this analysis is the life of the project.

Alternative 3 - Structures and Levee Reinforcement.

Direct Impacts

Structure #1 - HC water control structure 2.5 miles north of GIWW

The proposed water control structure would be an integral component in the existing system of levees that already restrict water movement and thereby prevent fisheries access to agricultural lands to the northwest and northeast of the proposed location. Installing a structure in HC in conjunction with refurbishment of existing levees may only slightly reduce estuarine fisheries access to habitat north of the proposed structure, depending on the structure operation. Habitat north of the proposed structure location consists of 1.8-miles (12 acres) of open water canal which contains limited to marginal fisheries habitat. The area northwest and northeast of that proposed structure consists almost entirely of leveed agricultural lands with little fisheries access, except to HC itself and adjacent pump-off drainage canals. Habitat west of the proposed structure location consists of about 54 acres of intermediate marsh south of the West Pump-Off Canal. Estuarine fish and invertebrate organism access to ±12 acres of open water canal habitat north of the proposed structure and ±54 acres of intermediate marsh south of the West Pump-Off Canal would be restricted during structure closures. The degree of fisheries access reduction would depend on the water control structure type and operation.

Structure #2 - Meaux's Ditch structure at Hwy 333

Installing a water control structure in MD 0.25 mile west of the Vermilion River would only slightly impact fisheries as MD is already constrained by levees and roads to ±6 ft NAVD88 which prevent fisheries ingress/egress to surrounding areas. Lands adjacent to MD are leveed agricultural fields, which provide no fisheries habitat; there are no hydrologic connections to area marshes. Therefore, implementation of the action would reduce estuarine fish and invertebrate access to 1.5 miles of open water canal between the proposed structure and the existing MD structure. This is an area equal to 8.2 acres (~1.5 miles X 45-ft-wide) of canal open water and mud bottom habitats, which is not considered ideal fisheries habitat. Freshwater fish would be able to survive in the canal open water habitat post construction. This activity would cause very little impacts to estuarine fisheries or their EFH.

Reinforce School Board Levee

The existing levee south of the School Board section may be ± 2 – 5 ft NAVD88. The levee may contain one small break that would allow fisheries access from the south; however, the canal is the only habitat fish could use because the habitat north of that levee and canal consists of leveed agricultural lands. Fisheries access to the north has been reduced or eliminated by the existing agricultural levee, and elevating it higher would not further reduce that access. Dredged material (spoil) placement from levee refurbishment may impact intermediate marsh. It is anticipated that levee refurbishment would have very minor adverse effects to fisheries access due to the existing levees.

Reinforce the eastern bank of the 7th Ward Canal

The existing 7th Ward Canal levees are low to moderate in height, 1 – 6 ft NAVD88, with few breaks that allow fisheries access. Furthermore, 2.2 miles (62%) of the total 3.5-mile 7th Ward Canal distance from Hwy 82 to the GIWW consists of leveed agricultural lands east of that canal with little to no fisheries access. The remaining 1.3-mile canal distance consists of intermediate marshes east of the canal, but there are no breaks in the eastern spoil bank except at one oil and gas canal at the southern end of the 7th Ward Canal. Dredged material (spoil) placement from levee refurbishment may impact intermediate marsh. It is anticipated that levee refurbishment would have very minor adverse effects to fisheries access due to the existing levees and agricultural lands east of that canal (See Appendix C – Alt. 3).

Indirect Impacts
Installation of the Alternative 3 may have a slight impact on fisheries species. It is difficult to predict indirect affects, which may occur later in time and further away from the project site. Potentially, the project area may become more habitable to fresh and brackish water fish species, which we believe historically, utilized the project area. It is unlikely that any impacts will occur at different, further away, geographic areas.

Cumulative Impacts
NOAA NMFS, as referenced in Vestal and Rieser (1995), states that among other causes, extensive losses of coastal fisheries habitats are attributable to a cumulative pattern of environmental degradation, repeated in numerous small alterations, but adding up to profound loss of ecosystem functioning. Among the effects listed are: thousands of [f]ederal projects and permit approvals along the Southeast Atlantic and Gulf of Mexico coasts; extensive marsh deterioration in Louisiana and Texas due to canal dredging, flood control levees, and water control structures for marsh management; and coastal pollution such as organic chemicals and trace metals in urbanized and industrial areas, toxic pesticides from agricultural areas, and other contaminants from inadequate septic systems, sewage discharge, and urban runoff. The geographic scope of the analysis is the LVRWP area. The temporal scale used in this analysis is the life of the project.

Of the three considered alternatives, Alternative 3 would yield the least impacts to estuarine fisheries, other thanthe No Action alternative.

5.5.2 Wildlife

Alternative 1 - No Action

Direct Effects, Indirect Effects, Cumulative Effects

Under the No Action alternative, water regimes and salinity levels would continue unchanged. It is likely that continued and repeated inundation with high-salinity waters would eventually cause vegetative communities to transition from fresh-intermediate marsh towards brackish marsh, with associated wildlife species diversity following suit. Though much of the terrestrial macrofauna will likely not be appreciably affected by changes in water regime or salinities, it is anticipated that certain waterbird species associated with fresh/intermediate marshwould eventually decline and in time no longer occur in the project area. Conversely, it is expected that species associated with brackish marsh would eventually become established in the study area.

Determination: Long-term adverse impacts to fresh and intermediate marsh species; and long-term beneficial impacts to brackish marsh species.

Alternatives 2 and Alternative 3

Engineering and design for proposed structures has not been completed, therefore impacts associated with each component can only be generalized. As water control structures/levees

are implemented, it is expected that salinity levels in the study area will trend towards fresh/intermediate levels more consistently and for longer periods over the course of a year, except for those times when storm surges and/or difficult to accurately predict events occur that exceed the protection measures designed into the project. The Operating Plan for each structure would ultimatelydetermine salinity-related changes in the area.

Clearing, ground disturbance, construction-related noise, increased human activity and traffic, and increased anthropogenic factors associated with the new structures on the landscape all have potential to adversely affect wildlife. Clearing vegetation and activities associated with construction of individual project components will result in short- and long-term adverse impacts to habitat and have a direct impact on wildlife that occur in and near the area of direct impacts. Clearing vegetation will remove foraging, sheltering, and nesting habitat and has potential to injure and kill individual animals that cannot disburse from the area prior to and/or during clearing activities. Likewise, ground disturbance during site preparation can destroy dens and kill individual animals thatburrow below ground. Animals that are inadvertently disbursed from their breeding territory may suffer reducedproductivity and loss of nesting potential for the season, and increased mortality, as loss of dens/nests/shelter leaves them more vulnerable to predation. Reduction of area nesting habitat may also leave migrant birds returning to the site after winter at a loss for suitable nesting habitat, potentially reducing their reproductive success in the season(s) following implementation of the proposed action.

Noise and increased human activity during construction can alter feeding and breeding patterns and disrupt reproductive potential of area wildlife for the duration of the project. Post-construction anthropogenic factors include increased human (and companion animals/dogs) activity in the vicinity of new structures (water control structures often attract fishermen) which can alter feeding and breeding patterns of area wildlife, and also result in indirect adverse effects such as increased pollutants (trash, vehicular runoff) in the landscape.

Implementation of the proposed action will permanently decrease habitat quantity in areas where new water control structures are to be constructed; and temporarily reduce habitat availability in those areas proposed for levee enhancements and in areas where construction-related activities and staging areas impact vegetation. The severity of impacts to wildlife are directly correlated with the quality and amount of habitat that would be disturbed or removed at each construction site.

Alternative 2 - Preferred Action

Hebert Canal water control structure at GIWW – Constructing a water control structure in the southern reachof Hebert Canal has potential to significantly change water regime, water levels and salinities within the marshesin the southern part of the study area. The greater the reduction in water flow into the area over time, the greaterwould be the effects associated with reduced salinity levels in the marsh. A structure designed to maximize flowand an Operating Plan that would require the structure be “open”, except during major storm events (tropical storms and hurricanes) or extreme high tides that would cause excessive saltwater backflow into the area, wouldmoderate potential for drastic salinity change and associated changes in

vegetation/habitat. However, the structure itself will still reduce the functional cross-section of the channel, therefore it is expected that flow and salinity levels would be affected to the degree of obstruction.

The LVWRP Operations plan proposes to maintain salinities at ±3 ppt, which is conducive to healthy fresh (salinities of 0 ppt) to intermediate (salinities of 0 to 5 ppt) marsh systems. CRMS Station 2041, located 2 milessoutheast of the Hebert Canal-GIWW confluence, has recorded an average salinity of 2.4 ppt over a thirteen year interval (2008 to 2021) (https://www.lacoast.gov/crms_viewer/Map/CRMSViewer,), which indicates the proposed operations plan would manage the LVRWP salinities within a range similar to current salinity levels in the project area. Based on that data, it is anticipated that the proposed LVRWP would have a negligible effect onmarsh habitat in the Bayou Chene marsh complex, and therefore would have minor effects to wildlife populationsover the life of the project.

If the structure design significantly reduces flow and/or is operated to restrict tidal inflow significantly, salinity levels within the LVRW would drop closer to 0 ppt effectively, and consequently would convert intermediate marshes to fresh marsh. Fresh marsh is highly susceptible to salt-water intrusion. Any storm surges above ±6 ftNAVD88 will overtop the proposed levees have high potential of killing fresh marsh vegetation ultimately causinga trend to shallow open water areas. It is expected that the rate of change in vegetation would be correlated to therate of change in salinity levels over time. Morton (1973) concluded that White Lake changed from a low-salinity estuary to a freshwater impoundment after the installation of the Schooner Bayou water control structure. Marshbird species are reliant on invertebrate fauna and seed production and could be indirectly affected if invertebratespecies were drastically changed in the area. However, marsh bird species that occur in the area are generally associated with fresh to intermediate marsh, therefore, population density or use would not be expected to changeon average. Since the area is predominantly intermediate to fresh, it is unlikely that terrestrial wildlife species diversity would be appreciably affected. Moreover, it is anticipated that regulating salinity levels by regulating saltwater backflow and storm/tidal surges via the GIWW and Vermilion River could have beneficial effects on areas of marsh in the study area that have been experiencing degradation due to increasing salinity levels. Regulating salinity levels in the area could support survival and establishment of vegetation, and likewise yield subsequent benefits for wildlife habitat stability into the future of the study area.

Potential direct and indirect temporary and permanent adverse effects include:

- loss of high-quality habitat along canal banks
- potential to kill animals within the area during clearing and ground disturbance
- reduction of habitat quality and availability in the vicinity of the structure
- noise and construction activities have potential to alter feeding and breeding patterns
- decrease in reproductive potential of wildlife
- human activity in the vicinity of new structure can result in long-term changes to

feeding and breedingpatterns; and increase pollutants (trash, vehicular runoff) in the landscape.

Determination: Long-term area-wide immeasurable benefits to wildlife.

Meaux's Ditch structure at Hwy 333 and **"Unnamed" Canal structure at Hwy 333** – Habitat in the areas surrounding Meaux's Ditch and the "Unnamed" canal has already been converted to agricultural fields and pastures. Water regimes within those areas are likely to remain as is, and there would be negligible effects to birds and wildlife species that utilize those fields.

Determination: Negligible effects to wildlife; permanent and short-term loss of low-quality habitat will result innegligible impacts to wildlife; vegetation will regenerate over time after construction has ceased.

Levee along the GIWW/Hwy 333 (0.5 miles) – Implementation of this component would result in conversion of ±2.1 acres of poor-quality habitat.

Determination: Negligible effects to wildlife

Alternative 3- Structures and Levee Reinforcement

Hebert Canal water control structure 2.5 miles north of GIWW – The proposed structure would not significantly change habitat to the north of the structure. Much of the area of impact has already been convertedto agricultural fields and would remain essentially unchanged. Construction activities would directly impact habitat along the Hebert Canal bankline within the structure footprint and within the vicinity of the proposed structure. Moderate quality scrub shrub habitat would be permanently removed. Habitat quality in the vicinity would be temporarily degraded as a result of increased activity and disturbance during construction.

Determination: Permanent loss of moderate quality habitat, temporary negative effects to wildlife.

Meaux's Ditch structure at Hwy 333 – Habitat in the area surrounding Meaux's Ditch has already been converted to agricultural fields and pastures. Water regimes within those areas are likely to remain as is, and there would be negligible effects to birds and wildlife species that utilize those fields.

Determination: Negligible effects to wildlife; permanent and short-term loss of low-quality habitat will result innegligible impacts to wildlife; vegetation will regenerate over time after construction has ceased.

Reinforce School Board Levee – Implementation of this component would result in temporary and permanent negative impacts to wildlife habitat, including the permanent loss

of forested habitat along 3.5-mile canal bankline. Expansion of the levee footprint would result in the permanent loss of marsh habitat, and potential taking of resident wildlife unable to disburse ahead of construction. Potential dredging and/or spoil placement would permanently convert marsh habitat to open water and/or permanently convert marsh to upland/levee habitat.

Determination: Minor long-term and permanent negative effects to habitat in the area of direct impact. Temporary negative effects to habitat and wildlife in the vicinity; vegetation will regenerate over time after construction has ceased.

Best Management Practices for Wildlife

Pre-Construction

- Pre-construction surveys to identify sensitive wildlife habitats and species present before construction begins

During Construction

- Phased construction into smaller phases to minimize the area disturbed at any given time
- Utilize sound barriers, mufflers, and construction schedules that minimize noise levels during sensitive wildlife periods
- Use shielded lighting to reduce disruption to nocturnal wildlife
- Install fencing to prevent wildlife from entering active construction areas
- Avoid construction during critical wildlife breeding and migration seasons

Post-Construction

- Incorporate site-specific monitoring to track potential impacts

More information on BMPs for wildlife can be found at Wildlifeelathome.com

5.5.3 Special Status Wildlife

Alternative 1 - No Action

Without intervention nor action plans, conditions for Special Status Wildlife would most likely be negatively impacted. As water quality, soil quality, and transitional changes in wetland landscapes and habitats would degrade overtime due increasing salinity and frequent flooding, the habitats specialized for rare species, migratory bird species, bald eagles, or federal-listed threatened, endangered and candidate species would disappear as well.

Alternatives 2- Preferred

Hebert Canal water control structure at Hwy 333 – Direct short-term adverse effects; indirect long-term minoreffects.

- potential to kill birds if clearing occurs during nesting season (March – September)
- permanent loss of high-quality habitat
- clearing will reduce available nesting and foraging habitat along canal banks in the immediate vicinity ofthe structure
- disturbance from activity and noise during construction have potential to cause a decrease in productivityof nesting birds in the vicinity of the project site (i.e. nest failure)
- noise and construction activities have potential to alter feeding and breeding patterns
- reduction of habitat quality and availability in the vicinity of the structure
- increased human activity in the vicinity of new structures can alter feeding and breeding patterns andcause indirect adverse effects such as increased pollutants (trash, vehicular runoff) in the landscape

Meaux's Ditch structure at Hwy 333 – No effects.

- no suitable nesting habitat at or near the proposed site.

"Unnamed" Canal structure at Hwy 333 – No effects.

- no suitable nesting habitat at or near the proposed site.

Levee along GIWW/Hwy 333 – Short-term minor adverse effects.

- loss of brush and herbaceous vegetation will result in loss of forage and nesting habitat;
- potential to kill nesting birds if clearing occurs during nesting season (March – September)
- permanent loss of poor to moderate quality habitat, some vegetation will regenerate over time

Hebert Canal water control structure 2.5 miles north of GIWW – Construction activities would directly impact habitat along the Hebert Canal bankline within the structure footprint and within the vicinity of the proposed structure. Moderate quality scrub shrub habitat would be permanently removed within the area of direct impact. Habitat quality in the vicinity would be temporarily degraded as a result of increased activity and disturbance during construction.

