Board of Regents of the University of Nebraska
151 Prem S. Paul Research Center at Whittier School
2200 Vine Street
Lincoln, NE 68583-0861
FEIN 47-0049123
DUNS # 55-545-6995
SAM 4B842

Nebraska Community Foundation
PO Box 83107
Lincoln, NE 68501-3107
FEIN 47-0769903

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

Contract between Nebraska Community Foundation, Platte River Recovery Implementation Program, and the Board of Regents of the University of Nebraska

LOWER PLATTE RIVER PALLID STURGEON HABITAT RESEARCH
2021 - 2026

1. Parties. This Contract is made and entered into by and between Nebraska Community Foundation ("Foundation") of Lincoln, Nebraska, representing all signatories to the Platte River Recovery Implementation Program ("Program") and the **Board of Regents of the University of Nebraska** ("Contractor"). The following persons are authorized to represent the parties through this Contract: Diane Wilson of the Foundation; Jason Farnsworth of the Program; and David B. Doty of the Contractor.

2. Purpose of Contract. The purpose of this Contract is to allow the Foundation, acting as the fiscal agent for the Governance Committee (GC) of the Program, to retain the services of the Contractor to render certain technical or professional services hereinafter described in connection with an undertaking to be financed by the Program, and to delegate the Executive Director's Office ("ED Office") through its Executive Director or his designee the authority to administer this Contract.

3. Term of Contract and Required Approvals. This Contract is effective when all parties have executed it and all required approvals have been granted. The term of this Contract is from **July 1, 2021** through **December 31, 2026**. All services shall be completed during this term. The services to be performed under this Contract will commence upon receipt of authorization to proceed.

If the Contractor has been delayed and as a result will be unable, in the opinion of the Program, to complete performance fully and satisfactorily within this Contract period, the Contractor may be granted an extension of time, upon submission of evidence of the causes of delay satisfactory to the Program. An extension of the contract term must be in writing, signed by both Parties in order to be valid.

4. Payment.

A. Reimbursement of Expenses. Amount based on the approved hourly rate and reimbursable expenses depicted in Exhibit C, attached to and incorporated by reference as part of this Contract, for the services described in Exhibit B, both attached to and incorporated by reference as part of this Contract. Total Payment under this contract shall not exceed $**1,201,000.**

B. Cost Rates. The labor and equipment cost rates for each task included in Exhibit B are as set forth on Exhibit C.

These unit prices are not to be exceeded unless authorized in writing by the Program. The contract total amount is controlling and is a ceiling price that Contractor exceeds at its own risk. Payment shall be made directly to the Contractor. The Contractor shall maintain hourly records of time worked by its personnel to support any audits the Program may require. Billing reports shall be submitted no more often than monthly for activities and costs accrued since the last billing report.

C. Billing Procedures. The Contractor shall send billing reports for budget items outlined in Exhibit C to the ED Office (address included below). The Program's Executive Director, upon receiving the billing report, will review the bill and advance the invoice to the Bureau of Reclamation who will advise the Foundation of approval. The Foundation will make payment of these funds directly to the Contractor within 30 days of receiving notice of approval. Payments are due within 60 days after the billing date.

Billing Point of Contact (Program):
Mr. Jason Farnsworth, Executive Director
Platte River Recovery Implementation Program
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: farnsworthj@headwaterscorp.com

D. Withholding of Payment.

(i) When the Program has reasonable grounds for believing that the Contractor will be unable to perform this Contract fully and satisfactorily within the time fixed for performance, then the Program may withhold payment of such portion of any amount otherwise due and payable to the Contractor reasonably deemed appropriate to protect the Program against such loss. These amounts may be withheld until the cause for the withholding is cured to the Program's satisfaction or this Contract is terminated pursuant to Section 8.U. Any amount so withheld may be retained by the Program for such period as it may deem advisable to protect the Program against any loss. This provision is intended solely for the benefit of the Program and no person shall have any right against the Program or Foundation by reason of the Program's failure or refusal to withhold monies. No interest shall be payable by the Program or Foundation on any

amounts withheld under this provision. This provision is not intended to limit or in any way prejudice any other right of the Program or Foundation.

5. Responsibilities of Contractor.

A. Scope of Services. The Contractor shall perform the specific services required under this Contract in a satisfactory and proper manner as outlined in the research proposal in Exhibit A and associated Scope of Services in Exhibit B. If there is any conflict between this Contract and the provisions of the specific requirements of Exhibit B, the specific requirements shall prevail.

B. Personnel. All of the services required hereunder will be performed by the Contractor or under its supervision, and all personnel engaged in the work shall be fully qualified and shall be authorized, licensed, or permitted under state and/or federal law to perform such services, if state and/or federal law requires such authorization, license, or permit.

C. Subcontracts.

(i) Approval Required for Subcontracts. Any subcontractors and outside associates or consultants required by the Contractor in connection with the services, work performed or rendered under this Contract will be limited to such individuals or firms as were specifically identified in the proposal and agreed to during negotiations or are specifically authorized by the Program during the performance of this Contract. The Contractor shall submit a list of the proposed subcontractors, associates, or consultants; the scope and extent of each subcontract; and the dollar amount of each subcontract prior to Contract execution to the Program for approval. During the performance of the Contract, substitutions in or additions to such subcontracts, associates, or consultants will be subject to the prior approval of the Program. The Program approval of subcontractors will not relieve the Contractor from any responsibilities outlined in this Contract. The Contractor shall be responsible for the actions of the subcontractors, associates, and subconsultants.

(ii) Billings for Subcontractors. Billings for subcontractor, associates or subconsultants services will not include any mark up. The subcontract costs will be billed to the Program at the actual costs as billed to the Contractor. Subcontract costs will be documented by attaching subcontractor billings to the Contractor's billing submittals.

(iii) Copies of Subcontracts. The Contractor shall provide to the Program copies of each subcontractor contract immediately following execution with the subcontractor. All subcontracts between the Contractor and a subcontractor shall refer to and conform to the terms of this Contract. However, nothing in this Contract shall be construed as making the Program a party to any subcontract entered between the Contractor and a subcontractor.

(iv) Contracts for Subcontractors. All subcontracts that Contractor enters into shall include any applicable provisions and certifications required by 2 CFR Part 200, including Appendix II thereto, and any other federal, state or local laws or regulations.

(v) Debarment and Suspension. Contractor shall not enter into subcontracts with any entity or individual that is suspended, debarred or otherwise excluded from participation in the transaction covered by this Contract.

D. Requests from the Program. The Contractor shall be responsible and responsive to the Program and the ED Office in their requests and requirements related to this Contract.

E. Reports. The Contractor shall provide annual written progress reports to the Program and a final report describing research methods, results, accomplishments, and interpretations. Annual reports shall be submitted by December 1 of each year. The final report shall be submitted prior to the termination date of this Contract. All reports shall be sent electronically to the Program's Technical Point of Contact.

H. Inspection and Acceptance. All deliverables furnished by the Contractor shall be subject to rigorous review by the ED Office prior to acceptance.

6. <u>Responsibilities of the Program.</u>

A. Designated Representative. The Executive Director of the Program shall act as the Program's administrative representative with respect to the Contractor's service to be performed under this Contract and shall have complete authority to transmit instructions, receive information, and interpret and define the Program's policies and decisions with respect to services covered by this Contract.

B. Data to be Furnished to the Contractor. All information, data, reports, and maps as are available to the Program and necessary for the carrying out of the Scope of Services set forth herein shall be furnished to the Contractor without charge and the ED Office shall cooperate with the Contractor in every way possible in the carrying out of the project.

C. Review Reports. The ED Office shall examine all data, reports and other work products presented by the Contractor to the Program and shall promptly render in writing the Program's decisions pertaining thereto within the time periods specified in Exhibit B.

D. Provide Criteria. The ED Office shall provide all criteria and full information regarding its requirements for the project.

7. <u>Special Provisions</u>.

A. No Finder's Fees. No finder's fee, employment agency fee, or other such fee related to the procurement of this Contract shall be paid by either party.

B. Publication. It is understood that the results of this work shall be available to the Contractor for publication including academic theses and dissertations and use in connection with related work. Use of this work for publication and related work by the Contractor must be conducted with full disclosure to and coordination with the Program's Technical Point of Contact.

The results of the Contractor's work may be published jointly by the Contractor and the Program or by the Contractor separately if the Program is given the opportunity to review and provide comments. Manuscripts prepared for publication by the Contractor shall be in writing and shall be reviewed by the Program within 30 days of receipt of the manuscript. It is further agreed that proper acknowledgement of funding support will be noted in all publications. In the event of disagreement, the Contractor may publish results on its own responsibility, giving proper acknowledgement of cooperation and disclaim that the other party agrees with the contents of the publication. Publications by the Contractor shall not discuss implications of the research to the Program.

C. Publicity. Any publicity or media contact associated with the Contractor's services and the result of those services provided under this Contract shall be coordinated with the Program. Media requests should be directed to the Director of Outreach and Operations in the ED Office.

D. Monitor Activities. The Program shall have the right to monitor all Contract-related activities of the Contractor and all subcontractors. This shall include, but not be limited to, the right to make site inspections at any time, to bring experts and consultants on site to examine or evaluate completed work or work in progress, and to observe all Contractor personnel in every phase of performance of Contract-related work.

E. Kickbacks. The Contractor certifies and warrants that no gratuities, kickbacks, or contingency fees were paid in connection with this Contract, nor were any fees, commissions, gifts, or other considerations made contingent upon the award of this Contract. If the Contractor breaches or violates this warranty, the Program may, at its discretion, terminate this Contract without liability to the Program, or deduct from the Contract price or consideration, or otherwise recover, the full amount of any commission, percentage, brokerage, or contingency fee.

F. Debarment and Suspension. Contractor certifies by signing this Contract that neither Contractor nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible or voluntarily excluded by any federal department or agency from participation in the transaction covered by this Contract.