Determination: Permanent loss of moderate quality nesting and foraging habitat; temporary minor impacts during construction.

Meaux's Ditch structure at Hwy 333 – Habitat in the area surrounding Meaux's Ditch has already been converted to agricultural fields and pastures.

Determination: Negligible adverse effects to migratory bird species. Vegetation will regenerate over time after construction has ceased.

Reinforce School Board Levee – Implementation of this component would result in temporary and permanent negative impacts to habitat, including the permanent loss of forested habitat along

3.5-mile canal bankline. Expansion of the levee footprint would result in the permanent loss of marsh habitat, and potential taking of resident nesting birds unable to disburse ahead of construction. Potential dredging and/or spoil placement would permanently convert marsh habitat to open water and/or permanently convert marsh to upland/levee habitat.

Determination: Minor long-term and permanent negative effects to habitat in the area of direct impact. Temporary negative effects to habitat and wildlife in the vicinity; vegetation will regenerate over time after construction has ceased.

Alternative 3 – Structural and Levee Reinforcement

Hebert Canal water control structure at Hwy 333 – Direct short-term adverse effects; indirect long-term minor effects.

- potential to kill birds if clearing occurs during nesting season (March – September)
- permanent loss of high-quality habitat
- clearing will reduce available nesting and foraging habitat along canal banks in the immediate vicinity of the structure
- disturbance from activity and noise during construction have potential to cause a decrease in productivity of nesting birds in the vicinity of the project site (i.e. nest failure)
- noise and construction activities have potential to alter feeding and breeding patterns
- reduction of habitat quality and availability in the vicinity of the structure
- increased human activity in the vicinity of new structures can alter feeding and breeding patterns and cause indirect adverse effects such as increased pollutants (trash, vehicular runoff) in the landscape

Meaux's Ditch structure at Hwy 333 – No effects.

- no suitable nesting habitat at or near the proposed site.

11 miles of Levee improvements – Short-term minor adverse effects.

- minimum loss of poor to moderate quality habitat, some vegetation will regenerate over time

Hebert Canal water control structure 2.5 miles north of GIWW – Construction activities would directly impact habitat along the Hebert Canal bankline within the structure footprint and within the vicinity of the proposed structure. Moderate quality scrub shrub habitat would be permanently removed within the area of direct impact. Habitat quality in the vicinity would be temporarily degraded as a result of increased activity and disturbance during construction.

Determination: Permanent loss of moderate quality nesting and foraging habitat; temporary minor impacts during construction.

Meaux's Ditch structure at Hwy 333 – Habitat in the area surrounding Meaux's Ditch has already been converted to agricultural fields and pastures.

Determination: Negligible adverse effects to migratory bird species. Vegetation will regenerate over time after construction has ceased.

Reinforce School Board Levee – Implementation of this component would result in temporary and permanent negative impacts to habitat, including the permanent loss of forested habitat along 3.5-mile canal bankline. Expansion of the levee footprint would result in the permanent loss of marsh habitat, and potential taking of resident nesting birds unable to disburse ahead of construction. Potential dredging and/or spoil placement would permanently convert marsh habitat to open water and/or permanently convert marsh to upland/levee habitat.

Determination: Minor long-term and permanent negative effects to habitat in the area of direct impact. Temporary negative effects to habitat and wildlife in the vicinity; vegetation will regenerate over time after construction has ceased.

5.5.4 Invasive Wildlife Species

Alternative 1- No Action

Invasive Aquatic Species – Asian Clam, Zebra Mussel, Applesnail, and Water Flea

Potential adverse ecological and economic effects associated with the introduction and/or spread of these species include reduced diversity and productivity of native species due to increased predation and competition for resources (forage, nest/shelter), and bio-fouling of vessels, equipment and pipes. Asian clam, zebra mussel, applesnail, and water flea can be spread via transfer of adults and microscopic larvae in water, mud, vegetation and debris. All vehicles, vessels, and equipment that are used in aquatic habitats have potential to harbor and transport invasive aquatic species.

Terrestrial Species–Tawny Crazy Ant, Red Imported Fire Ant

Tawny Crazy Ants (*Nylanderia fulva*) have two characteristics that cause ecological and economic impacts–massive colony size and a mutualistic relationship with agricultural pest species. Unlike native ant species, tawny crazy ant colonies share nesting sites, creating massive "super-colonies". The sheer numbers of this ant can devastate local insect populations which are important foods for native birds, bats, lizards and other wildlife, displace tree-nesting birds, asphyxiate cage-reared animals (rabbits, chickens), and destroy apiaries. They also attack larger animals, including cattle. Seemingly attracted to electrical equipment, large accumulations clog breaker boxes, outlets, phone lines, and air conditioning units and cause short circuits. They have also been found in chemical-pipe valves, computers, security systems, sewage pump stations, and electrical systems in automotive vehicles. Their primary feeding strategy is a mutualistic relationship with various hemipteran insects (aphids, mealybugs, scale insects,

treehoppers, whiteflies, etc.) which feed on plants and secrete honeydew. The tawny crazy ants tend and protect the hemipterans to gain access to the honeydew. The associated increase in hemipteran population has been correlated to agricultural losses and drying out of grassland habitats. (MacGown 2016) Potential exists for the species to be transported into the project area via vehicles or equipment, and personal items.

Red Imported Fire Ants (*Solenopsis invicta*) are widespread throughout the southeastern U.S. and known for their aggressive nature and potent sting. Adverse effects associated with introduction of this species includes increased predation and competition with native wildlife species, decreased productivity and increased mortality of migratory songbirds and ground-nesting species, and new born and young agricultural stock. *S. invicta* has been associated with crop damages, equipment damage, electrical damage, and structural damage. The species also increases health hazards associated with allergic reactions and possible medical complications. (MacGown 2016; CABI 2022; USDA 2022). Secondary indirect adverse impacts associated with control include potential surface water contamination from pesticide application (CABI 2022). This species can be spread via vehicles, equipment or machinery carrying infested soils and products, electrical equipment, and personal items (CABI 2022; USDA 2022). Due to the widespread nature of this species, it is likely that red imported fire ants are established in residential, industrial and agricultural areas in the LVRW. The primary concern regarding the species is to prevent the spread of imported red fire ants within the LVRW.

Environmental conditions would continue as is currently. The future without the project would neither lessen nor exacerbate the introduction and/or spread of invasive species. Any affects associated with invasive species in the LVRWP will occur regardless of this alternative.

Determination: No consequences.

Alternative 2 - Preferred Action

- **Hebert Canal Water Control Structure at GIWW**
- **Levee along the GIWW/Hwy 333**
- **Meaux's Ditch structure at Hwy 333**
- **Unnamed Canal structure at Hwy 333**

Potential consequences associated with each component are the same. All vehicles, vessels and equipment associated with surveying, construction and inspections have potential to harbor and transport the invasive species discussed above. Introduction and/or spread of these species could result in long-term adverse effects to native wildlife, economic losses associated with bio-fouling of vessels, equipment and pipes, structural and equipment damage, and agricultural impacts associated with increased hemipteran populations. Operations of the proposed water control structures would have no effect on invasive species that already occur in the area, or cause the introduction of invasive species into the LVRWP area.

Mitigation to offset/prevent potential adverse impacts associated with invasive species includes standard pre and post construction BMPs to inspect, clean and decontaminate all vessels, vehicles, trailers, equipment, machinery and any tools or devices prior to use in the project area. These BMP apply to equipment arriving on the project site, relocated within the project site, and leaving the project site.

Determination: No direct or indirect adverse effects are anticipated provided that BMPs are used in every phase of implementation: surveying, clearing, site preparation, construction through final inspections.

Alternative 3 - Structures and Levee Reinforcement.

- **Hebert Canal water control structure 2.5 miles north of GIWW**
- **Meaux's Ditch structure at Hwy 333**
- **Reinforce School Board Levee**

Potential consequences associated with each component are the same. All vehicles, vessels and equipment associated with surveying, construction and inspections have potential to harbor and transport the invasive species discussed above. Introduction and/or spread of these species could result in long-term adverse effects to native wildlife, economic losses associated with bio-fouling of vessels, equipment and pipes, structural and equipment damage, and agricultural impacts associated with increased hemipteran populations. Operations of the proposed water control structures would have no effect on invasive species that already occur in the area, or cause the introduction of invasive species into the LVRWP area.

Mitigation to offset/prevent potential adverse impacts associated with invasive species includes standard pre and post BMPs to inspect, clean and decontaminate all vessels, vehicles, trailers, equipment, machinery and any tools or devices prior to use in the project area. These BMP apply to equipment arriving on the project site, relocated within the project site, and leaving the project site.

Determination: No direct or indirect adverse effects are anticipated provided that BMPs are used in every phase of implementation: surveying, clearing, site preparation, construction through final inspections.

Compliance and Best Management Practices to Minimize Effects associated with Alternatives 2 and 3

The spread of invasive species can be prevented by simple but impeccable house-keeping. BMP (listed below) to prevent and minimize potential effects of invasive species includes thorough inspection and cleaning of all vehicles, vessels, and equipment prior to use in the project area, prior to relocating equipment between water bodies in the project area, and prior to moving equipment from the project area. To prevent cross contamination with other lands or water

bodies, whenever possible, keep equipment and vehicles at the same project area for use only in that project area.

BMPs to Prevent Introduction and Spread of Invasive Aquatic Species

Pre and post construction BMPs for invasive aquatic species follow NOAA guidelines. General guidelines are provided below, and in detail in Appendix E

Drain:

- Drain every conceivable space or item that can hold water.
- Follow factory guidelines for eliminating water from engines.
- Drain bilges and ballast tanks by removing the drain plug. Bilge pumps are not capable of removing all water from the boat hull.
- Drain live-wells, bilge, ballast tanks, and transom wells.

Clean:

- Remove any visible plant or plant fragments, as well as mud or other debris. Plant material, mud, and other debris routinely contain other organisms that may be an invasive species.
- Check trailer, including axle and wheel areas, in and around the boat itself: anchor, props and jet engines, ropes, boat bumpers, paddles.
- Clean all parts and equipment that came in contact with water using one or more of the methods listed in Appendix E.

Dry:

- Allow everything to completely dry before launching into new waters; five days in warm, dry weather and up to 30 days in cool, moist weather.
- If sufficient drying time is not available, decontaminate all surfaces using one or more of the cleaning methods described in Appendix E. Carefully inspect for invasive organisms before entering a new water body.

NOAA guidelines (see Appendix E)

- https://invasivemusselcollaborative.net/wp-content/uploads/2018/11/NOAA-Decon-Watercraft.pdf

Pre and Post Construction BMPs to Prevent The Introduction and Spread of Tawny Crazy Ants and Red Imported Fire Ants

- All equipment and vehicles that come into the LVRWP project site from other areas must be inspected prior to entry into staging areas or work zones.

- Any vehicles or equipment that are infested will be removed from the site for appropriate treatment.
- Materials such as board road matts, soils, gravel, etc. will be inspected prior to use.
- Any materials found to be infested will be removed immediately, treated and disposed of in accordance with local or state regulations.
- All staging areas, work sites, equipment and vehicles are to be kept clean and free of trash and debris.
- Food or sweet drinks are to be kept in tightly sealed containers, when not being used.
- All personnel will be informed of the potential for invasives and advised of appropriate action.
- Any invasive species identified within the project site will be reported to the local NRCS office.

LDWF Rare Species

Alternatives 2 and 3

The LDWF Wildlife Diversity Program's—*Rare Species and Natural Communities* online database, lists four species with state and/or global ranks that have potential to occur in the study area. An effects determination foreach of those species is provided in **Table 40.**

Table 40. Effects Determination for LDWF Rare Species in Vermilion Parish

Common / Scientific Name	Suitable habitat in LVRWP	Observed in LVRWP	Effects Determination
Bald Eagle *Haliaeetus leucocephalus*	Foraging	No	Immeasurable indirect effects to foraging associated with disturbance of prey species during construction activities; no direct, long-term or cumulative impacts
Roseate Spoonbill *Platalea ajaja*	Foraging	Yes	Potential for temporary minor adverse effects; noise and activity have potential to alter feeding and breeding patterns; no direct, long-term or cumulative impacts
Western Chicken Turtle *Deirochelys reticularia miaria*	Yes	No	Short-term temporary disturbance associated with activities in waterways during construction. No long-term impacts.
Saltmarsh Topminnow *Fundulus jenkinsi*	Yes	No	Short-term temporary disturbance associated with activities in waterways during construction. No long-term impacts.

Migratory Birds

Numerous migratory bird species occur in the LVRW. Potential adverse effects to birds will occur relevant to timing of clearing and construction activities and loss of suitable nesting habitat within the area of impact. Specific effects are discussed below. Potential effects to bald eagles are listed in Table 37.

Alternative 1 – No Action

Without intervention nor action plans, conditions for migratory birds would most likely be negatively impacted. As water quality, soil quality, and transitional changes in wetland landscapes and habitats would degrade overtime due increasing salinity and frequent flooding, the habitats specialized for migratory bird species would disappear as well.

Alternative 2 - Preferred

Hebert Canal water control structure at Hwy 333 – Direct short-term adverse effects; indirect long-term minoreffects.

- potential to kill birds if clearing occurs during nesting season (March – September)
- permanent loss of high-quality habitat
- clearing will reduce available nesting and foraging habitat along canal banks in the immediate vicinity ofthe structure
- disturbance from activity and noise during construction have potential to cause a decrease in productivityof nesting birds in the vicinity of the project site (i.e. nest failure)
- noise and construction activities have potential to alter feeding and breeding patterns
- reduction of habitat quality and availability in the vicinity of the structure
- increased human activity in the vicinity of new structures can alter feeding and breeding patterns andcause indirect adverse effects such as increased pollutants (trash, vehicular runoff) in the landscape.

Meaux's Ditch structure at Hwy 333 – No effects.

- no suitable nesting habitat at or near the proposed site.

"Unnamed" Canal structure at Hwy 333 – No effects.

- no suitable nesting habitat at or near the proposed site.

Levee along GIWW/Hwy 333 – Short-term minor adverse effects.

- loss of brush and herbaceous vegetation will result in loss of forage and nesting habitat;
- potential to kill nesting birds if clearing occurs during nesting season (March – September)
- permanent loss of poor to moderate quality habitat
- some vegetation will regenerate over time

Alternative 3 - Structures and Levee Reinforcement.

Hebert Canal water control structure 2.5 miles north of GIWW – Construction activities would directly impact habitat along the Hebert Canal bankline within the structure footprint and within the vicinity of the proposed structure. Moderate quality scrub shrub habitat would be permanently removed within the area of directimpact. Habitat quality in the vicinity would be temporarily degraded as a result of increased activity and disturbance during construction.

*Determination: P*ermanent loss of moderate quality nesting and foraging habitat; temporary minor impacts duringconstruction.

Meaux's Ditch structure at Hwy 333 – Habitat in the area surrounding Meaux's Ditch has already been converted to agricultural fields and pastures.

Determination: Negligible adverse effects to migratory bird species. Vegetation will regenerate over time after construction has ceased.

Reinforce School Board Levee – Implementation of this component would result in temporary and permanent negative impacts to habitat, including the permanent loss of forested habitat along 3.5-mile canal bankline. Expansion of the levee footprint would result in the permanent loss of marsh habitat, and potential taking of resident nesting birds unable to disburse ahead of construction. Potential dredging and/or spoil placement wouldpermanently convert marsh habitat to open water and/or permanently convert marsh to upland/levee habitat.

Determination: Minor long-term and permanent negative effects to habitat in the area of direct impact. Temporary negative effects to habitat and wildlife in the vicinity; vegetation will regenerate over time after construction has ceased.

Threatened and Endangered Species and Critical Habitat

Table 41 Summarizes the effects determined for each of the Endangered and Threatened wildlife species listed in the federal list provided by the Endangered Species Act (ESA).