G. Anti-Lobbying. Contractor makes the representations set forth on the Certification Regarding Lobbying, which is attached as Exhibit D and incorporated by reference as part of this Contract. Contractor shall execute such Certification at the time of executing this Contract.

H. Office Space, Equipment, and Supplies. The Contractor will supply its own office space, equipment, and supplies. Equipment and supplies purchased under this agreement shall become the property of the Contractor upon termination of this agreement.

8. General Provisions.

A. Amendments. Any changes, modifications, revisions or amendments to this Contract which are mutually agreed upon by the parties to this Contract shall be incorporated by written instrument, executed and signed by all Parties to this Contract.

B. Applicable Law/Venue. The construction, interpretation and enforcement of this Contract shall be governed by the laws of the State of Nebraska. The Courts of the State of Nebraska shall have jurisdiction over this Contract and the parties.

C. Assignment/Contract Not Used as Collateral. Neither party shall assign or otherwise transfer any of the rights or delegate any of the duties set forth in this Contract without the prior written consent of the other party. The Contractor shall not use this Contract, or any portion thereof, as collateral for any financial obligation, without the prior written permission of the Program.

D. Audit/Access to Records. The Program, the Foundation and any of their representatives shall have access to any books, documents, papers, and records of the Contractor which are pertinent to this Contract. The Contractor shall, immediately upon receiving written instruction from the Program or the Foundation, provide to the Foundation or any governmental entity, independent auditor, accountant, or accounting firm, all books, documents, papers and records of the Contractor which are pertinent to this Contract. The Contractor shall cooperate fully with the Foundation or any such governmental entity, independent auditor, accountant, or accounting firm, during the entire course of any audit authorized by or required of the Program.

E. Availability of Funds. Each payment obligation of the Program is conditioned upon the availability of funds and continuation of the Platte River Recovery Implementation Program. If funds are not allocated and available for the continuance of the services performed by the Contractor, the contract may be terminated by the Program at the end of the period for which the funds are available. The Program shall notify the Contractor at the earliest possible time of the services which will or may be affected by a shortage of funds. No penalty shall accrue to the Program in the event this provision is exercised, and the Program shall not be obligated or liable for any future payments due or for any damages as a result of termination under this section. This provision shall not be construed to permit the Program to terminate this Contract to acquire similar services from another party.

F. Award of Related Contracts. The Program may undertake or award supplemental or successor contracts for work related to this Contract. The Contractor shall

cooperate fully with other contractors and the Program in all such cases.

G. Certificate of Good Standing. Contractor shall provide Certificate of Good Standing verifying compliance with the unemployment insurance and workers' compensation programs prior to performing work under this Contract.

H. Compliance with Law. The Contractor shall keep informed of and comply with all applicable federal, state, and local laws and regulations in the performance of this Contract.

I. Confidentiality of Information. All documents, data compilations, reports, computer programs, photographs, and any other work provided to or produced by the Contractor in the performance of this Contract shall be kept confidential by the Contractor.

J. Conflicts of Interest

(i) Contractor shall not engage in providing consultation to or representation of clients, agencies or firms which may constitute a conflict of interest giving rise to a disadvantage to the Program or a disclosure which would adversely affect the interests of the Program. Contractor shall notify the Program of any potential or actual conflicts of interest arising during the course of the Contractor's performance under this Contract. This Contract may be terminated in the event a conflict of interest arises. Termination of the Contract will be subject to a mutual settlement of accounts. In the event the contract is terminated under this provision, the Contractor shall take steps to ensure that the file, evidence, evaluation, and data are provided to the Program or its designee. This does not prohibit or affect the Contractor's ability to engage in consultations, evaluations, or representation under agreement with other agencies, firms, facilities, or attorneys so long as no conflict exists.

(ii) A conflict of interest warranting termination of the Contract includes, but is not necessarily limited to, representing a client in an adversarial proceeding against the Program, its signatories, boards, commissions, or the Foundation, or initiating suits in equity including injunctions, declaratory judgments, writs of prohibition or *quo warranto.*

K. Entirety of Contract. This Contract, consisting of *eleven (11)* pages, Exhibit A, consisting of *nineteen (19)* pages, Exhibit B, consisting of *nine (9)* pages, Exhibit C, consisting of *four (4)* pages, and Exhibit D, consisting of *one (1)* page, represents the entire and integrated Contract between the parties and supersedes all prior negotiations, representations, and agreements, whether written or oral.

L. Force Majeure. Neither party shall be liable for failure to perform under this Contract if such failure to perform arises out of causes beyond the control and without the fault or negligence of the nonperforming party. Such causes may include, but are not limited to, acts of God or the public enemy, fires, floods, epidemics, quarantine restrictions, freight embargoes, and unusually severe weather. This provision shall become effective only if the party failing to perform immediately notifies the other party of the extent and nature of the problem,

limits delay in performance to that required by the event, and takes all reasonable steps to minimize delays. This provision shall not be effective unless the failure to perform is beyond the control and without the fault or negligence of the nonperforming party.

M. Indemnification. To the extent permitted by the laws of the State of Nebraska, the Contractor shall indemnify and hold harmless the Foundation, the Program, the ED Office, and their officers, agents, employees, successors and assignees from any and all claims, lawsuits, losses and liability arising out of Contractor's failure to perform any of Contractor's duties and obligations hereunder or in connection with the negligent performance of Contractor's duties or obligations, including but not limited to any claims, lawsuits, losses or liability arising out of Contractor's malpractice. The obligations of this paragraph shall survive termination of this Contract.

N. Independent Contractor. The Contractor shall function as an independent contractor for the purposes of this Contract and shall not be considered an employee of the Program, Foundation, or ED Office for any purpose. The Contractor shall assume sole responsibility for any debts or liabilities that may be incurred by the Contractor in fulfilling the terms of this Contract, and shall be solely responsible for the payment of all federal, state and local taxes which may accrue because of this Contract. Nothing in this Contract shall be interpreted as authorizing the Contractor or its agents and/or employees to act as an agent or representative for or on behalf of the Foundation or the Program, or to incur any obligation of any kind on the behalf of the Foundation or the Program. The Contractor agrees that no health/hospitalization benefits, workers' compensation and/or similar benefits available to Foundation, Program, or ED Office employees will inure to the benefit of the Contractor or the Contractor's agents and/or employees as a result of this Contract.

O. Notices. All notices arising out of, or from, the provisions of this contract shall be in writing and given to the parties at the address provided under this Contract, either by regular mail, facsimile, e-mail, or delivery in person. Notice is effective upon delivery.

P. Notice and Approval of Proposed Sale or Transfer of the Contractor. The Contractor shall provide the Program with the earliest possible advance notice of any proposed sale or transfer or any proposed merger or consolidation of the assets of the Contractor. Such notice shall be provided in accordance with the notice provision of this Contract.

Q. Ownership of Documents/Work Product/Materials. Program and Contractor shall have joint ownership of all data collected or compiled by Contractor within the scope of this work.

R. Patent or Copyright Protection. The Contractor recognizes that certain proprietary matters or techniques may be subject to patent, trademark, copyright, license or other similar restrictions, and warrants that no work performed by the Contractor or its subcontractors will violate any such restriction.

Inventions conceived or first reduced to practice under this Contract by the Contractor shall be owned by the Contractor and the Contractor shall bear the costs of filing related patents. Each party shall be granted a free, irrevocable, nonexclusive, and non-assignable right to use, solely for its internal noncommercial purposes, patented or non-patented inventions resulting from the work under this Contract.

S. Insurance Coverage. As of the date of the execution of this Agreement, Contractor is self-insured pursuant to the University of Nebraska Self-Insurance Trust Program. Subject to the terms, conditions, exclusions, and limits of the Statement of Self-Insurance Coverage contained in the Program, the Contractor shall become legally obligated to pay as damages for liability occurrences, up to the limits of $1,000,000 per liability occurrence and $3,000,000 in the aggregate of liability occurrences in any fiscal year.

T. Taxes. The Contractor shall pay all taxes and other such amounts required by federal, state and local law, including but not limited to federal and state income taxes, social security taxes, workers' compensation, unemployment insurance and sales taxes.

U. Termination of Contract. This Contract may be terminated, without cause, by the Program upon fifteen (15) days written notice. This Contract may be terminated immediately for cause if the Contractor fails to perform in accordance with the terms of this Contract. In the event of a termination, Program shall pay Contractor for all reasonable work performed up to the effective date of the termination. In the event the contract is terminated under this provision, the Contractor shall take steps to ensure that the data collected, analyses performed, results and interpretations made prior to termination are provided to the Program or its designee.

V. Third Party Beneficiary Rights. The parties do not intend to create in any other individual or entity the status of third-party beneficiary, and this Contract shall not be construed so as to create such status. The rights, duties and obligations contained in this Contract shall operate only between the parties to this Contract and shall inure solely to the benefit of the parties to this Contract. The provisions of this Contract are intended only to assist the parties in determining and performing their obligations under this Contract.

W. Time is of the Essence. Time is of the essence in all provisions of the Contract.

X. Titles Not Controlling. Titles of paragraphs are for reference only and shall not be used to construe the language in this Contract.

Y. Waiver. The waiver of any breach of any term or condition in this Contract shall not be deemed a waiver of any prior or subsequent breach.

Z. Survival. The parties' obligations under sections 8.D. (Audit/Access to Records), 8.S. (Insurance Coverage), and 8.U. (Termination of Contract) will survive the termination of this Contract.

9. Contacts.

Administrative Point of Contact (Foundation):
Diane M. Wilson
Manager of Public/Private Partnerships
Nebraska Community Foundation
PO Box 83107
Lincoln, Nebraska 68501-3107
Phone: (402) 323-7330
Fax: (402) 323-7349
Email: dwilson@nebcommfound.org

Admin. Point of Contact (Program):
Jason Farnsworth, Executive Director
Platte River Recovery Implementation Prog.
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: farnsworthj@headwaterscorp.com

Technical Point of Contact (Program):
Dr. Malinda Henry, Science Lead
Platte River Recovery Implementation Prog.
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: henrym@headwaterscorp.com

Media Point of Contact (Program):
Dr. Bridget Barron, Director of Outreach
Platte River Recovery Implementation Prog.
Headwaters Corporation
4111 4th Avenue, Suite 6
Kearney, Nebraska 68845
Phone: (308) 237-5728
Fax: (308) 237-4651
Email: barronb@headwaterscorp.com

Administrative Point of Contact (Contractor):
David B. Doty, Director
Office of Sponsored Programs
151 Prem S. Paul Res. Center at Whittier Sch.
2200 Vine Street
Lincoln, NE 68586-0861
Phone: (402) 472-3171
Fax: (402) 472-9323
Email: unlosp@unl.edu

Technical Point of Contact (Contractor):
Dr. Mark Pegg, Associate Professor
UNL School of Natural Resources
402 South Hardin Hall
3310 Holdrege Street
Lincoln, NE 68583-0974
Phone: (402) 472-6824
Email: mpegg2@unl.edu

THE REMAINDER OF THIS PAGE INTENTIONALLY LEFT BLANK

10. <u>Signatures</u>. By signing this Contract, the undersigned certify that they have read and understood it, that they have the authority to sign it, and that their respective Party agrees to be bound by the terms of the Contract.

NEBRASKA COMMUNITY FOUNDATION

_____ _____

Diane M. Wilson Date
Manager of Public/Private Partnerships

BOARD OF REGENTS OF THE UNIVERSITY OF NEBRASKA

_____ _____

William J. Nunez Date
Vice Chancellor, Business and Finance

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM ACKNOWLEDGEMENT

I hereby certify that the Governance Committee of the Platte Program has authorized the Nebraska Community Foundation, acting as contracting agent of the Governance Committee of the Platte Program, to enter into this agreement.

_____ _____

Jason Farnsworth Date
Executive Director

EXHIBIT "A"
RESEARCH PROPOSAL

Research Proposal – University of Nebraska-Lincoln (UNL) & Nebraska Game and Parks Commission (NGPC)

The research proposed was designed as a collaboration between UNL and NGPC, with Kirk Steffensen at NGPC serving as the collaborator at NGPC. NGPC is not a party to this agreement, but their role is described in Exhibit "B" Scope of Work.

Pallid Sturgeon Biology in the Platte River and Its Tributaries

Mark Pegg, School of Natural Resources, University of Nebraska-Lincoln
Jonathan Spurgeon, U.S. Geological Survey—Nebraska Cooperative Fish and Wildlife Research Unit and School of Natural Resources, University of Nebraska-Lincoln
Kirk Steffensen, Nebraska Game and Parks Commission

Pallid Sturgeon (*Scaphirhynchus albus*) is a long-lived (i.e., > 50 years) species that historically occupied a large proportion of the Mississippi River basin including the mainstem Missouri River and its large tributaries (DeLonay et al. 2016; Hamel et al. 2020). Pallid Sturgeon possesses a life-history strategy that enables individuals to maximize contributions of offspring to future generations through aligning spawning events with environmental conditions that support larval drift, survival, and recruitment to the population. However, Pallid Sturgeon do not spawn until they are many years old (i.e., 10 – 20 years), do not spawn annually when sexually mature, and reach relatively old ages (DeLonay et al. 2016; Hamel et al. 2020).

Pallid Sturgeon have undergone declines in abundance and distribution resulting in listing as a federally endangered species in 1990 (55 FR 36641). These declines are believed to be largely the result of anthropogenic activities including over-harvest and reductions in habitat availability for spawning following fragmentation and alteration of river channels—particularly in the Missouri River basin (DeLonay et al. 2016). Widespread harvest of Pallid Sturgeon is thought to be minimal following protection, but contemporary river conditions remain a suspect in limiting the recovery process. The present distribution of Pallid Sturgeon is truncated due to multiple environmental stressors including lack of connectivity from dams or other flow-control structures that block movements (DeLonay et al. 2016). Furthermore, minimal recruitment of Pallid Sturgeon has occurred within the lower Missouri River (Steffensen et al. 2019) as habitat conditions within the system may limit survival of drifting larvae and limited habitat for post-larval stages (i.e., young-of-year) may exist in altered mainstem channels (e.g., channelized Missouri River). Extensive hatchery supplementation of Pallid Sturgeon has occurred to stabilize population loss and potentially increase the number of reproductively viable adults to a level where natural reproduction can result in recruitment. However, a fundamental understanding of habitat needs of spawning adults across different systems as well as the role of different habitat types in enhancing survival of young is limited.

Studies to inform recovery efforts to date have focused on gaining a better understanding of life-history requirements, population dynamics, habitat use, and propagation in the mainstem Mississippi and

Missouri rivers (DeLonay et al. 2016; Steffensen and Mestl 2016; Steffensen et al. 2019; Kroboth et al. 2020). However, limited work has been done to understand the role of tributaries to fill data gaps in the recovery process. Therefore, there is a large need to provide details on Pallid Sturgeon populations and reproduction success in areas where they are not currently being evaluated. For example, the Platte River is frequently used by Pallid Sturgeon and may be important to species abundance, seasonal distribution, and reproductive ecology.

Past sampling efforts have documented wild- and hatchery-origin Pallid Sturgeon using the lower Platte River to approximately Columbus, NE (rkm 159; Hamel et al. 2014). Additionally, recaptures of previously tagged Pallid Sturgeon have been documented in tributaries to the Platte River (e.g., Elkhorn River and its tributaries; Pegg, unpublished data) as well as anecdotal catches by anglers in other tributaries (e.g., Loup River system). Hamel et al. (2016) did report hydrologic conditions conducive to greater Pallid Sturgeon abundances in the Platte River, but that study did not target specific movements and habitat use. According to information gathered using data storage tags, reproductively ready female Pallid Sturgeon are believed to have spawned in the lower Platte River (DeLonay et al. 2016). Reproductively ready adults have also been captured and used for hatchery propagation from the Platte River (Hamel and Pegg 2018, 2019; Ruskamp, 2021). However, site-specific habitat information as well as documented successful reproduction and recruitment of individuals is lacking.

The Platte River Recovery Implementation Program (PRRIP) is in an ideal position to fill data gaps about the importance of tributaries like the Platte River to the overall biology of Pallid Sturgeon. Specifically, the PRRIP is, among other items, tasked with ensuring management actions related to water and land management in the Platte River Basin have no adverse impact on Pallid Sturgeon in the lower Platte River. The PRRIP uses an adaptive management framework to inform and evaluate management actions in the Platte River. Certainly, knowing more about how Pallid Sturgeon use the Platte River in response to environmental conditions like flow, habitat availability, etc. will be an invaluable contribution to the science that informs both the Platte River and the Missouri River adaptive management programs.

GOAL

Fill knowledge gaps about lower Platte River contributions to Pallid Sturgeon spawning habitat, reproduction, recruitment, and population dynamics.

OBJECTIVES

1. Identify relations among environmental conditions (i.e., river discharge, turbidity, and temperature) with the timing and extent of Pallid Sturgeon movement into and within the lower Platte River.
    a. Quantify seasonal movements of juvenile and adult Pallid Sturgeon into and out of the lower Platte River.
    b. Quantify environmental patterns including—but not exclusive to—components of the flow regime, turbidity, and temperature variation in the lower Platte River.

2. Identify Pallid Sturgeon spawning habitat in the lower Platte River and its tributaries.
    a. Locate probable spawning areas used by gravid Pallid Sturgeon.

b. Document physical characteristics of the habitat at spawning locations.

3. Verify successful spawning by Pallid Sturgeon in the Platte River and/or its tributaries.
    a. Assess lower Platte River contribution of Pallid Sturgeon offspring to greater Missouri River population.
        i. Gather information on free embryo, larva, and exogenous feeding life-stages.

4. Provide Pallid Sturgeon genetic samples for further population and hybridization assessment (in collaboration with Dr. Heist's parallel proposal).
    a. Assess fraction of free embryo/larval/exogenous feeding individuals that are pure pallid, hybrid, and shovelnose sturgeon.
        i. Adult and juvenile Pallid Sturgeon fin clips from telemetry collection.
        ii. Free embryo/larvae/exogenous feeding individuals.

METHODS

This study will focus on collecting fish and habitat data throughout the lower Platte River, but will also include areas where Pallid Sturgeon observations have been reported or where detections by the proposed passive telemetry network indicates movements beyond the lower Platte River or into its tributaries (e.g., Elkhorn River, Loup River, Cedar Creek, Salt Creek, etc.). Fish data collection will focus on capturing adult and juvenile individuals for telemetry as well as sampling free embryos, larvae, and exogenous feeding age-0 Pallid Sturgeon.

We propose a 5-year study where the first four years of the project will focus predominantly on intensive field sampling. The field sampling will encompass a single crew from late summer to early spring that will transition to two crews in the field simultaneously during peak Pallid Sturgeon activity (i.e., spawning, or other movement periods) each year. A seasonal, third crew will also be deployed during intensive tracking and early larval fish sampling to maximize data acquisition during this time period. Data summarizations and reporting will be ongoing throughout the project. The fifth year will allow for all genetic samples to be processed in collaboration with Dr. Ed Heist (Southern Illinois University) so results can be verified for any genetically pure Pallid Sturgeon captured. The final year will also be used specifically to compile, synthesize, and analyze all data and complete project summary documents that integrate efforts over the course of the study. Specific methods are detailed below for each objective.

Objective 1: Identify relations among environmental conditions (i.e., river discharge and temperature) and timing and extent of Pallid Sturgeon movement into and within the lower Platte River.