Table 41. Summary of Effects Determinations for ESA-listed species

Species	**Effects Determination**	**Rationale**
Eastern Black Rail *Laterallus jamaicensis*	May affect, not likely to adversely affect	Within (non-nesting) range, potential for occurrence
West Indian Manatee *Trichechus manatus*	May affect, not likely to adversely affect	Potential for occurrence
Piping Plover *Charadrius melodus*	No effect	Outside of species' range
Smalltooth Sawfish *Pristis pectinata*	No effect	Outside of species' range
Green Sea Turtle *Chelonia mydas*	May affect, not likely to adversely affect	Potential for occurrence
Hawksbill Sea Turtle *Eretmochelys imbricata*	No Effect	Outside of species' range
Kemp's Ridley *Lepidochelys kempii*	May affect, not likely to adversely affect	Potential for occurrence

Leatherback Sea Turtle *Dermochelys coriacea*	No effect	Outside of species' range
Loggerhead Sea Turtle *Caretta*	May affect, not likely to adversely affect	Potential for occurrence
Gulf Sturgeon *Acipenser oxyrinchus desotoi*	No effect	Outside of species' range
Oceanic White-tipped shark *Carcharhinus longimanus*	No effect	Outside of species' range
Giant Manta Ray *Manta birostris*	No effect	Outside of species' range
Fin Whale *Balaenoptera physalus*	No effect	Outside of species' range
Sperm Whale *Physeter macrocephalus*	No effect	Outside of species' range
Sei Whale *Balaenoptera borealis*	No effect	Outside of species' range
Gulf of Mexico Bryde's Whale *Balaenoptera edeni*	No effect	Outside of species' range

Alternative 2 - Preferred Action and Alternative 3 - Structures and Levee Reinforcement.

Eastern Black Rail (*Laterallus jamaicensis jamaicensis*) (Threatened)—No high probability habitat for this species occurs in the areas of direct impacts. There are no known black rail nesting records in Vermilion Parish(PERS. Com. B. Vermillion April 14, 2020). Habitat in the study area is unlikely to support eastern black rail (PERS. Com. E. Johnson October 28, 2020). Implementation of the proposed action has potential to result in beneficial effects to black rails by improving marsh habitat over time.

Determination: May affect, not likely to adversely affect.

West Indian Manatee (*Trichechus manatus*) (Threatened)—Manatees occur in Louisiana annually, primarily during warm months, and sporadically during winter months. There are two records of manatees in the study area, and others within ten miles of the project site. Therefore, it should be assumed that manatees have potential to occur in the study area throughout the year, albeit with a low rate of occurrence. Manatees are naturally curiousand will readily approach human activity and boat traffic. The foremost threat to this species is injury/death caused by collisions with boats. Active construction in the water and boating traffic to and from the constructionsite have potential to cause injury and possibly death should a manatee be struck by a boat. Potential direct adverse effects could occur if manatees are in the vicinity during active construction and/or in channels where boat traffic is in route to the construction site.

The USFWS has developed the *Standard Manatee Conditions for In-Water Activities* to assist project proponentsavoid/minimize potential for take of this species.

Determination: May affect but not likely to adversely affect provided the *Standard Manatee*

Conditions for In- Water Activities are strictly adhered to for the duration of the project.

Piping Plover (*Charadrius melodus*) (Endangered) No suitable habitat for this species occurs in the study area.
Determination: No effect.

Smalltooth Sawfish (*Pristis pectinata*) (Endangered) project is outside of the species' range.
Determination: Noeffect.

Sea Turtles (*Chelonioidea*)

Sea turtles are marine species that occupy and depend upon marine systems. The fresh and intermediate habitat such as that within the Hebert Canal study area does not provide high probability habitat for sea turtles. However,the project's proximity to Vermilion Bay, which has records of loggerhead sea turtles, allows for some margin ofprobability that sea turtles could potentially occur in the project area, albeit not as a normal or regular occurrence.The GIWW and the Vermilion River provide salt to brackish habitat, water depths, and a larger area of travel andpotential forage, and have direct connections to Vermilion Bay and therefore the Gulf. The primary areas of concern within the project area are, 1) the Alternative 2 Hebert Canal water control structure, and 2) route of travel in the Vermilion River between the launch (presumably Intracoastal City on the Vermilion River) and areasof in-water activity.

Boating activity associated with in-water construction has potential to directly impact sea turtles. Vessel strikes have been identified by NOAA as one of the main threats to sea turtles in inland waters. Anthropogenic factors, including plastics and debris have been correlated to increased sea turtle mortality. To avoid and minimize potential adverse impacts to sea turtles, the NOAA *Sea Turtle (and Small Tooth Sawfish) Construction Conditions* (NOAA Conditions), will be adhered to for the duration of the project where applicable to in-water activities, from pre-project surveys through final inspections. All personnel will be informed of and instructed of the NOAAConditions; appropriate signage will be posted and made clearly visible to ensure adequate consideration. Hawksbill and leatherback sea turtles are primarily pelagic species and would not be expected to occur in theproject area.

Determination: No effect.

Green, Kemp's Ridley, and loggerhead sea turtles have potential to occur in the LVRWP area.

Determination: May affect, not likely to adversely affect. No long-term direct or indirect, or cumulative effects.

Pelagic Species

The proposed project is outside of the range of the following species:

Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)
Oceanic White-tipped shark (*Carcharhinus longimanus*)

Giant Manta Ray (*Manta birostris*)
Fin Whale (*Balaenoptera physalus*)
Sperm Whale (*Physeter macrocephalus*)
Sei Whale (*Balaenoptera borealis*)
Gulf of Mexico Bryde's Whale (*Balaenoptera edeni*)

Determination: No Effect.

Compliance and Best Management Practices

Pre and post construction consultation with the USFWS and NOAA NMFS will be conducted to ensure the proposed action does notjeopardize federal-listed species. Standard avoidance measures include:

1. USFWS Standard Manatee Conditions should be implemented and enforced for the entirety of the project,from pre-project surveys through final inspections (APPENDIX E)
2. USFWS Nationwide Standard Conservation Measures for migratory birds should be implemented and enforced for the duration of project construction and through final inspections to avoid and minimize potential effects to migratory birds (APPENDIX E)
3. NOAA Sea Turtle (and Small Tooth Sawfish) Construction Conditions *should be implemented* toavoid/minimize impacts to sea turtles for the duration of the project from pre-project surveys through finalinspections (APPENDIX E)
4. Designing project components to minimize project footprint will minimize habitat loss and impacts towildlife.
5. Minimize the footprint for staging areas and access roads
6. Site staging areas where there would be no loss of habitat, where possible, or in areas of low quality
7. Injured or orphaned wildlife should be reported to the LDWF or a qualified wildlife rehabilitation facility.
8. Instruct all personnel to keep work zones clean, properly dispose of garbage and secure receptacles tominimize wildlife invaders.
9. Proper maintenance of equipment and fuel stations to avoid/minimize wastes and spills.
10. Signage (permanent) on new structures that encourage visitors to pick up garbage, not leave food wastes, and clear all fishing lines upon departure will help reduce anthropogenic impacts and foster greater appreciation of area wildlife.

Cumulative Impacts

The primary cause for decreasing populations of special status wildlife is habitat loss due to destruction, degradation, and fragmentation (Evans 2013; Stein et. al. 2000; Croteau & Mott 2011) with the most significant attributable to urban, commercial, agricultural and coastal

development (ASU n.d.). Other causes identified include invasive species, pollution, disease, over-exploitation (Evans 2013; Stein et. al. 2000, ASU n.d.), environmental factors (i.e., climate change)., and anthropogenic causes (tourism, recreational use of habitats) (ASU n.d.). The LVRWP project area provides potential suitable habitat for federal and state listed and candidate species, and state and globally-ranked species. The species, status, habitat requirements and potential to occur in the LVRWP project area are discussed in Chapter 3. Project-specific indirect and direct effects are discussed in Chapter 5.5.3. The cumulative effects to each species have been assessed based on habitat needs of the species and how potential effects of the action integrate with impacts associated with past, present and future actions within the geographic context appropriate to each species. **Table 42** provides a comparison of cumulative impacts to special status species from construction and operations of Alternatives 2 and 3.

Geographic and Temporal Extent of Analysis

The geographic scope used to analyze cumulative impacts to terrestrial species is the Chenier Plain and Gulf Coast Prairie ecoregions, because eastern black rail, obscure skipper and Mississippi diamond-backed terrapin, are specific to the Gulf Coast marsh, and the subject whooping crane population is a coastal Louisiana-specific experimental population. The LVRWP project area is outside of the core monarch breeding region. The project would impact suitable habitat types for the monarch butterfly in the chenier plain and prairie ecoregions, but would have no impact on habitats widely used by the species throughout its core breeding region across the central United States and Canada. Sandhill cranes are wide-ranging and utilize a variety of open habitat types, but the proposed action would have no impact on habitat outside of the coastal marsh and prairie ecoregions. Waterbird nesting colonies occur throughout the North American continent. In order to prevent the discussion from becoming unwieldy, the assessment has been restricted to the same region as the other terrestrial special status species. West Indian manatee, green, Kemp's Ridley, and loggerhead sea turtles are uncommon in the SWLA coastal waters and a discussion restricted to only the Louisiana coast would not adequately encompass potential for cumulative effects on these species. Therefore, the geographic scope used to analyze impacts on aquatic species is the Gulf Coast. The temporal scale used in this analysis is eighteen months for construction and fifty years for operations.

<u>Alternative 2- Preferred</u>

Cumulative Impacts During Construction

Cumulative impacts associated with construction of Alternative 2 would be negligible for EBR, whooping crane, obscure skipper, sandhill crane, and waterbird nesting colonies, provided that pre and post construction BMPs are implemented. Construction would further reduce potential forage and breeding habitat for monarch butterfly in the Chenier Plain and Gulf Coast Prairie ecoregions. Herbaceous vegetation would recover quickly, and BMP would be beneficial. There would be no cumulative effects associated with construction on Mississippi diamond-backed terrapin. Cumulative impacts to aquatic species include increased adverse effects and potential for take associated with boat traffic, increased human activity, construction activities (noises, vibrations, lighting, debris, and hazardous spills). BMP will minimize potential cumulative effects. Cumulative impacts during construction would be temporary and cease upon cessation

of construction activities.

Cumulative Impacts During Operations

Operations of Alternative 2 would possibly increase the beneficial effects of past, present and future marsh and prairie restoration and management projects in the Chenier Plain and Gulf Coast prairies, and thereby expand available suitable habitat for eastern black rail, whooping crane, sandhill crane, and Mississippi diamond-backed terrapin. There would be no cumulative effects associated with operation of Alternative 2 on monarch butterfly, obscure skipper, and waterbird nesting colonies. Boating operations and any in-water work associated with operations would add to the cumulative adverse impacts (injury and death) to manatees and sea turtles associated with boat strikes and in-water activities throughout the Gulf Coast. Operations also increases potential for take of manatees by entrapment in structures. Cumulative impacts associated with operations would continue for the life of the project.

Alternative 3 – Structural and Levee Reinforcement

Cumulative Impacts During Construction

Cumulative impacts associated with construction of Alternative 3 include the general increase of adverse impacts associated with human presence and activities, lighting, and noises throughout the coastal prairies and Chenier Plain. Cumulative impacts from human disturbances would affect eastern black rail, whooping crane, sandhill crane, and waterbird colonies, if they occur in the vicinity of the proposed construction activity. Cumulative impacts due to disturbances are expected to be minor and temporary, ceasing upon cessation of all construction-related activities. Construction would further reduce potential forage and breeding habitat for monarch butterfly in the Chenier Plain and Gulf Coast Prairie ecoregions. Cumulative impacts associated with construction of Alternative 3 also include increased potential adverse effects (injury, mortality from vehicle/equipment strikes, ground disturbance) associated with vehicular traffic and equipment use in coastal marshes where Mississippi diamond-backed terrapin occur. Cumulative impacts due to vehicular traffic and equipment would be temporary, ceasing upon cessation of all construction-related activities. Cumulative impacts to aquatic species include increased adverse effects and potential for take associated with boat traffic, increased human activity, construction activities (noises, vibrations, lighting, debris, and hazardous spills). BMPs during construction activities will minimize potential cumulative effects.

Cumulative Impacts During Operations

Operations of Alternative 3 would have no effect on eastern black rail, monarch butterfly, whooping crane, obscure skipper, sandhill crane, Mississippi diamond-backed terrapin, and nesting waterbirds. Boating operations and any in-water work associated with operations would add to the cumulative adverse impacts (injury and death) to manatees and sea turtles associated with boat strikes and in-water activities throughout the Gulf Coast. Operations also increases potential for take of manatees by entrapment in structures. Cumulative impacts associated with operations would continue for the life of the project.

Summary and Comparison of Cumulative Effects of Alternative 2 and Alternative 3

Table 42 provides a comparison of cumulative effects of Alternatives 2 and 3 on special status species. Construction of Alternative 2 is negligible or no cumulative impacts on eastern black rail, whooping crane, sandhill crane, Mississippi diamond-backed terrapin, nesting waterbirds. Alternative 3 increases adverse cumulative effects to those species. Operations of Alternative 2 increases beneficial effects to eastern black rail, whooping crane, sandhill crane, Mississippi diamond-backed terrapin. Alternative 3 would yield no effects to those species. Construction of both alternatives would increase adverse effects to monarch butterfly. Construction and operations of both Alternative 2 and Alternative 3 would increase adverse effects to the West Indian Manatee, Green, Kemp's Ridley, and Loggerhead Sea Turtles. It is advised that pre and post construction BMPs, such as the USFW Standard Manatee Conditions for In-Water Activities, be implement at all times during construction in order to reduce the potential of negative impacts on these species. During operations, installing permeant signage in potential species habitat areas could potentially reduce adverse effects from boating injuries or entrapment of aquatic mammals within structures. Signage designating speeds of idle speed/no wake or NOAA fisheries hotline information for stranded or injured marine animals (Louisiana Sea Turtle Stranding and Salvage Network or Louisiana Marine Mammal Stranding Hotline) could increase awareness and environmental stewardship for these species following normal operations in the area. The table is color coded to indicate effects—green for beneficial, red for adverse, and none for negligible or no cumulative effects.

Table 42. Comparison of cumulative impacts on special status species.

Species	Cumulative Impacts			
	Alternative 2		Alternative 3	
	Construction	Operations	Construction	Operations
Eastern Black Rail, Whooping Crane, Sandhill Crane	Negligible with BMP	Increase beneficial effects of marsh and prairie restoration/management projects.	Potential increase in adverse effects of human presence and activity, lighting, and noises.	None
Monarch Butterfly	Increase adverse effects associated with further loss of habitat.	None	Increase adverse effects associated with further loss of habitat.	None
Obscure Skipper	Negligible with BMP	None	None	None
Mississippi Diamond-backed Terrapin	None	Increase beneficial effects of marsh and prairie restoration and management projects.	Potential increase in adverse effects (vehicle/equipment strikes, ground disturbance, hazardous waste, debris, noise.	None
Waterbird Nesting Colony	Negligible with BMP	None	Potential increase in adverse effects of human presence and activity, lighting, and noises.	None

West Indian Manatee	Increased adverse effects from boat traffic, human activity, and construction. Pre and post construction BMPs (USFW Standard Manatee Conditions for In-Water Activities) will minimize cumulative effects.	Increased adverse effects and potential take from boating operations and by entrapment in structures.	Same as Alternative 2	Same as Alternative 2
Green, Kemp's Ridley, and Loggerhead Sea Turtles	Increased adverse effects from boat traffic, human activity, and construction. BMP will minimize cumulative effects.	Increased adverse effects and potential take from boating operations.	Same as Alternative 2	Same as Alternative 2

Invasive Wildlife Species

The potential for cumulative impacts associated with the proposed action hinges entirely upon the strict adherence to the pre and post construction BMPs for invasive species throughout all phases of project implementation. Though potential adverse effects associated with this resource concern are considered to be mitigated based on the BMP, human error and complacency throughout all phases of surveying, construction, inspections, and operations increases potential for impacts to occur, despite the BMP.