This objective uses active and passive telemetry as the centerpiece means of data collection to document Pallid Sturgeon movement into and within the Platte River and its tributaries. Pallid Sturgeon movements will be coupled with habitat and water quality data to evaluate movement triggers both into and within the Platte River and its tributaries. Objective 2 will specifically address telemetry data

associated with identifying spawning site location(s) by narrowing in on reproductively ready fish to gather habitat data.

Telemetry

Approach: The main goals of these telemetry efforts are to track the movement of adult, reproductive Pallid Sturgeon; document spawning to determine spawning-site habitat characteristics; and document movements and habitat use by non-reproductive individuals using the Platte River. We will accomplish these goals using two sources of Pallid Sturgeon implanted with telemetry transmitters – fish caught in the Platte River and its tributaries (within this project) and fish being studied by a concurrent project on the Missouri River. First, we will establish passive and active telemetry networks for Pallid Sturgeon captured and tagged in the Platte River and its tributaries. Second, we will work in collaboration with Nebraska Game and Parks Commission's (NGPC) Pallid Sturgeon Population Assessment crew to use the lower Missouri River telemetry portfolio of fish to track Pallid Sturgeon when they enter the Platte River system from the Missouri River. All telemetry equipment (i.e., transmitters, passive listening stations, active tracking receivers) will be compatible with concurrent telemetry efforts in the Missouri River as listed in Table 1. Generally, we will monitor Pallid Sturgeon movement and habitat use in the Platte River and its tributaries following the basic guidelines outlined in Welker et al. (2020).

Table 1. Summary of telemetry tools used to track movements of Pallid Sturgeon > 800 g in the Platte River and its tributaries. All items listed are from InnovaSea Systems Inc. (formerly VEMCO) to be compatible with concurrent Pallid Sturgeon telemetry projects on the Missouri River (coded, 69 kHz transmitters and receivers). The minimum number column represents our targeted minimum sample size for transmitters with optimum numbers indicated in parentheses. Actual sample size will be dictated by catch.

Item	Model #	Use	Minimum number (ideal number)
Receiver	VR2Tx	Passive tracking	21 (30)
Receiver	VR-100	Active tracking	4
Transmitter	V-16TP*	All tracking efforts	20 (40)
Transmitter	V-13TP*	All tracking efforts	20 (40)

*Each acoustic transmitter is uniquely coded to provide individual fish identification. Transmitters are registered by the manufacturer to each buyer so "unknown" tag detections can be linked back to the tagging agency/university. Each receiver is able to detect any InnovaSea Systems Inc. tag in the 69 kHz range (i.e., no manual programming needed to detect tags as with radio receivers).

Pallid Sturgeon Collection for Telemetry: Our intent is to implant transmitters in as many Pallid Sturgeon as we can possibly capture, under environmental conditions that federal regulations allow sampling (water temperature < 15^{o}C) and use the lower stations of the passive telemetry to inform movements

into the lower Platte River from the mainstem Missouri River. Unfortunately, there is substantial uncertainty in the actual number of fish we will be able to capture. Data from previous studies suggest captures of reproductively ready adults could be relatively low; historical catches ranged from 1 to 5 per year but reproductively ready fish moving into the lower Platte River from the mainstem Missouri River is likely. Sub-adult captures were somewhat greater with catches ranging from 1 to dozens per year (Hamel and Pegg 2019). However, those studies used a single crew and a random site selection process to meet different objectives than proposed herein. We will build on these previous works to improve Pallid Sturgeon captures for the telemetry objectives in three ways: 1) longer duration sampling window (i.e., months vs. weeks), 2) two to three crews to increase sampling effort, and 3) non-random selection of sample locations to optimize captures. As such, we anticipate implanting a ***minimum*** sample size of 40 individuals (Table 1) during the first three years of the field season but will maintain capacity to put additional transmitters into Pallid Sturgeon should the opportunity arise. We will put an emphasis on implanting transmitters earlier in the project to facilitate as much data collection as possible.

Collection of Pallid Sturgeon suitable for telemetry will primarily occur during March – May each of the first three years. Sample efforts will be focused from the Elkhorn River confluence to the Missouri River. The lower Platte River reach has historically been a reach with the greatest abundance of Pallid Sturgeon in the Platte River system (Hamel et al. 2016). For instance, the reach of river 8-30 km upstream from the confluence with the Missouri River provided the greatest catch rates for collecting Pallid Sturgeon compared to areas outside of that reach (Hamel et al. 2014). At least initially, we will concentrate fish collection efforts there. We will use information gained from the ongoing telemetry observations to identify additional potential high probability capture locations when such data are available.

Fish collection methods will follow established collection techniques used in the Platte River and within the Pallid Sturgeon Handling Protocols. Specifically, we will target Pallid Sturgeon for transmitter implantation using baited trotlines (Peters and Parham 2008; Hamel and Pegg 2019), which has proved to be the most productive capture method. Each crew will set 10 - 20 trotlines per day in locations ideal for sturgeon captures (e.g., channels, behind sandbars, riprap bank lines, etc.). Trotlines will be 32 m long and made of 6 mm diameter nylon main line with a lead core. Hooks will be fished using a 30 cm line attached to the main line at 1.5 m intervals (N = 20 hooks/line). We will use O'Shaughnessy (size = 3/0) hooks baited with nightcrawlers *Lumbricus terrestris* for all trotline sets. The sets will typically be allowed to fish overnight with a maximum set time of 24 hours but will follow the requirements within the federal handling protocols. Start and stop times will be recorded in addition to georeferenced location (e.g., latitude and longitude coordinates) for each trotline set. Habitat measures (described below) will be taken at all trotline sample sites.

Collected fish will be temporarily held in a holding tank for processing. All fish *except* sturgeon species will be identified, measured for total length (mm) and mass (g), then released near the capture location. All sturgeon will be identified, measured for fork length (mm) and mass (g). Shovelnose sturgeon will be released near their capture location. Putative Pallid Sturgeon will be further processed for inclusion in the telemetry portion of this study when appropriate (Objectives 1 & 2) and genetic assessment

(Objective 4). Pallid Sturgeon will be checked for presence of a Passive Integrated Transponder (PIT; 125.0 or 134.2 kHz; Biomark unencrypted) tag that would have been implanted during previous studies. We will implant a new PIT tag if one is not present. The PIT tagging effort is an ongoing, collaborative component of the Pallid Sturgeon recovery plan across the Missouri River Basin to assess movements and develop population parameters. A fin clip will also be collected and preserved in 70% ethanol for genetic identification from all fish identified in the field as Pallid Sturgeon or suspected hybrids (Objective 4). Genetic samples will be shipped to Dr. Ed Heist for species identification and origin determination (wild or hatchery-origin).

Gender identification and reproductive evaluations for adults will be assessed using an ultrasound, oocyte biopsy, and/or visual examination during surgical implantation as outlined in Wildhaber et al. (2007). Gender identification will allow determination of the sex ratio of Pallid Sturgeon using the lower Platte River for comparison to the mainstem, while evaluations on reproductive status will also provide valuable information into the population characteristics (i.e., reproductive readiness ratio, age/length-of-maturity, etc.) of the lower Platte River. Also, knowing the gender and reproductive stage of individual fish will allow us to target likely reproductive fish in future years for intensive telemetry tracking efforts.

Implanting transmitters into Pallid Sturgeon: We will use two sizes of uniquely coded transmitters for tracking Pallid Sturgeon. We will use a V-16TP (16 mm X 71 mm; 26 g) for fish > 870 g and V-13TP (13 mm X 39 mm; 11 g) for fish 370 – 870 g. Each tag has a unique acoustic signal so that individual fish can be specifically identified. Both tag sizes provide battery life sufficient to track individuals for 3+ years and do not exceed the 3% of total body weight threshold often used in telemetry studies to reduce potential impacts of the transmitter on fish buoyancy (Cooke et al. 2012). The transmitters will also be equipped with temperature and pressure (depth) sensors that will provide additional insight into depth and temperature conditions used by these individuals through time. Changes in depth and temperature are particularly useful for identifying when Pallid Sturgeon move between the Platte and Missouri river systems (Haas et al. 2019).

As required under our Federal Endangered Species Collectors Permit and the revised Pallid Sturgeon Handling Protocols, all personnel responsible for surgery will undergo training for proper surgical methods and oocyte extraction by certified staff (training provided by USGS science center in Columbia, Missouri). Surgery procedures will follow guidelines developed for proper care and handling of Pallid Sturgeon (USFWS 2012, Kroboth et al. 2020). Transmitters will be inserted into the body cavity of the Pallid Sturgeon via an incision cut in the abdomen near, but not along, the ventral line. The incision will be closed using non-absorbable, monofilament suture material with independent sutures to ensure proper closure. All procedures will follow field sterilization procedures for instruments, transmitters, and suture materials and not occur when air temperatures are below 2^{o}C. Surgical implantations will also not occur in late-fall to prevent delayed incision heeling before the sutures dissolve due to cold water temperatures. A post-operative injection of antibiotics (Liquamycin Vaccination at 0.045 mg/kg) will also be administered to reduce the probability of infection when the procedure is complete.

Individuals will be released near the point of capture once they are able to hold themselves upright and transmitter signal is verified as turned on and functional.

Additional source of currently transmitter-implanted Pallid Sturgeon: Individual Pallid Sturgeon, already implanted with transmitters and of known reproductive status, have previously entered the Platte River from the Missouri River (Haas et al. 2019). Missouri River telemetry crews are not authorized to follow these fish into the Platte River. Valuable information is lost when fish move out of the Missouri River and into the Platte River or its tributaries. Our study would provide a means for the Missouri River telemetry crews to hand off the fish to the Platte River crews to the benefit of all involved. In essence, this transfer of information would maintain continuity in tracking individuals across wider movement patterns and provide an opportunity to possibly increase our sample size of adult, reproductive-ready Pallid Sturgeon using the Platte River and its tributaries. Likewise, we will also coordinate details with NGPC should Pallid Sturgeon implanted with transmitters in the Platte River system move to the Missouri River.

Habitat measures at Pallid Sturgeon capture locations: Habitat will be assessed at multiple spatial scales for **Objectives 1-3**. Micro-scale and meso-scale habitat information will be collected at each gear deployment location. Micro-scale habitat variables will be summarized across the area where gears were deployed and will include water velocity, water depth, dominant substrate type(s), water temperature, turbidity, conductivity, and presence of wood structure. Mesoscale habitat variables used to describe the area surrounding the location of capture will include—but not be limited to—categories such as main-channel, side-channel, overflowing bar, emerged-bar with main-channel border, or back-water. Reach-scale habitat variables will include measures of channel width and complexity as well as distances to tributary inflows. A river reach is defined—for the purposes of this study—as the 1km above and below the location where a Pallid Sturgeon is recaptured. Channel complexity will be analyzed using remote sensing methods and approaches similar to O'Neill and Thorp (2011), where the River Channel Complexity Ratio is measured using length of individual channels within a river reach compared to the total length of bank along the outside boundary. These data are consistent with previous habitat measures from the Platte River (Peters and Parham 2008; Hammen et al. 2018; Hamel and Pegg 2019; Platte River Recovery Stage-Change Study 2009). We will also assess hydrologic patterns by linking Pallid Sturgeon locations with the nearest USGS hydrologic gage. Flow metrics will be calculated on daily and sub-daily timescales (Spurgeon et al. 2016) and will summarize the magnitude, duration, frequency, rate-of-change, and timing of flow events. Additional flow metrics estimated at the yearly time scale also will be assessed. The combination of physical habitat measurements with hydrologic patterns may provide insight into the dynamic nature of habitat availability and Pallid Sturgeon use along the Platte River.

Passive Tracking: Passive tracking allows continuous monitoring of fish movements across a greater temporal and/or spatial scale than is typically logistically feasible solely using active tracking techniques (Kraus et al. 2018). The basic premise is that a network of receivers can be deployed across a study area to document when exactly a fish implanted with a transmitter has encountered the receiver

at a given location. This network approach has been used in numerous studies across a range of aquatic environments and provides a coarse view of where fish are located within the system as well as documents large-scale movement (e.g., Enders et al. 2019). We intend to use the passive tracking portion of the telemetry study to assist with documenting large scale movements as in other studies, but to also assist in determining if and when Pallid Sturgeon have moved to new areas within the Platte River or into one of its major tributaries. Specifically, we will deploy passive telemetry stations (VR2Tx receivers) in the Platte River at strategic locations to document specific fish movements (Figure 1). These receivers operate by detecting signals within a "line of sight", meaning there needs to be an unobstructed path between the transmitter and the receiver through the water. Therefore, we will create the passive tracking network by placing receivers in locations (e.g., narrowing channel with potential complete line of sight, known sturgeon congregation areas, etc.) starting just upstream from the confluence with the Missouri River, continuing to a location past the Loup River confluence with the Platte River. Some locations will likely require more than one receiver to ensure full line of sight coverage across the river. Furthermore, we will use the passive tracking network to monitor Pallid Sturgeon movements into or out of major tributaries to the Platte River where they have been reported in the past. Each tributary will be monitored by placing a receiver just upstream from its confluence, yet far enough into the tributary to be sure the fish is actually in the tributary. We will initially place 21 listening stations (Table 2; Figure 1) prior to implanting any transmitters in fish during the first year of this study. We will place additional receivers (maximum of 9 additional receivers) to target specific data collection based on movements of Pallid Sturgeon over the course of the project or to replace damaged or lost receivers in the original network design. Additional receivers may also be needed in areas with braided channels to minimize missing individuals when multiple channels are present.

The passive tracking network will be an integral component of the entire telemetry portfolio to document the extent of Pallid Sturgeon movements in the Platte River, its tributaries, and emigration into the mainstem Missouri River. The passive tracking network provides continuous listening abilities (i.e., always listening for transmitters upon being deployed) that active tracking cannot always deliver. The passive tracking network will also be able to monitor movement information for the entire telemetry portfolio when crews are intensively tracking reproductive fish. Receivers document exactly when (i.e., uniquely coded individual fish detections with a date and time stamp) any individual passes a respective receiver. We anticipate coupling the data gathered by the passive network and the active tracking to test the relation between Pallid Sturgeon movements and potential environmental cues like discharge, temperature, etc.

Table 2. *Approximate* location and estimated number of VR2Tx receivers to be initially placed in the Platte River and its tributaries to establish a passive telemetry network. Location numbers correspond to mapped locations in Figure 1. An additional nine transmitters are included as additional passive tracking sites emerge or as replacements if deployed receivers are damaged or lost.

Station	Map location (from Figure 1)	Longitude	Latitude	Estimated number of receivers
Platte Confluence	1	-95.88220	41.053346	2
Cedar Creek	2	-96.11301	41.036487	2
Suspected Spawning Site	3	-96.12966	41.029207	2
Highway 50	4	-96.15746	41.012596	2
Salt Creek	5	-96.33799	41.051616	2
Highway 6	6	-96.32663	41.061275	2
Elkhorn River	7	-96.29643	41.204528	2
Above Elkhorn Confluence	8	-96.31282	41.121036	2
Fremont	9	-96.50269	41.403659	1
Rogers	10	-96.92405	41.456900	1
Platte River-Loup Power Canal	11	-97.28230	41.398238	1
Loup River	12	-97.40016	41.431202	1
Columbus Bridge	13	-97.36772	41.397570	1
Additional receivers (for spawning locations or replacements)				9
			Total	**30**

The network will also serve as a "safety net" of sorts to help us locate fish that are not found during active tracking. We expect the receivers will remain in place year-round, or nearly so, once positioned. However, receivers placed in the small tributaries (i.e., Cedar Creek, Salt Creek) may be removed prior to potential ice-flow events in the winter to protect the receivers from damage. Similar activities may also occur on the mainstem Platte River if the receivers are at risk of ice scour but will largely depend on exact location of receiver placement (e.g., bridge abutments, anchored in the channel, tethered to shore, etc.). As long as the receiver remains submerged and fish "line-of-sight" is clear of physical obstructions, they will be actively collecting data. Gathering data from each receiver in the network will require physically retrieving each receiver to attain data since the previous download event. Retrieving the data from these receivers will likely be done in accordance with the fish movements we have been observing to balance optimal data collection under both the passive and active segments of this project. At the very least, we anticipate downloading data from each receiver twice annually. Actual downloads will likely be more frequent depending on last known locations of fish within the system. For example, if an individual has been in the Platte River-Elkhorn River confluence area and active tracking fails to find the fish, we will download data from receivers in that general area to assess the suspected direction of movement. We believe targeting specific receivers for data downloads in this strategic manner will be

especially crucial if/when individuals move into one of the tributaries or move into the Missouri River as it will provide valuable direction on where a more extensive search should be initiated or if the fish will be handed off to NGPC.

Active Tracking: Active tracking will include *extensive* tracking to locate all fish and *intensive* tracking to follow reproductively ready adults during the spawning season. Details regarding the intensive tracking events are detailed in Objective 2. However, both tracking events will use InnovaSea VR100 deck boxes equipped with a multidirectional hydrophone and a directional hydrophone to locate fish (Table 1). Each receiver is capable of detecting any transmitters it encounters with an InnovaSea transmitter in the 69 kHz range.

Extensive tracking will be primarily conducted by one field crew for much of the year and will attempt to gather monthly locations for all fish with transmitters within the Platte River and its tributaries outside of the spawning season and when water conditions allow (i.e., January – March and July – December each year). The search event will generally follow a systematic approach where the field crew will search for fish in the Platte River and then radiate into the tributaries as needed or as the passive tracking network indicates. We anticipate most fish will initially remain in the Platte River near where we focus our fish collection efforts and then disperse upstream or downstream accordingly. It seems reasonable to start extensive searches in this area until we observe dispersal events. We will develop the most efficient search approach based on fish behaviors observed from our tracking data collection efforts. We will use the passive listening network to bolster our ability to locate fish and determine whether or not they remain in our study area as described in the passive telemetry section. This is especially true for fish whose last known location was near one of the tributaries or the upstream and downstream extents of our network.

We will typically use the omnidirectional hydrophone to locate fish during the monthly tracking events. Once a fish is located, we will switch to the directional hydrophone to get as specific to the location of the fish as possible without disturbing the fish. Location accuracy should be < 5 m and will provide direct insight into the type of microhabitat in which the fish is located. A habitat assessment will then be conducted near the fish's location.

Habitat measures at Pallid Sturgeon relocation sites: Habitat for relocated Pallid Sturgeon will be assessed at multiple spatial scales. Micro-scale, meso-scale, and reach-scale habitat information as described above will also be collected when Pallid Sturgeon can be relocated. As described above, flow patterns according to the nearest USGS hydrologic gage will be linked to Pallid Sturgeon relocation sites. Additionally, if environmental conditions permit (i.e., water depth and hydrologic conditions), we will attempt to provide side-scanned images of the location where individual Pallid Sturgeon are located for further analyses.

Objective 2: Identify Pallid Sturgeon spawning habitat in the lower Platte River and its tributaries.

Surgically implanting transmitters provides an opportunity to assess adults and their stage of reproductive readiness while the fish is in hand. Likewise, the NGPC PSPAP crews will also be tracking reproductively ready adults and will notify our crew(s) when a fish moves near or enters the lower Platte River from the Missouri River to make sure we follow that individual appropriately. We will use this information to intensively follow fish we identify as being reproductively ready during their spawning period and attempt to document spawning behaviors and location. Two telemetry crews will try to collect individual locations daily when spawning timing approaches (~April) and water temperatures are less than 16^{o}C. As water temperatures near 16-18^{o}C, intensive active tracking efforts will begin locating reproductive fish approximately every 15 to 60 minutes during daylight hours. Overnight tracking on the major river systems is difficult and dangerous so will likely not occur. However, crews will continue active tracking the following morning based on observed swimming speed and potentially information retrieved from passive stations to anticipate relocation areas if the fish is not immediately found. Behaviors that typically suggest a spawning event include an individual halting its upstream movement, remaining in one localized area for a short period (1-5 days) with consistent patterned movement of approximately 100-m along spawning locations, then moving back downstream (DeLonay et al. 2014). After continued downstream movement is detected, crews will attempt to recapture the fish to assess spawning success.