Geographic and Temporal Extent of Analysis

The geographic scope used for analysis of impacts for terrestrial invasive species is the LVRWP project area. The geographic scope for analysis of aquatic invasive species is the LVRW. Because actions associated with operations have potential to introduce invasive species, the temporal scale used in the analysis for both terrestrial and aquatic species is the life of the project (50 years).

Past Actions

- Residential and industrial development
- Commerce and transport of materials
- Recreational influx of vehicles and boating
- State Management Plan for Aquatic Invasive Species

Present Actions

- Residential and industrial development
- Commerce and transport of materials
- Recreational influx of vehicles and boating

Future Actions

- Residential and industrial development
- Commerce and transport of materials
- Recreational influx of vehicles and boating
- Ducks Unlimited marsh restoration project

Invasive Aquatic Species – Asian Clam, Zebra Mussel, Applesnail, and Water Flea

Applesnail has already been documented in the LVRW and within the project area, therefore, past actions within the watershed have already introduced that species. Other past actions with regards to aquatic invasives include the creation of the Louisiana Aquatic Invasive Species Task Force (Executive Order MJF 02-11, June 2002) which, led by the LDWF, prepared the State Management Plan for Aquatic Invasive Species (July 2005) to identify issues and propose strategies to minimize impacts associated with aquatic invasive species.

Because aquatic invasives can potentially be transported by any vessel, vehicle or equipment that enters a waterway and/or comes in contact with areas that drain to nearby waterways, there is potential for introduction and spread of invasive aquatic species throughout the watershed by all present and future actions associated with recreational, commercial, or other waterway users. The Ducks Unlimited marsh restoration project that is planned to occur in the LVRWP project area will employ vessels and equipment, presents a future action with potential for cumulative impacts with the LVRWP.

Cumulative Impacts During Construction

Potential cumulative impacts that could occur during construction include the inadvertent introduction of aquatic invasives by all users of waterways in the LVRW. Any dearth of awareness and disregard for implementing the pre and post construction BMPs has potential to add to the watershed-wide issue of aquatic invasive species.

Cumulative Impacts During Operation

Potential for cumulative impacts during operations is essentially the same as those during construction. All vessels, vehicles, equipment, etc. have potential to introduce or spread aquatic invasives and thereby add to the watershed-wide hazard of aquatic invasive species. Vessels and equipment used during operations also have potential to harbor and transport aquatic invasive species.

Terrestrial Invasive Species–Tawny Crazy Ant, Red Imported Fire Ant

It is likely that red imported fire ants have already been introduced to the LVRWP project area.

Cumulative Impacts During Construction

Residential and commercial activities that introduce materials have potential to transport these species and add to cumulative impacts associated with the species. Potential cumulative impacts that could occur during construction include the inadvertent introduction of terrestrial invasives into the project area, or spread within the project area. Any dearth of awareness and disregard for implementing the BMP has potential to add to the watershed-wide issue of invasive species.

Cumulative Impacts During Operation

Potential for cumulative impacts during operations is essentially the same as those during construction. Vehicles and equipment associated with the operations of the project have potential to introduce and/or spread terrestrial invasive species, adding to any existing impacts within the LVRWP area. Residential and commercial traffic that carries infested materials can introduce these ant species or spread them within the project area. Specific impacts associated with tawny crazy ant and red imported fire ant are discussed in **Chapter 5.5.4**.

5.6 Human and Environmental Resources

5.6.1 Cultural and Historic Resources

Alternatives 1 – No Action

This alternative should have negligible effect on historical properties and cultural resources

Alternatives 2 – Proposed Action

As described in Chapter 3, cultural resources background research and assessment determined no historic properties are located within or adjacent to the APE for the proposed alternative. There are no recorded archaeological sites, historic buildings, standing structures, cemeteries, or other historic properties within the APE. Although no previous cultural resource surveys encompassed the APE, there have been 19 previous culturalresource investigations within the LVRWP area. These investigations recorded and identified 22 archaeological sites, five historic standing structures recorded with the Louisiana Historic Standing Structures Survey, four historic cemeteries, and the Vermilion Lock on the Gulf Intracoastal Waterway (GIWW). All of these properties are located outside of the APE for the proposed alternatives. The LVRWP will potentially benefit these cemeteries, structures, and sites through flood prevention and protection from storm surge.

NRCS determined the APE for cultural resources was limited to direct APE, or areas of ground disturbance from proposed undertakings. SHPO concurred on APE and finding of no adverse effect based on previous investigations and current assessment. While the APE has

not been recently surveyed, survey work was not recommended due to extensive disturbance noted by previous investigators. Extensive ground disturbances from intensive agricultural practices (tilling, land leveling, etc.), industrial sites with extensive grading and infrastructure development (pipeline installation, drilling, topsoil stripping, etc.), or heavily developed urban areas with multiple construction phases have a high probability of rendering surveys largely ineffective and a costly expense. In addition, natural disturbances such as flooding, erosion, landslides, fires, windstorms, and other disturbances could also create and/or acerbate conditions that could ultimately affect the quality and abundance of cultural resources. As such, extensive ground disturbances on landscapes leave the potential of finding significant cultural resources at a minimal. The preliminary cultural resources desktop assessment identified the natural levee of the Vermilion River as an area of low probability for the occurrence of cultural resources. The preliminary assessment was performed during our June 2020 site visit. The proposed restoration of the Meaux's Ditch structure and installation of a control structure on an "Unnamed" canal are within this area. One recorded site, 16VM16, lies in the vicinity (within 250 meters) but outside of the APE for the proposed restoration of the Meaux's Ditch water control structure. The remaining APE is assessed as having a low probability for cultural resources. Areas of low probability for cultural resources within the APE include all inundated or periodically inundated areas of lower elevation off of the natural levee. There are no historic properties within the APE that are listed, or eligible for listing in the NRHP.

Consultations were coordinated by the NRCS State Cultural Resources Specialist/Tribal Liaison, pursuant to Section 106 of the National Historic Preservation Act (NHPA) and implementing regulation (36 CFR 800). The Louisiana State Historic Preservation Office (SHPO) and Tribal Historic Preservation Office (THPO) of federallyrecognized Indian tribes with an area of interest (AOI) encompassing the project area were contacted on September 25, 2019, regarding the potential effect of the project alternatives on historic properties. The Chitimacha Tribe of Louisiana, Coushatta Tribe of Louisiana, Jena Band of Choctaw Indians, and Tunica- Biloxi Tribe of Louisiana were provided with a project description, including the proposed alternatives, and invited to comment. On December 11, 2024, an additional Tribal Consultation Letter of Request was sent to the Cultural Resource Specialist within the Archaeologist NRCS Louisiana State Office to assist in reviewing and consulting with Federal, State, and non-federally recognized tribes not listed in the 2019 efforts. These include Alabama Coushatta Tribe of Texas, Mississippi Band of Choctaw Indians, Adai Caddo Indians of Louisiana, and Atakapa-Ishak Nation tribal organizations (see Appendix A). The Cultural Resource Specialist's response to the Tribal Consultation Letter of Request stated that the Federally recognized Indian Tribes consulted for this project include the Chitimacha Tribe of Louisiana, Coushatta Tribe of Louisiana, Jena band of Choctaw Indians, and the Tunica-Biloxi Tribe of Louisiana. The Alabama-Coushatta Tribe noted in your correspondence was not consulted for this project. This Tribe's Area of Interest (AOI) is not State-Wide (encompassing all of Louisiana) as listed or illustrated on some databases and AOI maps. This Tribe's AOI map provided to NRCS Louisiana is separated into Primary and Secondary AOI. Vermilion Parish is not located in either of the two. The Mississippi Band

of Choctaw Indians were also not consulted for this project. NRCS Louisiana's former State Conservationist Kevin Norton sent a formal request to the Mississippi Band of Choctaw Indians Chief and Tribal Historic Preservation Officer to initiate Government-to-Government relations on May 28, 2014. There was no response to Mr. Norton's request. Subsequent to this project, Government-to-Government relations were established under Former State Conservationist Chad Kacir.

State Recognized Tribes are not consulted under Section 106 protocols unless the Tribe sends a formal letter to the State Conservationist requesting the Tribe be consulted and justification for consultation. The State Conservationist then makes a determination if the State Recognized Tribe(s) will be consulted. No formal request from the Adai Caddo Indians of Louisiana or the Atakapa-Ishak Nation were submitted for this project. With this additional letter and response by NRCS personnel, these tribes with ancestral land claims within the AOI were consulted, and no comments or concerns have been received from these tribal organizations as of December 2024. The State Historic Preservation Officer from the Louisiana Office of Cultural Development made a preliminary determination that the LVRWP would not adversely affect historic properties listed, or eligible for listing in the NRHP. NRCS requested the project be allowed to proceed without additional investigation of cultural resources.

On July 17, 2020, the Louisiana SHPO concurred with the preliminary determination that no historic properties would be adversely affected by the proposed LVRWP alternatives. The SHPO responded with no objection to theproject proceeding as planned. The THPO of the federally recognized Indian tribes that were consulted under Section 106 did not reply to the NRCS within the 30-calendar day review period. On July 23, 2020, the NRCS State Cultural Resources Specialist/Tribal Liaison advised the Assistant State Conservationist that NRCS fulfilledits obligations under Section 106 of the NHPA and its implementing regulation, and that the LVRWP can proceedas planned.

Canals and ditches within the APC not eligible for listing on the NRHM, as theses elements of the cultural landscape are not associated with significant historical events or persons, do not represent distinctive characteristics or the work of master and have little potential to produce information important to history or prehistory. In the event canals or other elements of the landscape are determined to be eligible for listing on the NRHP, recommend the proposed undertakings will have no adverse effect, as the undertakings are in keeping with the purpose of the original construction.

If human remains, artifacts, or cultural resources 50 years of age or older are discovered during construction, the ground disturbing activities will immediately cease in the area. In the event human remains are discovered, the Louisiana Unmarked Human Burial Sites Preservation Act (Revised Statute 8;671-681) will be followed. A qualified archaeologist will monitor all ground disturbance and determine if cultural resources are potentially eligible for listing on the NRHP.

Alternatives 3 – Structures and Levee Reinforcements

Similar to Alternative 2, a cultural resources background research and assessment determined no historical properties located within or adjacent to the APE for this alternative. There are no recorded archaeological sites, historical buildings, standing structures, cemeteries, or historic properties within the APE. All previously investigations within the LVRWP area, which found 22 archaeological sites, five historical standing structures, four historic cemeteries, and the Vermilion Lock on the GIWW, are all properties outside of the APE for this alternative. The actions found within this alternative would potentially benefit these cemeteries, structures, and sites through flood prevention and protection from storm surges.

NRCS determined the APE for cultural and historical resources was limited to areas of ground disturbance from proposed undertakings of construction of two water control structures and the approximately 11 miles of levee improvements by 2 ft (6ft. total). During a preliminary assessment preformed on June 2020 site visit. One recorded site, 16VM16, lies in the vicinity (within 250 meters) but outside of the APE for the proposed restoration of the Meaux's Ditch water control structure. There are no historic properties within the APE that are listed, or eligible for listing in the NRHP.

Similar to Alternative 2, consultations were coordinated by the NRCS State Cultural Resources Specialist/Tribal Liaison, pursuant to Section 106 of the National Historic Preservation Act (NHPA) and implementing regulation (36 CFR 800). The Louisiana State Historic Preservation Office (SHPO) and Tribal Historic Preservation Office (THPO) of federally recognized Indian tribes with an area of interest (AOI) encompassing the project area were contacted on September 25, 2019, regarding the potential effect of the project alternatives on historic properties. Another consultation letter of request was sent to the NRCS State Cultural Resources Specialist/Tribal Liaison on December 11, 2024 to complete consultation requirements for both Federal and State recognized Indian tribes that had previously been missed during the 2019 efforts (see previously in Alternative 2). As of December 2024, no comments or concerns have been received from tribes with ancestor lands within the AOI.

If human remains, artifacts, or cultural resources 50 years of age or older are discovered during construction or levee improvements, the ground disturbing activities will immediately cease in the area. In the event human remains are discovered, the Louisiana Unmarked Human Burial Sites Preservation Act (Revised Statute 8;671-681) will be followed. A qualified archaeologist will monitor all ground disturbance and determine if cultural resources are potentially eligible for listing on the NRHP.

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5.6.2 Land Use

Alternative 1 - No Action

The No Action Alternative would not result in any direct change to land cover or land use. Indirect changes to pastureland may occur if flooding from major storm events continues. The back to back storm events from this past year (2020), forced one known cattle farmer to uproot

their livestock and search for new land to raise their cattle. **See Appendix E** –Hurricane Reports

Alternative 2 - Preferred Action

The Preferred Alternative will have no effect on land use adjacent to control structures or levee improvements.

Alternative 3 – Structures and Levee Reinforcement

This alternative will have no effect on land use adjacent to control structures or levee improvements.

5.6.3 Scenic Beauty and Visual Resources

The assessment of potential affects to this resource is based on an evaluation of the contrast created by introducingproject-related visual elements into the viewshed. Visual contrast is the primary indicator of how well the projectaccomplishes objectives of Title 190—*to preserve the natural beauty of an area and contribute to the quality of the visual resource*. The degree of contrast between a newly introduced element and its surroundings determinesthe level of impact on the viewshed and to viewers. Measuring contrast establishes a weight of comparison for the elements of form, line, color, light, movement, and texture, and provides an indicator to determine the level of impact that would result from a proposed action. Contrast is a measure of how much an element distracts theviewer's attention from the natural environment and is rated as follows:

- None – contrast is not visible or perceived
- Weak – contrast is visible but does not attract attention
- Moderate – the contrast attracts attention and is a dominant characteristic
- Strong – the contrast is stark, captivates attention and is impossible to overlook

Contrast is considered to be adverse when visually pleasing elements are removed or incongruent elements are introduced or constructed within the viewshed. Beneficial effects occur when unaesthetic elements are removedor rehabilitated.

Alternative 1 - No Action

Under the No Action alternative, there would be no visual changes to the viewshed. Operations and maintenanceactivities associated with existing structures and levees would continue as currently managed with regular inspections, and occasional maintenance and

repairs of existing levees and structures. Such activities (e.g. mowing, minor localized levee repair) cause intermittent, temporary, weak to moderate visual contrast. However,the vast majority of the existing levees and structures are located in remote locations and would rarely be viewedby the general public.

Determination: The No Action Alternative would result in occasional temporary negligible and minor adverse impacts to visual resources.

Alternatives 2 and Alternative 3

Direct impacts associated with the proposed action will occur within the immediate vicinity of specific project components. There will be no overall impacts to the LVRWP viewshed.

Hebert Canal water control structure at Hwy 333 – will result in strong visual contrast between introduced elements and the surrounding environment. Site preparation will create strong contrast as equipment, vegetationremoval and activity will occur in a natural setting. Activities associated with construction will create visually distracting motion and form in contrast to existing elements of form, light, texture, and motion within in the landscape. Construction activities in the water will increase turbidity resulting in temporary changes in color and clarity. Removal of vegetation and construction will create a permanent high-contrast element within the viewshed. Some of the vegetation will reestablish itself naturally, but the water control structure will remain as a permanent high contrast component on the landscape. The location of this structure is in a high visibility area where traffic along Hwy 333 will be able to see all phases of the project. This component will cause moderate short-term, long-term, and permanent adverse impacts to the viewshed.