Intensive tracking requires a lot of time and effort to locate individual fish daily and the number of fish tracked annually depends upon fish availability, distance between reproductive fish, and available crews. To maximize information return, we will use two crews during spawning and immediately after spawning to maximize the number of fish that can be simultaneously, yet intensively tracked. However, this will limit the information acquired for juveniles and non-reproductive adults for Objective 1 to incidental detections during the spawning season window.

Habitat measures at Pallid Sturgeon spawning locations: Habitat information from the spawn site(s) will be recorded to characterize spawning sites following the spawning season to ensure we do not disturb or interrupt spawning behaviors. Habitat at spawning locations will be estimated at multiple spatial scales. Micro-scale and meso-scale habitat information will be collected when spawning Pallid Sturgeon sites are documented. Reach-scale habitat variables such as channel width and complexity as well as distances to tributary inflows will also be measured. If environmental conditions permit (i.e., water depth and hydrologic conditions), we will attempt to provide side-scanned images of the location where individual Pallid Sturgeon are/were located. Hydrologic patterns will be assessed by linking Pallid Sturgeon locations with the flow metrics described above as obtained from the nearest USGS hydrologic gage. These measurements will document the physical and hydrological conditions of Pallid Sturgeon spawning habitat on the Platte River. After the reproductive fish concludes spawning behavior and begins downstream movement, we will attempt recapture to determine if that individual successfully spawned as well as attempt to capture free embryos in the general spawning area (Objective 3).

Objective 3: Verify successful spawning by Pallid Sturgeon in the Platte River and/or its tributaries.

Young-of-year Pallid Sturgeon Collection

Approach: We will use two sampling approaches to document Pallid Sturgeon spawning success in the Platte River and its tributaries. These approaches will facilitate gathering information on the contribution of the lower Platte River and its tributaries to Pallid Sturgeon population dynamics on the lower Missouri River and document locations where Pallid Sturgeon are spawning successfully within the Platte River system.

First, we will document the contribution of Platte River collected Pallid Sturgeon embryos, larvae, and exogenous feeding individuals to the lower Missouri River system through a systematic sampling process. We will use ichthyoplankton nets (gear deployment described below) to target early life-stage Pallid Sturgeon at the confluence of the Platte River with the Missouri River as well as above and below the confluence in the Missouri River (Figure 1). Sampling at the confluence area of the Platte River with the Missouri River will document the Pallid Sturgeon being produced in the Platte River and "exported" to the Missouri River when such an instance occurs. In essence, a cumulative perspective of the Platte River's contribution to the greater Pallid Sturgeon population. Furthermore, sampling in the Missouri River above and below the confluence will give insight into the relative contribution of Pallid Sturgeon from the Platte River compared to the mainstem Missouri River above the confluence. Weekly sampling will commence when water temperatures exceed 15^{o}C or May 1, whichever occurs first, through June 30 each year of field data collection. We will sample the Platte River along a transect (perpendicular to flow) approximately 1-km upstream from the confluence. Habitat diversity is greater in the Platte River compared to available sample locations on the Missouri River. Therefore, we will sample three locations along a transect wherein we deploy gear about 50-m away from each bank and a mid-river location. Exact sample locations will likely be dictated by water conditions and presence of sandbars, but we will target the deepest water available. Conversely, DeLonay et al. (2016) reported the majority of Pallid Sturgeon were collected in outside bend habitats on the Missouri River. Hence, we will target outside bend habitats in the Missouri River about 1-km upstream and 1-km downstream of the Platte River confluence and all samples will be collected on the riverbed. Each Missouri River sampling location will be sampled in triplicate for parity with the Platte River sampling. We will use a third crew to sample the confluence area during this time given the logistical demands on the two telemetry crews also operating at this time. These logistical plans will be dictated by how many reproductively active individuals are currently in the Platte River and its tributaries each year during spawning.

Second, we will initiate an intensive sampling effort at site(s) where behavior by individuals implanted with transmitters suggest spawning is occurring or has occurred (per Objective 2). Here, one or both of the telemetry crews that are following reproductively active adults will deploy ichthyoplankton nets downstream of the spawning location to target collection of free embryos and/or larval Pallid Sturgeon to document that successful spawning took place. The amount of water sampled by the ichthyoplankton nets will be dependent on debris load. Sampling sites will be selected based on channel

configuration to maximize capture probability. Sampling will begin 3 days post-spawning and continue for 5 to 7 days depending on the number of Acipenseriformes larvae being collected. Field samples will be immediately processed or "picked" in the field and preserved in alcohol. All individuals from Acipenseriformes in each sample will be submitted to Dr. Ed Heist for species identification (Objective 4).

Sample Collection: Ichthyoplankton nets will be used to collect free embryos, larvae, and early life-stages of exogenous feeding individuals. These 750-micron mesh nets are conical in shape, with 0.75-m diameter openings that extend 4-m to a cod end equipped with a jar to hold captured material. These nets will be set from an anchored boat to ensure stationary deployment and consistent gear operation. We will deploy nets in tandem (i.e., one net starboard/one net port) at each sample location. Both nets will be placed at or near the bottom of the water column at the water-substrate interface to target Acipenseriformes (sturgeon and paddlefish) species (DeLonay et al. 2016). Drift net deployment times will likely vary depending on quantities of organic flotsam in the water column, but we will target 10-minute sets in all locations. Sampling times will likely vary, but sampling effort will be standardized according to the amount of water sampled in each net. We will collect three replicate samples at each of the Platte River confluence and Missouri River sites. Intensive spawning site sample collection will likely vary but will be at least five (5) samples per day when verifying spawning success at a particular site.

We will determine relative density of fish captured in the nets as number of fish per unit volume of water sampled (e.g., number of individuals per cubic meter; $\#/m^3$). Volume of water sampled (V) will be calculated as:

$$V = \pi * R^2 * H$$

where R is the net radius, and H is the distance of water sampled. We will determine H using a General Oceanics (Miami, FL) flow meter positioned at the mouth of the drift net during deployment. This flow meter counts propellor revolutions in the instrument that can then be multiplied by a manufacturer-provided constant to convert flow into distance of water sampled.

Processing Suspected Sturgeon Species: All samples will be initially screened immediately following net retrieval for individuals from the Order Acipenseriformes (i.e., sturgeon and paddlefish). Species-specific identification of individuals from Acipenseriformes is not possible from morphometric features when assessed in the field at the free embryo and early larval stages. Therefore, individuals identified as being from Acipenseriformes will be immediately preserved in 70% ethanol. Remaining fish in the sample will be preserved in either a 10% buffered formalin or 70% ethanol solution to be processed at a later date. Preserved specimens will be identified to the lowest possible taxonomic level (e.g., Family, Genus, Species). All suspected *Scaphirhynchus* spp. will be submitted for genetic identification per

Objective 4 to verify successful spawning by Pallid Sturgeon in the Platte River and assess the Platte's contribution of Pallid Sturgeon offspring to the greater Missouri River population.

Habitat measures taken at suspected spawning sites: Habitat information from the spawn site(s) will be recorded to characterize spawning sites following the spawning season as described above for Objective 2.

Objective 4: Annual sampling of fish and free embryo/larvae/young-of-year from the Lower Platte to provide samples for Dr. Ed Heist's genetic study.

Tissue samples from all Pallid Sturgeon captured as part of this project will be provided to Dr. Ed Heist's laboratory at Southern Illinois University for genetic analyses to assess species identification, demographics, and the potential degree of hybridization with Shovelnose Sturgeon (See companion proposal from Dr. Heist for specific details). Juvenile and adult Pallid Sturgeon (and potential hybrids that are phenotypically identified in the field) collected under **Objective 1** will provide insights into Pallid Sturgeon population dynamics (i.e., ratio of wild to hatchery-origin, natural recruitment via juvenile wild-origin fish collected, occurrence/rate of hybridization). Age-0 (embryos, larval, and exogenous feeding) individuals collected under **Objectives 2 and 3** will provide insights into reproductive success in the lower Platte River, purity of these reproductive events, and contribution of the Platte River to the lower Missouri River sturgeon populations.

All samples (e.g., fin clips or whole specimens depending on life stage) will be preserved, documented, and shipped to the laboratory for further processing following protocols provided by Dr. Heist. Results derived from this objective will be provided in reporting documents as described in the companion proposal to this document. Results from genetic analyses will be incorporated into the current project to verify field identification of adults and juveniles as pure Pallid Sturgeon and make Pallid-specific assessments of Platte River habitat use, successful spawning, and contributions to the Missouri River population(s).

References

Cooke, S. J., S. G. Hinch, M. C. Lucas, and M. Lutcavage. 2012. Biotelemetry and biologging. Pages 819-881 in A. V. Zale., D. L. Parish, and T. M. Sutton, editors. Fisheries Techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

DeLonay A. J., K. A. Chojnacki, R. B., Jacobson, P. J. Braaten, K. J. Buhl, C. M. Elliott, S. O. Erwin, J. D. A. Faulkner, J. S. Candrl, D. B. Fuller, K. M. Backes, T. M. Haddix, M. L. Rugg, C. J. Wesolek, B. L. Eder, G. E. Mestl. 2016. Ecological requirements for pallid sturgeon reproduction and recruitment in the Missouri River: Annual report 2014: U.S. Geological Survey Open-File Report 2016–1013.

DeLonay, A. J., R. B. Jacobson, K. A. Chojnacki, M. L. Annis, P. J. Braaten, C. M. Elliott, D. B. Fuller, J. D. Haas, T. M. Haddix, H. L. A. Ladd, B. J. McElroy, G. E. Mestl, D. M. Papoulias, J. C. Rhoten, and M. L. Wildhaber. 2014, Ecological requirements for pallid sturgeon reproduction and recruitment in the Missouri River—Annual report 2011: U.S. Geological Survey Open-File Report 2014–1106.

Enders, E. C., C. Charles, D. A. Watkinson, C. Kovachik, D. R. Leroux, H. Hansen, and M. A. Pegg. 2019. Identifying requirements for fish passage at dams and weirs using a large-scale acoustic receiver network. Sustainability 11:3051.

Fischenich J. C., K. E. Buenau, J. L. Bonneau, C. A. Fleming, D. R. Marmorek, M. A. Nelitz, D. Pickard, B. O. Ma, and T. R. Gemeinhardt. 2018a. Science and Adaptive Management Plan Appendices and Attachments. Missouri River Recovery Program, U.S. Army Corps of Engineers.

Fischenich J. C., D. R. Marmorek, M. A. Nelitz, C. L. Murray, B. O. Ma, K. E. Buenau, G. Long, J. L. Bonneau, C. A. Fleming, and C. J. Schwarz. 2018b. Science and Adaptive Management Plan. Missouri River Recovery Program, U.S. Army Corps of Engineers.

Haas, J., R. Ruskamp, J. D. Adams, K. D. Steffensen, and G. E. Mestl. 2019. Analysis of historic Pallid Sturgeon telemetry data from the lower Missouri River. NGPC, Lincoln NE.

Hamel, M. J., J. J. Spurgeon, M. A. Pegg, and K. D. Steffensen. 2020. Uncovering unique plasticity in life history of an endangered centenarian fish. Nature Scientific Reports 10:12866

Hamel, M. J., and M. A. Pegg. 2019. Riverine Sportfish Ecology and Management. Final report to Nebraska Game and Parks Commission.

Hamel, M. J., and M. A. Pegg. 2018. Sturgeon management in the Platte River, Nebraska: implications to a declining sportfish population. Project completion report to Nebraska Game and Parks Commission, Lincoln, NE.

Hamel, M. J., M. A. Pegg, J. J. Hamman, and M. L. Rugg. 2014. Population characteristics of pallid sturgeon, Scaphirhynchus albus (Forbes & Richardson, 1905), in the lower Platte River, Nebraska. Journal of Applied Ichthyology 30:1-9.

Hamel, M. J., J. D. Koch, K. D. Steffensen, M. A. Pegg, J. J. Hammen, and M. L. Rugg. 2014. Using mark-recapture information to validate and assess age and growth of long-lived fish species. Canadian Journal of Fisheries and Aquatic Sciences 71:559-566.

Hamel, M. J., J. J. Spurgeon, M. A. Pegg, J. J. Hammen, and M. L. Rugg. 2016. Hydrologic variability influences distribution and occurrence of pallid sturgeon in a Missouri River tributary. River Research and Applications 32:320-329.

Hammen, J. J., M. J. Hamel, M. L. Rugg, and M. A. Pegg. 2018. Habitat associations of shovelnose sturgeon Scaphirhynchus platorynchus (Rafinesque, 1820) in the lower Platte River, Nebraska. Journal of Applied Ichthyology 34:12-20.

HDR. 2009. Lower Platte River Stage Change Study Final Protocol Implementation Report. Final report to Platte River Recovery Implementation Program.

Kraus, R. T., C. M. Holbrook, C. S. Vandergroot, T. R. Stewart, M. D. Faust, D. Watkinson, C. Charles, M. Pegg, E. Enders, and C. C. Krueger. 2018. Evaluation of acoustic telemetry grids for determining aquatic animal movement and survival. Methods in Ecology and Evolution 9:1489-1502.

Kroboth, P. T., D. A. Hann, M. E. Colvin, P. D. Hartfield, and H. L. Schramm Jr. 2020. Pallid sturgeon seasonal habitat selection in a large free-flowing river, the lower Mississippi River. Journal of Applied Ichthyology 36:131-141.

O'Neill, B. J., and J. H. Thorp. 2011. A simple channel complexity metric for analyzing river ecosystem responses. River systems 19: 327-335.

Peters, E. J., and J. E. Parham. 2008. Ecology and management of sturgeon in the lower Platte River, Nebraska. Nebraska Technical Series No. 18, Nebraska Game and Parks Commission, Lincoln, Nebraska. 232pp.

Ruskamp, R. L. 2021. Central Lowlands and Interior Highlands Pallid Sturgeon Spawning and Stocking Summary Report, 1992-2021. NGPC Lincoln, NE

Spurgeon, J. J., M. J. Hamel, and M. A. Pegg. 2016. Multi-scale approach to hydrological classification provides insight to flow structure in altered river system. River Research and Applications 32:1841-1852.

Steffensen, K. D., and G. Mestl. 2016. Assessment of pallid sturgeon relative condition in the upper channelized Missouri River. Journal of Freshwater Ecology 31:583-595.

Steffensen, K. D., M. J. Hamel, and J. J. Spurgeon. 2019. Post-stocking pallid sturgeon Scaphirhynchus albus growth, dispersal, and survival in the lower Missouri River. Journal of Applied Ichthyology 35:117-127.

Steffensen, K. D., K. A. Chojnacki, J. A. Kalie, M. L. Bartron, E. J. Heist, K. R. Winders, N. C. Loecker, W. J. Doyle, and T. L. Welker. 2019. Evidence of limited recruitment of Pallid Sturgeon in the lower Missouri River. Journal of Fish and Wildlife Management 10:336-345.

U.S. Fish and Wildlife Service. 2012. Biological procedures and protocols for researchers and managers handling pallid sturgeon. U.S. Fish and Wildlife Service. Billings, Montana.

U.S. Fish and Wildlife Service. 2014. Revised recovery plan for the Pallid Sturgeon Scaphirhynchus albus. U.S. Fish and Wildlife Service, Billings, Montana.

Welker, T. L., M. R. Drobish, and G. A. Williams. 2020. Pallid sturgeon population assessment project, volume 2.0. U.S. Army Corps of Engineers, Omaha District, Yankton, South Dakota.

Welker, T. L., and M. R. Drobish. 2016. Missouri River standard operating procedures for fish sampling and data collection, volume 1.8. U.S. Army Corps of Engineers, Omaha District, Yankton, South Dakota.

Wildhaber, M. L., D. M. Papoulias, A. J. DeLonay, D. E. Tillitt, J. L. Bryan, and M. L. Annis. 2007. Physical and hormonal examination of Missouri River shovelnose sturgeon reproductive stage: a reference guide. Journal of Applied Ichthyology 23:382-401.

Timeline

We are proposing a 5-year study to gather information on pallid sturgeon use and spawning in the Platte River system with field work beginning during spring 2022. This project will include four years of intensive field data collection efforts. Telemetry data verification, genetic lab-sample processing, and data analyses are anticipated to be time consuming and continue into a fifth year. Therefore, we will follow the field-data collection years with one additional year to allow time for final data analyses, results synthesis, completion of genetic results, and composing the final report.

Included in the study is support for one Ph.D. student and two M.S. students (in consecutive sequence). Specific graduate project descriptions will be developed with input from Platte River Recovery Implementation Program (PRRIP) Executive Director's Office (EDO) staff where appropriate and we will investigate the potential for Dr. Malinda Henry to serve on the graduate committee for students. Timelines for data collection, analyses, and summarization (Table 3) and graduate student timelines (Table 4) are below. Years are divided into quarters to highlight specific activities at approximate times throughout the project timeline (Table 3; Table 4).

Table 3. Proposed project timeline. All field-related activities indicate an ***approximate period*** of the indicated activity and will actually be conducted when specific timing is appropriate and as dictated by water conditions and fish availability.

Task	2022	2023	2024	2025	2026
Hire personnel					
Acquire telemetry and sample equipment					
Deploy/replace listening stations					
Fish collection and transmitter implantation					
Active Tracking (all fish)					
Active Tracking (reproductively ready adults)					
Passive Tracking Listening station downloads					
Free embryo and exogenous feeding sampling					
Data processing (QA/QC)					
Data analyses (interim and preliminary)					
Annual summary/report					
Student dissertation/theses completion					
Final Report analyses and preparation					

Table 4. Tentative student timeline

Student	2022	2023	2024	2025	2026
Ph.D.					
MS					
MS					

We recognize this study has substantial complexity related to timing and allocation of effort. Logistical constraints tied to boat availability, safe sampling conditions, fish availability, etc. can alter plans as we have presented them here. However, we have collectively accrued over 60 years of river sampling experience and over 20 years of experience coordinating and conducting telemetry projects in riverine conditions across North America. Additionally, the NGPC Missouri River Program's staff has extensive telemetry experience in the mainstem Missouri River and will be available for training and logistical knowledge/support consultation at all times. This expertise has given us a solid foundation and insight into how to successfully adapt to real-time conditions to meet project objectives. While we cannot anticipate every situation that may require a contingency plan, we do have a prioritization process in place. The below highlights that prioritization in terms of data collection priorities. This prioritization is most poignant during the spawning season and embryo collection phases of the project when all crews will be actively conducting field work.

Spawning/embryo sampling time period prioritization

Intensive telemetry of reproductively active adults will be our highest priority when we have such within the system. Females will be ranked higher than males and will take top priority. Correspondingly, attempts to collect embryos immediately following an indication of spawning will be coupled with the intensive tracking as a logical next step and top priority. Intensive tracking is very time consuming, requiring non-traditional working hours and days. Monthly searches for all juveniles or non-reproductively active adults will be deferred to the passive tracking network during this time if both crews are dedicated to intensive tracking. If reproductive fish are limited or not available in a given year, focus on the juvenile and non-reproductive fish movements and habitat use will be the main priority.