Meaux's Ditch water control structure at Hwy 333 – will result in weak to moderate contrast between introduced elements and the surrounding environment. The site location for this component is in an area that is regularly maintained/mown with little natural vegetation along canal banks. Activities associated with construction will create visually distracting motion and form visible to viewers/traffic along Hwy 333. Site preparation will create weak to moderate contrast primarily with regards to soil disturbance. Construction activities in the water will increase turbidity resulting in temporary changes in color and clarity visible to viewers crossing Meaux's Ditch at Hwy 333. This component will cause localized short-term, permanent minor adverseimpacts to the viewshed.

"Unnamed" Canal water control structure at LA Hwy 333 – would result in permanent moderate visual contrast within the viewshed. The site location is within an area that is heavily managed, with little herbaceous vegetation on the bankline, a gravel road along the south side of the canal, and mown areas and pastures to the south and north. There is no natural habitat within this part of the viewshed. The site is approximately 200′ westof Hwy 333 and would be somewhat visible to traffic. Visually distracting motion and form during site preparation and construction will create weak to moderate contrast to existing elements. Activities in the

water will cause temporary changes in color and clarity that would be visible to traffic crossing the Hwy 333 bridge. The structure will not be visible from the highway. This component will cause localized short-term, minor permanent adverse impacts to the viewshed.

Levee construction along GIWW and Hwy 333 – will result in strong visual contrast between introduced elements and the surrounding environment. This location already contains rock shoreline protection along the bank of the GIWW parallel to Hwy 333. The existing rock is less than 5 ft in elevation with some herbaceous vegetation along the site, and provides a minor visual break between the dynamic movement of water in the GIWW and the visually static linear feature of Hwy 333. Activities associated with construction operations willcreate high visual contrast including distracting motion and form of equipment and vehicles, and disturbance to elements of form, and motion as activities introduce materials into the water. Construction activities in the waterwill increase turbidity resulting in temporary changes in color and clarity. Construction of the levee will increasethe visual weight of the existing visual break between the GIWW and Hwy 333 and result in a permanent high- contrast element within the viewshed. Some vegetation will reestablish itself, but the levee will remain as a permanent moderately contrasting component on the landscape. The location of this structure is in a high visibilityarea where traffic along Hwy 333 will be able to see all phases of the project. This component will cause moderateto strong short-term, long-term, and permanent adverse impacts to the viewshed.

Determination: Implementation of the proposed action will likely result in short-term, long-term, and permanentmoderate adverse impacts; short-term, permanent adverse impacts; short-term, minor permanent adverse impacts;and moderate to strong short-term, long-term, and permanent adverse impacts. The effects will be highly localized and would not result in significant impacts to the LVRW viewshed.

5.6.4 Human Health and Safety

Alternative 1 - No Action

This alternative would not result in any change to transportation routes.

Alternatives 2 and Alternative 3

During operation and maintenance, there is a risk due to heavy equipment, high-voltage electricity, and the use ofpetroleum products.

The project has increased potential for injuries during project construction, operation, and maintenance. During construction, heavy equipment for trenching and installation of large-scale equipment pose safety risks. All localstate and federal rules concerning worker safety should be observed. During construction, all local, state and federal rules concerning worker safety will be followed. Measures may include signage, lighting, and access control during and after construction. no effects on Public Health and Safetyare anticipated from any of the

proposed construction activities

5.6.5 Socioeconomics

Alternative 1 - No Action

Under the No Action alternative, there would be no adverse socioeconomic effects

over current effects.

Alternatives 2 and Alternative 3

Although the project area has both moderate and low- income populations neither the Proposed Action nor its alternatives are anticipated to disproportionately impact these populations due to the minimal changes to the physical and human environment anticipated to result from project implementation

Proposed Action

There would be no direct, indirect or cumulative impacts to population and demographics trends in the parish or sub watershed from the proposed action. Implementation of the project would provide direct and indirect positiveeffects on employment and keep farm production in business.

Implementation of the project in the watershed would increase the potential for fresh water supply to producers in the watershed while also decreasing the amount of storm induced flooding and soil salt concentrations. Farm net revenues would increase because of reduced flood damage and land remediation costs. Salinity reduction benefits are avoidable economic damages resulting from downstream controls necessary to reduce salinity. These benefits would be recognized through the installation of control structures and levee improvements.

5.7 Cumulative Impacts

The CEQ regulations for implementing the NEPA define cumulative effects as: the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such other actions (40 CFR ~ 1508.7). Cumulative impacts are the incremental accumulation of effects (adverse or beneficial) on a given resource from the proposed action in addition to effects from actions that have occurred in the past, are currently ongoing, and actions that would occur in the future. Effects accumulate when subsequent impacts occur before the resource or ecosystem can fully rebound from the effect of the previous action(s). Cumulative impacts can be interactive or synergistic and are defined temporally and geographically. Cumulative effects must be considered in the NEPA analysis of whether the

proposed action would cause a significant impact on the human environment.

5.7.1 Methodology for the Cumulative Impacts Analyses

The methodology followed for determining cumulative impacts includes:

1. Identify affected resources
2. Establish temporal and spatial parameters
3. Identify past, present and future actions that would have cumulative effects
4. Analyze the cumulative effects associated with the LVRWP

Identify Affected Resources

Only those resources expected to be directly or indirectly affected by the proposed action, as discussed in Chapter 5.1 – 5.6, have been analyzed for cumulative impacts. Resources that would be only negligibly impacted by construction and operations of the proposed alternatives (listed below) are not considered in the cumulative impacts analysis.

5.3 - Air Quality
5.4.2 - Special Status Plants
5.4.3 - Invasive Plant Species
5.6.1 - Cultural and Historic
5.6.2 - Land Use
5.6.4 - Human Health and Safety
5.6.5 - Socioeconomics

Table 42. Comparison of the Cumulative Impacts from Alternatives 2 and 3.

Resource	Past Actions	Present Actions	Comparison of Cumulative Impacts	
			Alternative 2	Alternative 3
Water Quality	- Channelization - TVFWD - Agricultural practices - NRCS conservation projects	- Channelization - TVFWD - Agricultural practices - NRCS conservation projects	- offset adverse effects of channelization - increase benefits of TVFWD - moderate agricultural practices - increase protection of NRCS projects and sustain financial investment made with producer partnerships	- offset adverse effects of channelization - increase benefits of TVFWD - moderate agricultural practices - regulate water movement in interior canals - increase protection of NRCS projects and sustain financial investment made with producer partnerships
Water Quantity			- offset adverse effects of channelization - negligible increase of benefits of TVFWD - offset adverse effects of agricultural water withdrawals - increase protection of NRCS projects and sustain financial investment made with producer partnerships	- offset adverse effects of channelization - increase benefits of TVFWD - regulate water availability in interior canals - offset saltwater intrusion via Hebert Canal - moderate agricultural water withdrawals - periodically exacerbate water quantity issues - increase protection of NRCS projects and sustain financial investment made with producer partnerships
Soils and Geology	- Agricultural practices - Leveeing - Channelization - NRCS conservation projects	- Agricultural practices - Leveeing - Channelization - NRCS conservation projects	- decrease adverse effects of agriculture (chemical applications, nutrient loading, salinization) - increase adverse effects of agriculture (soils compaction, tilling) - exacerbate subsidence - increase protection of some NRCS projects and sustain financial investment	Same as Alt 2
Land Cover Types	- 88 CPRA projects - USDA Prairie Restoration - Leland Bowman lock - Channelization	- Ducks Unlimited marsh restoration - CPRA projects - USDA Prairie Restoration - Channelization	- increase benefits of marsh management and restoration - potential salt scald would reduce benefits of marsh management/restoration efforts; and - increase adverse effects of channelization and diversions	- increase adverse effects of surface use conversion

Special Status Plants	- Leveeing - Drainage and diversion systems - Habitat loss and fragmentation - NRCS conservation projects	- Agricultural and industrial pollutants - NRCS conservation projects	- increase benefits of marsh management and restoration - potential salt scald would reduce benefits of marsh management/restoration efforts; and - increase adverse effects of channelization and diversions - increase protection of NRCS projects and sustain financial investment made with producer partnerships	- increase adverse effects of surface use conversion
Wetlands, Riparian Zones			- reduce adverse effects of channelization - increase benefits of marsh management and restoration - potential salt scald would reduce benefits of marsh management/restoration efforts; and - increase adverse effects of channelization and diversions - increase protection of NRCS projects and sustain financial investment made with producer partnerships	- increase adverse effects of surface use conversion
Fishery Resources	- Drainage channels - Levees, roads, agricultural impoundments - Water control structures	- Drainage channels - Levees, roads, agricultural impoundments - Water control structures	- increase adverse effects of channelization, impoundments and water control structures	- minor increase in adverse effects of channelization, impoundments and water control structures
Terrestrial Wildlife	- 88 CPRA projects - USDA Prairie Restoration - Leland Bowman lock - Channelization - Leveeing	- Ducks Unlimited marsh restoration - CPRA projects - USDA Prairie Restoration - Channelization - Agricultural and industrial pollutants	- increase adverse effects of habitat loss and fragmentation - increase adverse effects of anthropogenic impacts (roadways, traffic, lighting) - permanently convert available habitat - increase benefits of marsh restoration efforts - offset some of the negative effects of channelization	- increase adverse effects of habitat loss and fragmentation

Migratory Birds, BCC	- Drainage and diversion systems - Habitat loss and fragmentation -Pollution		- increase adverse effects of habitat loss, conversion and fragmentation in the migration corridor - increase adverse effects of anthropogenic impacts (roadways, traffic, lighting) - increase negative impacts of leveeing and diversions - increase benefits of marsh management - offset some of the negative effects of channelization - increase adverse effects (pollutants)	- increase adverse effects of habitat loss, conversion and fragmentation in the migration corridor - increase adverse effects of anthropogenic impacts (roadways, traffic, lighting)
Special Status Species			- further reduce habitat for monarch butterfly - increase adverse effects (manatee, sea turtles) - increase benefits of marsh and prairie restoration (eastern black rail, whooping crane, sandhill crane, Mississippi diamond-backed terrapin) - increase adverse impacts (manatee and sea turtles)	- increase adverse impacts from human presence (eastern black rail, whooping crane, sandhill crane, waterbird colonies) - reduce habitat (monarch butterfly) - increase adverse effects from vehicular traffic and equipment (Mississippi diamond-backed terrapin) - increase adverse effects from boat traffic, human activity, construction activities (manatee, sea turtles)
Invasive Wildlife Species	- Residential and industrial development - Transport of materials - Vehicles and boating	- Residential and industrial development - Transport of materials - Vehicles and boating	- potential increase of adverse effects of past, present actions	Same as Alternative 2
Scenic Beauty and Visual Resources	- Residential and industrial development - Leland Bowman lock - GIWW	- Local residential and industrial actions	- increase adverse effects of past, present actions	None

1. Establish Spatial and Temporal Parameters

The geographic scope within which the effects of the proposed action are likely to overlap with the effects of past, present and future actions has been established for each resource topic, based on the watershed, ecoregion or other spatial parameter appropriate to the resource. The temporal scale used for these analyses is based on the length of time that impacts will continue before a given resource recovers to pre-project conditions. Timeframes used in this analysis include the time of effects during construction and the duration of effects over the course of the project life (fifty years). Geographic and temporal parameters are discussed under each resource topic.

2. Identify Past, Present and Future Actions with Potential Cumulative Impacts

Based on the unique vulnerabilities of each resource, a list of actions that would interface with each resource has been identified and discussed under each resource topic below.

3. Analyze Potential Cumulative Impacts on Each Resource

Each resource that was determined to be affected by the proposed action was analyzed for cumulative impacts with respect to past, present and future actions that have potential to impact those resources in a synergistic or aggregate manner with the proposed action. Past, present and future actions identified are specific to each resource and are identified under each resource topic below.

5.8 Risk and Uncertainty

Engineering

Under the preferred alternative, all control structures and levee improvements must be designed by professionalengineers. This ensures the structures meet industry standards.

Economics

The economic calculations are subject to several components of uncertainty that may influence the actual projectoutcome. Commodity process and economic marks fluctuate from year to year.

5.9 Controversy

Areas of controversy could arise should the Hebert Canal Structure be operated to significantly restrict fisheriesaccess.

5.10 Precedent for Future Action with Significant Impacts

The alternatives do not set a precedent for future actions to follow that would be associated with major impacts. Future, similar watershed projects would be evaluated on their own merits and evaluated for effects based on relevant resources identified during each project's scoping process.

5.11 Compliance with Federal, State and Local Laws Federal

5.11.1 SECTION 404 PERMIT

A Section 404 permit from the USCOE would be required for impacts on wetlands and other waters of the U.S. The USCOE requires prior authorization of discharges of dredge orfill material, including those for temporary construction purposes, into waters of the U.S.
(33 USC 1344). Mitigation is anticipated for Alternative 2 levee construction and Alternative 3 levee reinforcement. We anticipate mitigation of wetlands cost to be approximately $170,000.

5.11.2 ENDANGERED SPECIES ACT

The agency taking the action decides if the proposed action has either a “no effect” or “may affect” on a listed species or designated critical habitat. If the agency determines there is a“may affect” then, Section 7(a)(2) of the Endangered Species Act states that the federal agency shall consult with U.S. Fish and Wildlife Service (USFWS).

Based on a review of the federally listed species concerns within the Project area, the No-Action Alternative has no effect on a listed species or designated critical habitat.

5.11.3 NATIONAL FLOOD INSURANCE PROGRAM

The No-Action is not anticipated to be influenced by or influence the National Flood Insurance Program (NFIP).The preferred alternative should reduce flooding to homes and businesses thereby saving the program funds.

5.11.4 NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to determine whether their undertakings will have an adverse impact on historic properties that are listed on or are eligible forlisting on the National Register of Historic Places and to afford the Advisory Council on Historic Preservation areasonable opportunity to comment. A Section 106 determination by the NRCS indicated that the preferred alternative would not adversely affect area historic properties.

5.11.5 BALD AND GOLDEN EAGLE PROTECTION ACT

The proposed project is unlikely to affect either the bald or golden eagle or their habitats.

5.11.6 MIGRATORY BIRD TREATY ACT

The proposed project is unlikely to affect migratory birds or their habitats.

6. CONSULTATION, COORDINATION AND PUBLIC PARTICIPATION

Communications Outreach

Communications outreach soliciting engagement and participation from the public, stakeholders, and agency partners began during the Draft Plan-EA scoping phase. A project website, www.lvrwp.com, was created and served as an information hub for the project. The site includes background and up-to-date project information, as well as a portal for public comments. A complete list of communication materials includes:

- LVRWP Sign-in Sheet
- LVRWP Fact Sheet
- LVRWP Comment Card
- LVRWP Website and Email Address: www.lvrwp.com / info@lvrwp.com
- LVRWP PowerPoint Presentation
- LVRWP Project Launch Press Release
- LVRWP Agriculture Producer's Survey

(See Appendix E for communications materials)

6.1 Public Participation

6.1.1 Agricultural Producers Meeting

The Sponsors worked closely with local producers and landowners to provide information on the planning activities and to solicit their input on the pertinent issues and solutions to be considered during planning.

Agriculture Producer Surveys were distributed to farmers in the impacted area. The purpose of the surveys was to better understand the impact of flooding and saltwater storm surges on agricultural producers in and around the Lower Vermilion River Watershed project area.

On behalf of the SLO, two producer meetings were held during the scoping process to receive feedback and encourage producer engagement. The first producer meeting for the LVRWP was held at Palmetto Island State Park on July 17th, 2020. The second meeting was at the same location on July 23, 2020. Approximately 10 local producers and/or landowners were in attendance at each meeting. A project fact sheet was distributed, which addressed frequently asked questions regarding the project. Comment cards and meeting notes were used to document producers' input and concerns on the possible alternatives and the planning process. To minimize risks,we followed the COVID-19 guidelines set forth by the State of Louisiana. All attendees, including hosts and participants, were required to wear facemasks at all times and follow the social distancing measures.

6.1.2 Public Scoping Meeting

A virtual public scoping meeting (webinar) was held on Thursday, August 6th from 6:00 pm - 7:00 pm. The meeting was held virtually due to the COVID-19, as stated on epa.gov:

> *Virtual public hearings and meetings are supported by the EPA in order to provide meaningful publicparticipation and engagement during the Novel Coronavirus Disease (COVID-19) Outbreak.*

Communication outreach inviting public participation to the virtual public scoping meeting included: (See Appendix E for communications materials.)

- Press release sent on behalf of NRCS to local and neighboring parish digital and print publications including Cameron, Lafayette, Vermilion, St. Martin and Iberia Parishes
- Postcard mailed to households, landowners and businesses located within a five-mile radius of thestudied area
- Public service announcement (PSA) print ad distributed to local newspapers and publications includingCameron, Lafayette, Vermilion, St. Martin and Iberia Parishes

Panelists in attendance included representatives from the Bluewing Civil Consulting engineering and scientific team, as well as from NRCS and VSWCD.

Twenty (20) individuals registered for the virtual public meeting and 13 individuals attended.

During the Scoping Webinar, comments were collected regarding the project. Two comment letters were receivedduring the Public Scoping meeting and one comment was collected by email.

The Public Scoping Meeting was recorded and submitted for public viewing on the project website: https://lvrwp.com/https-www-dropbox-com-s-3bucqrvs6lvs8vi-lvrwp-scoping-webinar-movdl0/

6.1.3 Draft Plan-EA review

A Draft Plan - EA will be distributed for interagency and public review following NRCS approval. The distribution list of agencies andorganizations is included in Chapter 10. Copies of the document will be placed on the www.lvrwp.com website and in news articles placed in local newspapers to solicit comments from the public during the comment period. After the interagency and public review period, comments received on the draft would be incorporated into the Final Plan-EA. Letters of comments received on the draft plan and NRCS responses to the comments will be included in Appendix A.

6.2 Agency Coordination

Outreach notifying Cooperating Agencies about the Scoping Plan-EA was sent to federal, state

and local agencies including: United States Department of Agriculture, National Resources Conservation Service, Louisiana State Historic Preservation Office, National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS), U.S. Fish and Wildlife Service (FWS), U.S. Army Corps of Engineers (USACE), Bayou Vermilion Preservation Association (BVPA), Teche-Vermilion Water District (TVFWD).

TVFWD Board agrees that this project will extend the benefits of the freshwater supply from the Vermilion River to more in lower Vermilion Parish and complement the Seventh Ward Canal Watershed Project.

NRCS State Cultural Resources Specialist and Tribal Liaison, Dr. Aubra "Butch" Lee - concurs with the preliminary assessment that the described planned work will not adversely affect any cultural resources and/or historic properties within the APE. Dr. Aubra "Butch" Lee responded on December 11, 2024 acknowledging receipt of the second Tribal Consultation Letter of request for missed tribes during the first SHPO review.

State Historic Preservation Officer, Kristin P. Sander, Deputy, responded on July 17, 2020: "The proposed undertaking will have no adverse effect on historic properties. Therefore, our office has no objection to the implementation of this project. This effect determination could change should new information come to our attention." The Louisiana SHPO acknowledged receipt of the Section 106 documentation on July 17, 2020 alongwith a letter of concurrence with the preliminary determination that no historic properties would be adversely affected by this undertaking and the project could proceed as planned. The NRCS has fulfilled its obligations under Section 106 and the project can proceed as planned (36 CFR 800.3(c)4).

National Marine Fisheries Service (NMFS), Andrew J. Strelcheck**,** Regional Administrator, responded on June 9, 2022 acknowledging receipt of the letter from NRCS requesting NMFS participation as a cooperating agency in the development of the EA for LVRWP (See Appendix A).

U.S. Fish and Wildlife Services (FWS), Brigette Firmin, Field Supervisor, responded on December 11, 2024 acknowledging receipt of the Consultation Letter of request from NRCS requesting FWS participation as a cooperating agency in the development of the EA for LWRWP (See Appendix A).

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Table 43. Agency and Public Consultation and Coordination Record Summary *(See Appendix E for Consultation and Correspondence Documentation)*

Date	Contact, Agency	Communication
February 26, 2020	**Conference Call** • Alex Guillory, BWC • Jenee Dansdill, BWC • Tami St. Germain	• Scope of project plan • Description of sites • Scoping process
April 08,2020	**Assessment Team Meeting** • Alex Guillory, BWC • Jenee Dansdill, BWC • Darryl Clark • Tami St. Germaine • Jeremy Griffith • Mark Rees, Ph.D. • Cathi Pavy	• Discuss site location and project name • Recommendations for localized watershed area for Project Map • Project assessment • Plan of Work
April 22, 2020	**Assessment Team Meeting** • Mitzi Dohrman, VSWCD • Britt Paul, NRCS • Joey Breaux, USDA • Alex Guillory, BWC • Jenee Dansdill, BWC • Darryl Clark	• Project scope. Main focus on flood prevention • Project area • Discuss alternatives for Draft Plan-EA • Discuss project expectations and plan of work
	• Tami St. Germain • Jeremy Griffith • Mark Rees, Ph.D. • Cathi Pavy	• Preliminary assessment
May 21, 2020	**VSWCD Board Meeting**	• Confirmed project name to be Lower Vermilion River Watershed Project Plan-EA • Discussed communication plan including press release and website • Suggested public meeting date and location • Discussed database development • Plan of Work
June 09, 2020	**7th Ward Drainage District Meeting**	• LVRWP Updates • Review Fuselier survey • History of Hebert Canal and existing control structures • Producer Surveys • Installation cost estimate for control structure • Public meeting site suggestions • Site tour

Date	Contact, Agency	Communication
June 17, 2020	**Agency Correspondence** To: Kimberly S. Walden, M.Ed, Chitimacha Tribe of Louisiana From: Aubra L. "Butch" Lee, USDA-NRCS	• Preliminary determination that Lower Vermilion Watershed project would not adversely affect any significant cultural resources
July 7, 2020	**Agency Correspondence** To: Jenee Dansdill, BWC Alex Guillory, BWC From: Kurt M. Guidry, LSU Agricultural Center	• Agricultural economic data request and receipt related to Hebert Canal Watershed
July 08, 2020	**VSWCD Board Meeting**	• View PowerPoint presentation • Notes to revise presentation to reduce up front environmental discussion and focus on alternatives and proposed improvements
July 17, 2020	**Agriculture Producers Meeting #1** • Alex Guillory, BWC • Jenee Dansdill, BWC • Sherrill Sagrera, VSWCD • Ernest Girouard, VSWCD	• Presentations and discussions concerning "Meaux's ditch" • Overview on LVRWP Assessment and Planning Process • Request/discuss stakeholder information, input, and • Distributed Producer Surveys
July 23, 2020	**Agency Correspondence** To: W. Britt Paul, P.E., USDA-NRCS From: Aubra L. "Butch" Lee, USDA-NRCS	• Louisiana SHPO acknowledged receipt of Section 106 documentation and concurred with preliminary determination that no historic properties would be adversely affected and could proceed with undertaking Lower Vermilion Watershed project on 07/17/20
July 23, 2020	**Agriculture Producers Meeting #2**	• Overview on LVRWP Assessment and Planning Process • Request/discuss stakeholder information • Discuss issues, options, and possible solutions to stakeholder concerns • Distributed producer surveys
August 6, 2020	**Virtual Public Scoping Meeting (Webinar)** 13 participants	• Overview on LVRWP Assessment and Planning Process • Request/discuss stakeholder information, input
September 30, 2020	**Agency Meeting** Joseph Ranson, USFWS Rusty Swafford, NMFS	• Overview of Watershed Assessment & Planning Process • Request feedback and assistance • Identify potential concerns

Date	Contact, Agency	Communication
October 13, 2020	**7th Ward Gravity Drainage District Meeting**	• Discuss 7th Ward O & M Agreement • Discuss detailed operations plan • Request inspection reports for current structure • Preferred alternatives • Discuss Hurricane Laura • Alt 2 Levee update
October 13, 2020	**Agency Correspondence** To: Jenee Dansdill, BWD From: January Murray, NOAA CC: Alex Guillory, BWC Mitzi Dohrman, VSWCD Britt Paul, USDA Tami St. Germain, Environmental Scientist Darryl Clark, Fisheries Biologist	• Request for review of proposed LVRWP plan Environmental Assessment received • NMFS recommendation that requestors evaluate the need for hydrologic restoration in addition to flood protection in LVRWP plan
October 23, 2020	**Lockmaster Meeting** **Leland Bowman locks** • Alex Guillory, BWC • Jenee Dansdill, BWC	• Discussed Alt 2 and how it would benefit the locks mission to protect the Mermentau watershed from salt intrusion
	• Sherrill Sagrera, VSWCD • Jason Petrey, Lockmaster • Shannon Lemaire, Local Producer	
October 27, 2020	**Agency Correspondence** To: Jenee Dansdill, BWD From: Joseph A. Ranson, LA Ecological Services Center CC: EPA, NRCS, NMFS, LDWF, LDNR, CMD, OCPR	• Provided Planning Aid Report
November 10, 2020	**Assessment Team Meeting** • Mitzi Dohrman, VSWCD • Britt Paul, NRCS • Alex Guillory, BWC • Jenee Dansdill, BWC • Sherrill Sagrera, VSWCP • Ernest Girouard, VSWCD • Donald Sagrera, 7th Ward Gravity Drainage • Chad Lege, VPPJ • Tami St. Germain, Environmental Scientist • Darryl Clark, Fisheries Biologist • Shannon Lemaire, Local Producer	• Review of alternatives • Preliminary agency comments • Discuss O & M plan • Discuss alternative modifications, Alt 2A/B • “Unnamed” canal discussions • Consultation with agencies/organizations

Date	Contact, Agency	Communication
November 17, 2020	**Agency Correspondence** To: Jeremy Griffith From: Barbara Darrel, CIV US ARMY CC: Alex Guillory, BWC Jenee Dansdill, BWC Robert L. Swayze, CIV US ARMY Victor A. Landry, CIV US ARMY	• Concerning opinion request on flood protection alternatives, re: Proposed levee and water control structure at Hebert Canal and GIWW
November 19, 2020	**Agency Correspondence** To: Barbara Darrel, CIV US ARMY From: Robert Swayze, CIV US ARMY CC: Alex Guillory, BWC Jenee Dansdill, BWC	• Re: Proposed levee and water control structure at Hebert Canal and GIWW • No major issue reported by Robert Swayze
	Victor A. Landry, CIV US ARMY	• Incidences that occur during high- • Water event presented by Lockmasterat Leland Bowman lock
December 02, 2020	**Local Organization Correspondence** To: Amber Robinson From: Lawrence Rozas CC: Heather Warner-Finley Alex Guillory, BWC CEO@bayouvermiliondistrict.org Kiera Frey Kelia Bingham Jackie Vargas-Beitia Vanessa V. Adamson Shane Miller, DEQ Will Bailey Gretchen Vanicor Monica A. Roward Bess Foret Sarah Schoeffler Babette Werner Ariel Dauzart Jeff Jackson	• Concerns relayed related to Lower Vermilion Watershed project and support for delay to provide additional information regarding fisheries impact

Date	Contact, Agency	Communication
	Donald Segura Ernest Girouard Jenee Dansdill, BWC	
December 04, 2020	**Agency Correspondence** To: Tami St. Germain, Environmental Scientist From: Michael Tucker, NOAA CC: January Murray, NOAA Jenee Dansdill, BWC	• Re: Sea Turtles – Vermilion Parish • Determination that the LVRWP project is not likely to adverselyaffect the sea turtles

6.3 Tribal Coordination

In accordance with EO 13175, NRCS is responsible for assessing the impacts of activities, considering tribal interests, and assuring that tribal interests are considered in conjunction with federal activities and undertakings. NRCS recognizes that tribal governments are sovereign nations located within and dependent upon the United States. NRCS has a responsibility to help fulfill the U.S. government's responsibilities toward tribes when considering actions that may affect tribal rights, resources, and assets.

Tribal consultation was conducted in accordance with the NHPA of 1966 and EO 13175 to maintain the NRCS'sgovernment-to-government relationship between Native villages and tribes via a letter to four Indian tribes: Chitimacha Tribe of Louisiana, Coushatta Tribe of Louisiana, Choctaw Indians, Tunica-Biloxi Tribe of Louisianarequesting input and notifying them of the scoping process. In December 11, 2024, an additional letter was sent to the Archaeologist NRCS Louisiana State Office to insure no Federal, State, or non-federally recognized tribes were missed during 2019 SHPO review. These included the Alabama-Coushatta Tribe, Mississippi Band of Choctaw Indians, Adai Caddo Indians of Louisiana, and Atakapa-Ishak Nation. Two tribes were recognized as not being consulted for the project; the Mississippi Band of Choctaw Indians and the Alabama-Coushatta Tribe. The former State Conservationist Chad Kacir established Government-to-Government relations with the Mississippi Band of Choctaw Indians only after the initiation of the Plan-EA. The Alabama-Coushatta Tribe are not located within Vermillion Parish. State Recognized Tribes are not consulted under Section 106 protocols unless the Tribe sends a formal letter to the State Conservationist requesting the Tribe be consulted and justification for consultation. The State Conservationist then makes a determination if the State Recognized Tribe(s) will be consulted. No formal request from the Adai Caddo Indians of Louisiana or the Atakapa-Ishak Nation were submitted for this project.

The NRCS has not received any correspondence from the federally recognized Indian tribes consulted within the30-calendar day review period that ended on July 17, 2020. The NRCS has fulfilled its obligations under Section106 and the project can proceed as planned (36 CFR

800.3(c)4).

7. PREFERRED ALTERNATIVE

7.1 Selection of the Preferred Alternative

The Preferred Alternative for the project is the Proposed Alternative 2 and is based on the ability of the alternative to meet the purpose and need for the project and provide the most beneficial impacts to environmental and social resources, as detailed in Chapter 5 of this Plan-EA. The Preferred Alternative is the only alternative that meets the SLO purpose and needs and meets the NED benefit-cost ratio.

7.2 Rationale for the Preferred Alternative

The Lower Vermilion River Watershed Project is a flood protection and agricultural water management for landowners in the lower Vermilion Parish, LA. The project addresses natural resource concerns by implementing a series of water control structures and levee improvements to reduce flooding, saltwater intrusion and increase the potential of freshwater in the watershed.

The project directly addresses multiple CCA resource concerns in the Bayou Vermilion River Basin, including:

- **Flood Damage Reduction** - installation of water control structures and levee improvements will reduce flooding associated with abnormal tidal influences and allow for disposal of surface waters from abnormally high precipitation events.
- **Agricultural Water Management -** will be accomplished via installation and operation of water control structures that will improve water quality by regulating saltwater intrusion into the watershed, provide a more consistently reliable source of fresh water for irrigation and livestock, and allow for adequate drainage from abnormal precipitation events.

7.3 Measures to be Installed

Project Components

The known project-specific components receiving NRCS funding would primarily be composed of installation of control structures and installation/reconstruction of levees. A summary of project components is included in **Table 44.**

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Table 44. Summary of Project Components.

Subwatershed	Component	Description
Vermilion River-FrontalIntracoastal Waterway	Water Control Structure	Construction of 3 two-way, semi- automatic water control structures, which include fisheries access, ramps/slots, andboat bays. Alternative 2 (preferred): Structure will belocated directly north (100 ft.) of the LA 333 bridge crossing of the Hebert Canal. Structure will retain more than 100% of existing x-sectional area. Approximately 1479 ft^2 of the existing 1084.1 ft^2 of the canal will remain free flowing at this location for fisheries access. Nearby CRMS and USGS gauges will be utilized for water level and salinity monitoring.
	Levee Construction	Construction of levee improvements Alternative 2 (preferred): 0.45 miles of levee improvements required. Height oflevee 6.0 ft NAVD88; top width 10 ft.

Table 45. Structural Data - Levees Table

Structural Table						
	Proposed Channel					
Name/Location of Structure	**Bay Height (ft.)**	**Bay Width (ft.)**	**No of Bays (ft.)**	**Boat Bay Width (ft.)**	**X-Sectional Channel Area (ft^2)**	
Hebert Canal at GIWW	14.5	10	9	12	1479	
	Proposed settings					
Name/Location of Structure	**S1: Total area of open bays/gates (default setting) (ft^2)**	**S2: Total area of open bays/gates (Partial closure setting) (ft^2)**	**S3: Total area of open bays/gates (Full closure setting) (ft^2)**	**S1: % Increase of X-Sectional Area (Default setting)**	**S2: % Reduction of Cross Sectional Flow Area (Seasonal setting)**	**S3: % Reduction of Cross Sectional Flow Area (Storm setting)**
Hebert Canal at GIWW	1479	754	0	36%	30%	100%

Table 46. Structural Data - MD and UC Structures Table

Structural Table (Water Control Structures)					
	Proposed				
Name/Location of Structure	**Bay Height (ft)**	**Bay Width (ft)**	**Estimated Pipe Diameter (ft)**	**No. of Bays**	**X-Sectional Channel Area (ft^2)**
Meaux's Ditch (typical structure)	6	3	-	3	96
Unnamed Canal (flapgate culvert)	-	-	4		38

Table 47. Structural Data Table 3a for Dam & Levee

Structural Data Table - GIWW Levee							
Dike/Levee	**Stationing**	**Top Width (ft)**	**Average Side slope**	**Average height of Levee (ft.) above sea level**	**100-Year Frequency Velocity (ft/s)**	**Dike/Levee Protection (ft)**	**Volume of Earth Fill (yd^3)**
GIWW Bulkhead Levee	South of LA 333	10	3	Appx 6'	4.24	2	52800
Structure (HC)	Confluence of HC and GIWW	112	2/1	6	4.24	6	-

Prepared: May 2022

Construction of structures would occur from November to May to avoid the Atlantic hurricane season. The construction phase of each project component is anticipated to require multiple number of construction seasons to complete.

Reconstruction of levees would occur during the winter months [Nov- Feb] (to avoid clearing during the bird migration season) and require some borrow or fill material and storage material.

7.3.1 Mitigation Measures

Wetland Mitigation

Under the preferred alternative (Alt 2), the proposed action would affect approximately one acre of wetlands. Due to the brackish marsh (Category 2), the mitigation ratio would be 2/1. The estimated cost per acre for mitigation is approximately $85,000. The total estimated cost of mitigation is approximately $170,000.
Below are three mitigation purchase options to consider:

- Option 1 – Conservation Easement (least costly): A voluntary, legal agreement that permanently limits uses of the land in order to protect its conservation values. This option includes: Converting Agricultural Pasture land to brackish marsh. This cost would be mainly borne by landowners. NRCS may be able to fund up to 75% of these costs. The landowner must maintain a healthy brackish marsh in addition to annual monitoring and reporting. Existing Brackish Marsh land: minimal cost to the SLO and NRCS. Responsibility on landowner. Annual monitoring and reporting by the landowner is required. Also, needs USACE approval that the land qualifies.
- Option 2 – LDNR's In Lieu Fee Program: This Program involves the restoration, establishment and/or preservation of aquatic resources through funds paid to a government or non-profit natural resources management entity Instead of paying a Mitigation Bank, the permitee applies for this program and pays the designated government/non-profit entity at a discounted fee to satisfy compensatory mitigation requirements for permits. The estimated discounted fee is estimated to be $70,000 per acre. Requirements: impacts are to be located in the Louisiana Coastal Zone
- Option 3 - Mitigation Bank: Tradition Purchase of CreditsCategory 2 (Brackish Marsh): 2/1 ratio Estimated Cost per Acre: $85,000 Estimated land to be impacted: 1 acre (2 acre in credits) Total estimated cost of mitigation: $170,000NRCS may be able to cost share mitigation up to 50%

Fisheries Mitigation

Due to the location of the proposed Hebert Canal (HC) structure, the project has the potential to affect the egress and ingress of aquatic habitat in that area. In order to mitigate such impacts, the following measures are to be taken regarding the operations of the HC structure. The Operations Plan (see Appendix E) defines the primary objectives to be maintained within the LVRW, and the water control structures operational protocols necessary to maintain an open/free flowing cross sectional area for fisheries access throughout the year, with the exception of major storm events. The plan also proposes multiple structural settings to maintain this free flowing area while still protecting the watershed from high salinities. See Appendix E Operations Plan for control setting details..

BMP's

Design features and BMP's that would be applied during construction of the proposed project components to. Avoid and minimize impacts to environment and social resources are described below;

Pre-construction

- Ground disturbances shall be limited to only those areas necessary to safely implement the ProposedAction.
- Work will be confined within existing ROWs whenever possible to preserve existing vegetation andprivate property. The ROW will be clearly marked in the field.
- All access will be designated on project area maps, including along the construction corridor. No cross- country travel will occur in marked wetland areas.
- Construction components including temporary use areas for material and equipment storage will be located outside of wetlands or riparian areas.
- Construction limits shall be clearly flagged onsite to avoid unnecessary plant loss or ground disturbance.
- If special status plants are identified in pre-construction surveys in or near the construction corridor, weedmanagement strategies shall prioritize the protection of special status plants.
- Ensure that project staff and contractors working on site are aware of and can identify special status plantand wildlife species with potential to occur in the project footprint; stop work if a special status plant or wildlife species is discovered in the project footprint and notify the project manager.
- The NRCS State Cultural Resources Specialist/Tribal Liaison and SHPO will be notified if cultural resources, such as archaeological materials or artifacts, 50 years old or older, are identified during pre- construction within the areas of proposed ground disturbance.
- Ensure that project staff and contractors are aware that archaeological materials, such as ceramic sherds and stone projectile points (including arrowheads), are cultural resources and as such, are subject to applicable laws and regulations.
- If human remains are inadvertently discovered during pre-construction, the provisions of the Louisiana Unmarked Human Burial Sites Preservation Act (Revised Statute 8:671-681) will be followed.

During construction

- Vegetation and topsoil removal shall be confined to the smallest portion of the Proposed Action Area necessary for completion of the work.
- During construction, topsoil would be saved and then redistributed after completion of construction activities.
- Straw wattles, silt curtains, cofferdams, dikes, straw bales, or other suitable erosion control measures would be used to minimize soil erosion and prevent soil erosion from

entering water bodies during construction.

- Fuel, oil, hydraulic fluid, lubricants, and other petrochemicals will not be stored within 200 ft of the wetland and riparian areas and will have a secondary containment system to prevent spills. Appropriate spill clean-up materials, such as booms and absorbent pads, will be available on-site at all times during construction.

- Leaks that occur to equipment while working on the Project will not be allowed to continue operating until the leak is fixed. Refueling will occur a minimum of 100 ft from wetland and riparian areas.

- Use of stabilized construction entrances to minimize tracking.

- Require appropriate emission control devices on all construction equipment.

- During construction activities, the SHPO and NRCS State Cultural Resources Specialist/Tribal Liaison, will be notified, in accordance with applicable guidance and law, if there are any inadvertent discoveriesof cultural resources such as archaeological materials or artifacts 50 years old or older.

- Ensure that project staff and contractors are aware that archaeological materials, such as ceramic sherds and stone projectile points (including arrowheads), are cultural resources and as such, are subject to applicable laws and regulations.

- If human remains are inadvertently discovered during pre-construction, the provisions of the Louisiana Unmarked Human Burial Sites Preservation Act (Revised Statute 8:671-681) will be followed.

Post- Construction

- Re-seeding shall occur at appropriate times with certified weed-free seed mixes per NRCS, BLMor Reclamation instructions, as appropriate.

- Weed control shall be implemented by the project proponent to parish standards (at a minimum).

- Disturbed areas would be smoothed, shaped, contoured and reseeded to as near their pre-project conditionsas practicable.

- Lands previously in agricultural production would be returned to agricultural production following construction.

7.3.2 Operation, Maintenance, and Replacement

Operation of the control structures includes the administration, management and performance of maintenance actions needed to keep the structures safe and functioning as designed. Damage repair to collected structures caused by normal deterioration, droughts or flooding is considered maintenance. Maintenance includes both routine and as-needed measures. (See **Operations**

Plan)

Inspection of the structures is necessary to verify that they are safe and functioning properly. The Seventh Ward Gravity Drainage District (7th Ward GDD) is responsible for inspecting the structures on an annual basis as well as after major storm events. Inspection reports would be supplied to the NRCS following each inspection. Inspection and the associated reports would assess the following item:

- Identify the adequacy of O&M activities
- Identify needed O&M work
- Identify unsafe conditions
- Specify ways of relieving unsafe conditions or performing other needed work
- Set action dates for performing corrective actions

As indicated in **Estimated Average Annual NED costs,** the 7th Ward GDD would continue to be responsible for the operation, maintenance, rehabilitation, and future modifications to the structures, and the estimated annual O&M cost is $20,000. A specific O&M plan is prepared by NRCS and the SLO in accordance with the NRCS National Operation and Maintenance Manual (NRCS 2003). This plan and agreement would provide operation procedures for open/closing of the structures, inspections and reports. **See Appendix D**

7.4 Compliance with Local, State, And Federal Laws

7.4.1 Permits and Compliance

Permits and compliance required for the installation of the NED alternative will depend onsite specific project proposals and agency consultations. A list of possible permits that may be required has been formulated and described below. This list includes examples brought to the local sponsor's attention but may not be complete orinclusive of all possible permits and compliance necessary.

- Louisiana Department of Natural Resources, Office of Coastal Management Coastal Use Permit
    - Required for all impacts below the 5-foot contour line within the state managed Coastal Management Zone.
- United States Army Corps of Engineers (USACE) Section 404 Permit
    - Required for unavoidable impacts to wetlands/water considered to be "Waters of the US".
    - Section 10 Permit (Rivers and Harbors Act) may also be required.
- Louisiana Department of Environmental Quality Section 401 Water Quality Certification
    - Required for water quality review of the USACE Section 404 Permit.
- Vermilion Parish Police Jury Letter of No Objection
    - Required for all activities within Vermilion Parish.
- Louisiana Department of Transportation Right of Way Permit or Construction Permit
    - Required for activities within the highway right-of-way.

All applicable local, state, and federal laws will be complied with in the installation of this project

7.5 Economic Benefits-Costs for Preferred Alternatives

7.5.1 Ecosystem Services Benefits

The Ecosystem Service Benefits were evaluated by using the Benefit Transfer Method (BTM) to facilitate its proprietary Ecosystem Valuation Toolkit (EVToolkit), which is one of world's most robust repositories of peer-reviewed studies, reports, and gray literature on the value of ecosystem services. The EVToolkit associates up to 200 data elements with each value estimated in a given study, including the location and scale of a study site, detailed descriptions of the ecosystems and ecosystem services assessed, methodologies, and the type of economic value produced. Studies within the EVToolkit have gone through multiple reviews and are standardized to units of dollar-per-acre-per year for use in BTM.

For this study, the team started by limiting the data to studies conducted in Louisiana. Studies conducted outside this area were added on a case-by-case basis to fill gaps for ecosystem services values that could be reasonably applied to the transfer site (i.e., ecosystems similar to those at the study site). All studies included in the dataset were from the southeastern US. For cases where the team was unable to identify a study suitable for transfer to the study area, no value was included. It is important to understand that this decision simply reflects the limitations of valuation research, not that those natural assets provide no value. Finally, all data was adjusted to the 2023-dollar year using the consumer price index as described by the U.S. Bureau of Labor Statistics (2024b).

These values were applied to the acres of land cover types under each of the three alternatives. When land is converted from one type to another, ecosystem functions are altered, changing the suite of ecosystem services provided. Valuing this change is critical to measuring the impacts of proposed projects. Land cover acre changes were valued in monetary terms by mapping them on to the ecosystem services framework in Table 48 and assessing the before-and-after difference in ecosystem services value provided. Table 48 below shows which ecosystem services were able to be valued by land cover type.

Table 48. Ecosystem Services Valued in the Study, by Land Cover Type

Services	Scrub/ Shrublands	Wetlands	Forests
Provisioning			
Energy and Raw Materials			
Food			
Medicinal Resources			
Ornamental Resources			
Water Storage		●	●
Regulating			
Air Quality	●		●
Biological Control	●		
Climate Stability	●	●	●

Services	Scrub/ Shrublands	Wetlands	Forests
Disaster Risk Reduction		●	
Pollination, Seed Dispersal			
Soil Formation			
Soil Quality			
Soil Retention			
Water Quality	●	●	
Water Supply			
Navigation			
Supporting			
Habitat		●	●
Information			
Aesthetic Information		●	
Cultural Value		●	
Science and Education			
Recreation and Tourism		●	

It should be noted that not all existing ecosystem services by land cover are valued. Their exclusion does not indicate that these services are not present, rather that there are gaps within existing literature that prevent their valuation.

7.5.2 Benefit-Cost Analysis

As required by the National Environmental Protection Act (NEPA), all proposed federal investments that are anticipated to impact current environmental conditions must undergo an environmental analysis and a benefit-cost analysis (BCA). A BCA is a decision support tool that quantifies an investment's total lifetime benefits and costs. The primary output of a BCA is the benefit-cost ratio (BCR) which is calculated by dividing total benefits by total costs. A BCR makes it easy to identify whether investments are economically efficient (providing more benefits than costs), and to compare that efficiency across multiple project alternatives.

A BCA must be completed for at least three project alternatives including the no-action, preferred action, and alternative action scenarios. The no-action scenario forecasts current conditions, the preferred action is the applicant's desired strategy, and the alternative action is a secondary strategy that also accomplishes the project's outcomes. The purpose of including these three scenarios is to accomplish the required outcomes in the most economically and environmentally efficient manner.

Traditionally, BCAs include only market benefits and costs and not the value of environmental or social impacts. Advances in ecological economics enable non-market benefits, ecosystem services, to be monetized. This allows the value of environmental and social impacts to be estimated and integrated into BCAs. This plan uses the BTM and function transfer methodologies as described in the above sections to value ecosystem service benefits and costs associated with each alternative and includes them within each BCA. Each BCA is conducted over a 50-year period using a three percent discount rate to standardize all future values to the 2023-dollar year. The BCR and net-present value (NPV)—which is the lifetime benefits minus costs—are presented for each

alternative. Each alternative's BCA will be compared to help decision makers identify which scenario should be pursued.

7.5.3 Accounting for Regrowth

The disruptions of scrub/shrub and forested levee bank lines are projected to take 30 years to completely recover after construction. This must be accounted for within the valuation. Therefore, a linear regrowth equation was established. This approach assumes that within year one of the project, these land cover types would be converted to barren land due to construction activities, and gradually regrow over a 30-year period. It is assumed in year one that the bank lines would provide no ecosystem services, and in year 30 they would be restored to their full ecosystem service potential. A linear slope is specified as there is no primary literature to suggest a more appropriate functional form.

7.5.4 Agricultural Losses and Risk analysis

As mentioned previously, one objective of the project is to protect people and the environment from the impacts of storm surges. Current levee conditions protect agricultural lands from water levels up to four feet above sea level. Alternatives two and three will alter levees and/or implement flood water control gates, providing protection from water levels up to six feet above sea level. The change in protection levels alters the probability of overtopping and risk of crop losses due to salinity, which must be integrated into each BCA. Since it is unknown when or how many overtopping events may occur throughout the project timeline, the annual probabilities and value of crops lost for four-foot and six-foot storm events must be accounted for. This is accomplished by multiplying the value of crops protected by the annual probability of an overtopping storm event for each scenario. The resulting estimate is the value of probable crop losses. The annual value of avoided crop losses associated with alternatives two and three is the difference between probable crop losses for four-foot and six-foot events in each year. The annual probabilities for four-foot and six-foot events were collected and are communicated in Table 49.

Table 49. Annual Probabilities of Overtopping (Medium Sea-Level Rise)

Year	Alternative 1 (4-Foot Event)	Alternative 2 & 3 (6-Foot Event)
2020-2030	7%	1%
2030-2040	10%	2%
2040-2050	16%	2%
2050-2060	31%	3%
2060-2070	61%	5%
2070-2080	99%	9%
2080-2090	100%	17%

Source: Surging Seas, (2024)

Due to projected sea-level rise, the annual probability of each event occurring gradually increases through time. The probabilities above are associated with the medium sea-level rise scenario. Annual probabilities were available for each decade. A linear slope is calculated by taking the difference in probabilities between each decade and dividing it by ten.

7.5.5 Annual Ecosystem Services Values by Land Cover Type

The ecosystem services valuation techniques are rooted in using the BTM methodology to assign annual values to land cover types. Direct land cover changes were identified, while indirect changes due to alterations in ecosystem conditions were not modeled. The loss of three land cover types were identified including scrub/shrub bank line, forested bank line, and intermediate wetlands. Using available data, it was found that alternative two was less impactful than alternative three in terms of total land cover loss or change. Alternative one (no-action) would produce no direct change but would likely cause a shift in wetland types, though the extent and rate of change was not quantified and therefore could not be valued within this report. Table 50, below, shows the total acreage of land cover losses under each alternative. Again, land covers potentially preserved could not be identified due to data availability surrounding the anticipated losses under the no-action scenario.

Table 50. Total Acres of Land Cover Loss by Alternative

Land Cover Type	Alternative 1	Alternative 2	Alternative 3
Scrub/shrub	0	1.3	27
Wetland	0	0.6	80
Forest	0	0	15

Peer review literature and meta-analyses were collected and filtered to construct ecosystem service values for each land cover type and are communicated in dollar per acre per year units. This standardization allows for values to be easily applied, scaled, and forecasted to future years. Table 51 shows the annual ecosystem service value by land cover type.

Table 51. Annual Ecosystem Service Value by Land Cover Type

Land Cover Type	Value	Unit
Shrub/grasslands	$200	$/acre/year
Wetlands	$8,800	$/acre/year
Forests	$320	$/acre/year

Due to the provision of key resources and significant cultural value, wetlands are estimated to provide the most value both environmentally and socially at upwards of 8,800 dollars per acre each

year. This value is derived mainly from the land cover's ability to manage water quality and reduce the risk of disaster, and wetlands' cultural significance in the region.
Forests are another productive land cover type, anticipated to provide up to 320 dollars per acre per year. Forest land covers within the analysis were limited to the bank lines of levees, therefore difficult to assign all available ecosystem service values. Traditional forest ecosystems provide services that are assumed not to be provided by the forested levees—for example, extraction of raw materials such as lumber or social value through recreation. In the context of this project, it is expected that these forest ecosystems are not utilized by people in the same way. Therefore, only select services were chosen to be included within the valuation to provide a conservative estimate. Of the services included, forests provide significant value through carbon sequestration as well as water capture and water quality services.
Finally, compared to the other land covers, scrub/shrub are projected to provide the least value, estimated to be about 200 dollars per acre per year, though this may be due to scrub/shrub being understudied in valuation literature, leading to underestimation. This value is driven primarily by the ecosystems' ability to sequester carbon and remove pollutants from water resources. For a more detailed breakdown of each land cover's value by service, please refer to the Appendix. These ecosystem services value estimates are scaled and applied to predict the value of ecosystems directly lost under each alternative.

A summary of the economic analysis of the Preferred Alternative (NED Alternative) and No Action Alternative is provided in Alternatives Section. The full Benefit Cost Analysis report can be found in Appendix D. Average Annual Benefits are estimated at roughly $373,000: average annual costs are estimated at roughly $329,112, for an estimated Benefit-Cost of 1.13. The following tables provide more detail on the costs and benefits associated with the Preferred Alternative.

Table 52. Economic Table 1 – Estimated Installation Cost, Lower Vermilion River Watershed, Louisiana, 2024$

Works of Improvement	Number				Estimated Cost (Dollars 1/)					
					Public Law 83-566 Funds		Other Funds			Total
	Unit	Federal Land	Non-Federal Land	Total	Non Federal Land NRCS	Total	Federal Land	Non-Federal Land	Total	
Water Control Structures (3) Levee Improvements	Acres	0	7.5	7.5	$8,429,697	$8,429,697	$0	$2,810,743	$2,810,743	$11,240,440
Total Project			7.5	7.5		**$8,429,697**			**$2,810,743**	**$11,240,440**

1/Price Base: 2024 dollars Prepared Dec. 2024

2/²Project cost includes construction of water control structures and protection levee, engineering services.

Table 53. (NWPM 506.12, Economic Table 2) presents the project's cost distribution, as well as the proportion of PL 83-566 fundingand on the how-to refunding sources.

Table 53. Economic Table 2-- Estimated Cost Distribution of Control Structures and Bulkhead, Lower Vermilion RiverWatershed, Louisiana, 2024$

	Installation Cost - Public Law 83-566						Installation Cost - Other Funds						Total
Works of Improvement	Construction	Engineering	Mitigation	Relocation Payments	Project Admin	Total Public Law 566	Construction	Engineering	Real prop rights/ Mitigation	Relocation Payments	Project Admin	Total other	Installation costs
WCS (3) & Levee Improvements	$7,755,077.70	$674,619.36	$0.00	$0.00	$0.00	$8,429,697.06	$2,251,474.17	$0.00	$116,363.20	$0.00	$272,905.96	$2,640,743.33	$11,070,440.39
Total	$7,755,077.70	$674,619.36	$0.00	$0.00	$0.00	$8,429,697.06	$2,251,474.17	$ -	$ 116,363.20		$ 272,905.96	$ 2,640,743.33	$ 11,070,440.39

1/ Price base: 2024 dollars

Prepared Dec. 2024

Table 54. (NWPM 506.12, Economic Table 2a) presents the installation cost allocated to various purposes in the project, as well as thesharing of costs allocated to flood prevention and water quality.

Table 54. Economic Table 2a- Cost Allocation and Cost Sharing Summary, Lower Vermilion River Watershed, Louisiana,2024$[1]

Item	Cost Allocation 2			Cost Sharing					
	Purpose			Public Law 83-566[2]			Other[3]		
	Flood Prevention	Ag Water Management	Total	Flood prevention	Ag Water Management	Total	Flood prevention	Ag Water Management	Total
Water Control Structures & Levee Improvements									
Construction	$1,000,655.19	$9,005,896.68	$10,006,551.87	$1,000,655.19	$6,754,422.51	$7,755,077.70	$0.00	$0.00	$0.00
Engineering	$67,461.94	$607,157.42	$674,619.36	$67,461.94	$607,157.42	$674,619.36	$0.00	$2,251,474.17	$2,251,474.17
Property Rights	$11,636.32	$104,726.88	$116,363.20	$0.00	$0.00	$0.00	$11,636.32	$104,726.88	$116,363.20
Mitigation	$17,000.00	$153,000.00	$170,000.00	$0.00	$0.00	$0.00	$17,000.00	$153,000.00	$170,000.00
Project admin.	$27,290.60	$245,615.36	$272,905.96	$0.00	$0.00	$0.00	$27,290.60	$245,615.36	$272,905.96
Subtotal	$1,124,044.04	$10,116,396.35	$11,240,440.39	$1,068,117.12	$7,361,579.93	$8,429,697.06	$55,926.92	$2,754,816.41	$2,810,743.33
Total	$1,124,044.04	$10,116,396.35	$11,240,440.39	$1,068,117.12	$7,361,579.93	$8,429,697.06	$55,926.92	$2,754,816.41	$2,810,743.33

1/ Price base: 2024 dollars

Prepared Dec 2024

2/ Method of Cost Allocation:

7/ Engineering services contract cost to be borne: 100% by Public Law 83-566 funds and 0% by other funds.

5/Mitigation costs included to be borne: 100% by other funds. Property Rights to be borne 100% by other funds.

Table 55 (NWPM 506.12, Economic Table 4) presents the estimated average annual National Economic Development (NED) plancosts.

Table 55. Economic Table 4 – Estimated Average Annual NED Costs, Lower Vermilion River Watershed, Louisiana, 2024$[1]

Works of Improvement	Average Annual Instalation Cost	Average Annual Operation, Maintanice & Replacement cost	Other Direct Costs	Total
WCS (3) & Levee Improvements	$309,112	$20,000	$0	$329,112
Total	$309,112	$20,000	$0	$329,112

1/Price Base FY 2024, amortized over 50 years at an rate of 2.75 %. Prepared: Dec 2024

3/ Includes Annual cost of $20,000 for operation, maintenance of the structures

Table 56. (NWPM 506.12, Economic Table 5) presents the estimated average annual flood reduction benefit with and without the project.

Table 56. Economic Table 5- Estimated Average Annual Flood Reduction Benefits, Lower Vermilion River Watershed,Louisiana, 2024$[1]

Item	Estimated Average Annual Flood Damage Without Project Ag Related2/	Estimated Average Annual Flood Damage Without Project Non-Ag Related	Estimated Average Annual Flood Damage With Project Ag Related2/	Estimated Average Annual Flood Damage With Project Non-Ag Related2/	Damage Reduction Benefits Ag Related2/	Damage Reduction Benefits Non-Ag Related
Residential 4/	$0	$0	$0	$0	$0	$0
Commercial	$0	$0	$0	$0	$0	$0
Institutional	$0	$0	$0	$0	$0	$0
Other	$370,000	$0	$3,000	$0	$373,000	$0
Total	**$370,000**	**$0**	**$3,000**	**$0**	**$373,000**	**$0**

1/Price Base FY 2024, amortized over 50 years at a discount rate of 2.75 percent. Prepared Dec 2024
2/Agriculture-related damage includes damage to rural communities.
3/Other includes Ag cleanup costs, emergency repairs and remediation of soils, and Loss of Crops economic analysis for additional detail.

Table 57 (NWPM 506.12, Economic Table 5a) presents the average annual watershed protection damage reduction benefits.

Table 57. Economic Table 5a - Estimated Average Annual Watershed Protection Damage Reduction Benefits, LowerVermilion River Watershed, Louisiana, 2024$[1]

Works of Improvement	Damage reduction agriculture-Related	Damage Reduction Non - Agricultural	Average Annual Benfits	Average Annual costs	Benefit -Cost Ratio
WCS (3) & Levee Improvements	$373,000	$0	$373,000	$329,112	1.13
Total	$373,000	$0	$373,000	$329,112	
1/ Price base on FY 2024, ammorized over 50 yrs at a discount rate 2.75% percent					

Prepared Dec 2024

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10. DISTRIBUTION LIST

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- U.S Army Corps of Engineers (USCOE)
- Louisiana Geological Survey (LGS)
- Louisiana Department of Wildlife and Fisheries (LDWF)
- State Historic Preservation Office (SHPO)
- Division of Historic Preservation
- Chitimacha Tribe of Louisiana
- Coushatta Tribe of Louisiana
- Tunica-Biloxi Tribe of Louisiana
- Vermilion County Farm Service Agency (FSA)
- Coastal Protection and Restoration Authority (CPRA)
- Seventh Ward Drainage District (GDD)
- Environmental Protection Agency (EPA)
- Louisiana Department of Natural Resources (LDNR)
- Louisiana Department of Transportation and Development (LDOTD)
- Louisiana Department of Agriculture and Forestry (LDAF)
- Office of Lieutenant Governor
- Bayou Vermilion Preservation Association (BVPA)
- Teche-Vermilion Freshwater District (TVFWD)
- National Marine Fisheries Service (NMFS)
- Alabama-Quassarte Tribal Town
- Apache Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Mississippi Band of Choctaw Indians

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11. ACRONYMS

ACHP	Advisory Council on Historic Preservation
AOI	Area of Interest
APE	Area of Potential Effect
BCA	Benefit Cost Analysis
BMP	Best Management Practice
BWC	Bluewing Civil Consulting, LLC
CAA	Clean Air Act of 1970
CE	Categorical Exclusion
CED	Conservation Engineering Division
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPPE	Conservation Practice Physical Effects
CRM	Cultural Resources Management
CTA	Conservation and Technical Assistance
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EAP	Emergency Action Plan
EE	Environmental Evaluation
EFH	Essential Fish Habitat
EIS	Environmental Impact statement
EO	Executive Order
EPA	Environmental Protection Agency

ESA	Endangered Species Act
FA	Financial Assistance
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FOTG	Field Office Technical Guide
FR	Federal Register
FS	Forest Service
FSA	Farm Services Agency
FSEIS	Final Supplemental Environmental Impact Statement
FWOFI	Future without Federal investment
GIS	Geographic Information Systems
GIWW	Gulf Intracoastal Waterway
GM	General Manual
GMFMC	Gulf of Mexico Fishery Management Council
HEP	Habitat Evaluation Procedures
Hwy	Highway
IPAC	Information for Planning and Consultation
LA	Louisiana
LDEQ	Louisiana Department of Environmental Quality
LDWF	Louisiana Department of Wildlife and Fisheries
LHRI	Louisiana Historic Resource Inventory
LTC	Long-term Contract
LVRWP	Lower Vermilion River Watershed Project
MBTA	Migratory Bird Treaty Act

MGD	Million Gallon Daily
M&I	Municipal and industrial water supply
MOU	Memorandum of Understanding
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
mS/m	MilliSiemen Per Meter
NA	No Action
NAAQS	National Ambient Air Quality Standards
NBAPM	National Basin and Area Planning Manual
NCGCAM	National Contracts, Grants, and Cooperative Agreements Manual
NCRH	National Cultural Resources Handbook
NECH	National Environmental Compliance Handbook
NED	National Economic Development
NEM	National Engineering Manual
NEPA	National Environmental Policy Act
NHCP	National Handbook of Conservation Practices
NHPA	National Historic Preservation Act
NHQ	National Headquarters
NLCD	National Land Cover Dataset
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOMM	National Operation and Maintenance Manual
NPPH	National Planning Procedures Handbook
NRCS	Natural Resources Conservation Service
NRD	Natural Resources District

NRHP	National Register of Historic Places
NWMC	National Water Management Center
NWPH	National Watershed Program Handbook
NWPM	National Watershed Program Manual
O&M	Operation and Maintenance
OCD	Office of Cultural Development
OMB	Office of Management and Budget
OM&R	Operation, Maintenance, and Replacement
PR&G	Principles, Requirements, and Guidelines for Water and Land Related Resources Implementation Studies
POINTS	Program Operations Information Tracking System
POW	Plan of Work
RC&D	Resource Conservation and Development
RED	Regional Economic Development
RFO	Responsible Federal official
ROD	Record of Decision
RUS	Rural Utilities Service
RWA	Rapid Watershed Assessment
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Officer
SLO	Sponsoring Local Organization
STC	State Conservationist
SWCD	Soil and Water Conservation District
TA	Technical Assistance
THPO	Tribal Historic Preservation Officer
TMDL	Total Maximum Daily Loads

TVFWD	Teche-Vermilion Freshwater District
TVA	Tennessee Valley Authority
USACE	U.S. Army Corps of Engineers
U.S.C.	U.S. Code
USDA	U.S. Department of Agriculture
USDA-RD	U.S. Department of Agriculture, Rural Development
USEPA	United States Environmental Protection Agency
USBLS	U.S. Bureau of Labor and Statistic
USFWS	U.S. Fish and Wildlife Service
USFS	U.S. Forest Service
WAP	Wildlife Action Plan
WSPPM	Watershed Surveys and Planning Program Manager