Communications and Coordination with PRRIP

We envision regular formal and informal communications and coordination with PRRIP EDO staff and other facets of the PRRIP throughout this study. Examples of these efforts could include, but are not limited to, monthly updates/discussions on field sampling and progress toward meeting objectives, updates on data analyses and their results, and presentation(s) of interim study progress and results at PRRIP-led meetings. We also anticipate technical and public presentations of our results at scientific conferences, public media outlets (as requested), and lay presentations to the general public (as requested) by the students and PIs.

Deliverables

In addition to items delivered as part of our regular communications listed above, we anticipate providing the following written documents: 1) Annual reports (by December of each year starting 2022), 2) 2 M.S. Theses, 3) 1 Ph.D. Dissertation, and a final report to supplement documents developed during the interim upon project completion. We will also publish results of our findings in peer-reviewed, scientific journals.

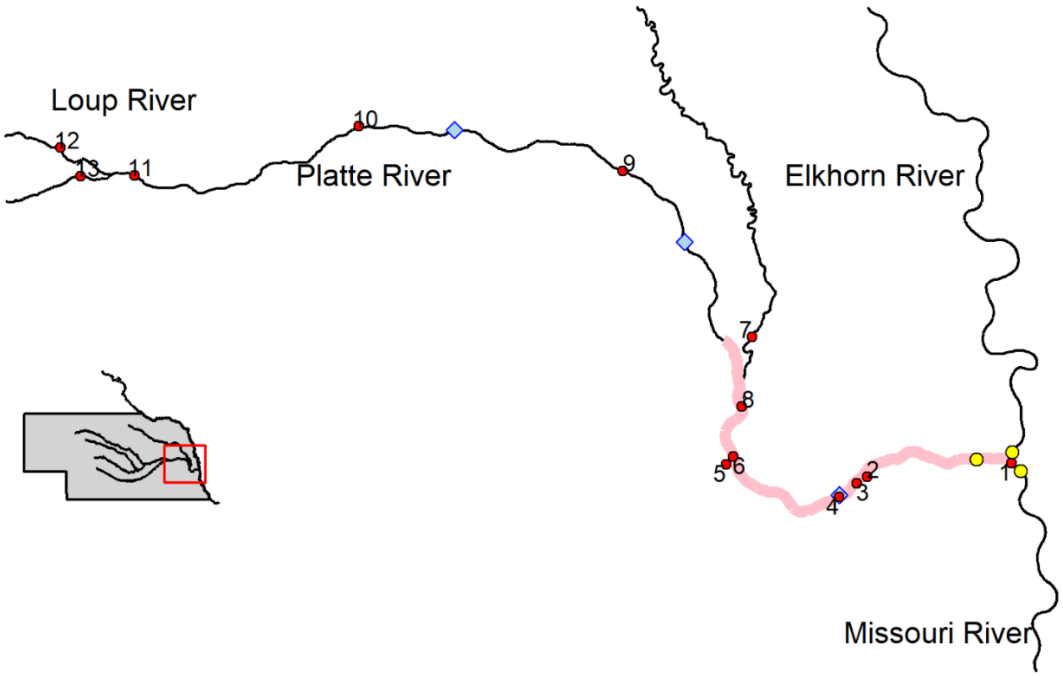

Figure 1. Rivers where Pallid Sturgeon will be tracked during the course of the proposed study. Potential listening station locations in lower Platte River are represented by red dots. The locations of USGS gaging stations are represented by blue triangles. The section of the lower Platte River where sampling for Pallid Sturgeon will occur initially is represented by a solid pink line. The locations where free embryo/larval drift samples are initially proposed are indicated by yellow circles. Some listening station areas will likely require >1 receiver to detect fish across width of river due to limited "line of sight" detection from channel braiding (refer to Table 2).

EXHIBIT "B"
SCOPE OF WORK

The research proposed in Exhibit A was designed as a collaboration between UNL and NGPC, with Kirk Steffensen at NGPC serving as the collaborator at NGPC. NGPC is not a party to this agreement but their role is described in the scope of work below. This project also relies on genetic sample analyses to be completed by Southern Illinois University (SIU). SIU is not party to this agreement but their role in genetic sample analysis is described in the scope of work below.

It is anticipated that monitoring, sampling, and analysis may evolve as learning during the course of the project dictates.

TASK: COMMUNICATION AND COORDINATION

Objective: Develop a system of information exchange among Program Technical Point of Contact, UNL/NGPC, and SIU through which information, data, and samples are exchanged in a timely manner to facilitate successful achievement of collaborative research objectives and provide information for Program planning, management, and decision-making.

Key Understandings

- ED Office takes an active collaborative role in research.
- Project requires communication and coordination between ED Office, UNL/NGPC and SIU which will be processing genetic samples in the lower Platte.

Key Activities

- Pre-season (Jan-Feb) planning and post-season (Sep - Oct) wrap up meetings involving Program Technical Point of Contact, UNL/NGPC and SIU principal investigators, graduate students, and technical staff.
- Collaborative development of prioritization guidelines for tagging, genetic sampling, genetic analyses, and close coordination between the two projects to provide timely feedback to guide efforts.
- Regular phone call/virtual platform/email updates among parties
- Attend and participate in Program-led meetings as necessary.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will participate in pre-season (Jan-Feb) planning and post-season (Sep - Oct) wrap up meetings involving Program Technical Point of Contact and SIU principal investigators, graduate students, and technical staff.
- UNL/NGPC will engage in regular formal and informal communication and coordination with the Program's Technical Point of Contact, ED Office, and Program committees to keep them informed of progress toward and potential impediments to achieving Program objectives.
- UNL will facilitate the process required for Dr. Malinda Henry to serve on graduate student committees.

Program Collaborative Expectations

- The Program's Technical Point of Contact will schedule, organize, lead, and document formal and informal coordination meetings between UNL/NGPC, SIU, and the ED Office.
- ED Office Technical Point of Contact will schedule and engage in regular phone call/virtual platform/email updates
- ED Office Technical Point of Contact will schedule, organize, and lead Program meetings as necessary
- Program Technical Point of Contact will serve as a member of graduate student advisory committees to help tie student theses/dissertation research to Program objectives.

TASK: SUPERVISION AND TRAINING OF STUDENTS AND TECHNICAL STAFF

Objective: Ensure the proper training and supervision of students and technical staff is provided prior to and during the course of the proposed scope of work to facilitate accurate and efficient data collection that contributes toward the achievement of Program objectives.

Key Understandings

- Students and technical staff must be adequately trained to perform their duties in a manner that safely, efficiently, and effectively contributes to attainment of the research objectives.
- Training and supervising graduate students and technical staff is the responsibility of the Principal Investigators.
- Graduate students and technical staff on crews one and two will be exclusively dedicated to this research effort. The potential third crew doing larval sampling will be exclusive when this work is needed but will not be employed year round by this project as per the budget.

Key Activities

- Training in field methods involved in pallid sturgeon passive and active tracking, capture, identification, and tagging.
- Training in field methods involved in collection and initial identification ("picking") of Acipenseriformes young of the year.
- Training in the collection of habitat data.
- Training in proper surgical methods and oocyte extraction (training provided by USGS).
- Training in the appropriate collection, documentation, processing, and storage of genetic samples for sequencing.
- Introduction of students to past and present accumulated learning about pallid/shovelnose sturgeon, methods for sequencing and analyzing sequence data for genotyping, and applications to recovery of the species.

UNL/NGPC Collaborative Expectations

- UNL will select graduate students for participation in the proposed research.
- UNL/NGPC will provide the appropriate training, support, and supervision of graduate students and technical staff.

- UNL will notify the Program immediately if a change in supported graduate student or technical staff is necessary and justify the change in personnel.

Program Collaborative Expectations

- ED Office will review the training and credentials of UNL selected graduate students and technical staff to assist in ensuring they are appropriately prepared for implementation of the research proposed.

TASK: ADULT AND JUVENILE PALLID STURGEON COLLECTION

Objective: Collect and implant transmitters in as many pallid sturgeon (PS) as possible during safe environmental conditions.

Key Understandings

- Researchers will be properly trained and follow established fish collection and implantation protocols required under UNL's Federal Endangered Species Collectors Permit.
- Anticipate implanting acoustic transmitters a minimum of 40 PS individuals and up to 80 individuals in the first three years of the project with an emphasis on implanting reproductive females.
- Male and juvenile PS will also be implanted with transmitters to increase sample size and provide insights to non-spawning behavior.

Key Activities

- Collection of pallid sturgeon during March – May of project years 1 through 3. Sampling effort focused on the reach below the Elkhorn River at locations known to hold pallid sturgeon.
- Year 1 will focus on capture and transmitter placement.
- Years 2-3 will focus largely on tracking. However, additional transmitters will be placed as available as early in the year as possible to ensure crews are available for active tracking when adults are moving to spawn.
- Two crews will set 10 – 20 trotlines per day with a maximum set time of 24 hours.
- Micro- and meso-scale habitat parameters will be collected at each gear deployment/capture location.
- Putative PS will be visually identified based on morphologic features and implanted with a PIT tag (if not previously tagged).
- Data from PIT tags will be read by handheld devices and recorded**.**
- Putative PS will be prioritized for transmitter implantation in the following order: adult females are top priority, followed by adult males, then any juveniles.
- Transmitters (models described in Exhibit A) will be surgically implanted into the body cavity of PS and a post-operative injection of antibiotics will be administered.
- Gender identification and reproductive evaluations for adults will be assessed during the implantation process where possible.

- A fin clip will be collected from all fish identified in the field as putative pallid sturgeon or suspected hybrids and preserved for genetic identification.
- Fin clip samples from all putative PS and suspected hybrids will be shipped to SIU for genetic analysis using appropriate protocols that will be developed in cooperation with SIU. Metadata associated with sample collection will accompany each sample.
- Collection of discharge data from nearest USGS stream gage station.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will be responsible for all aspects of this task.

SIU Collaborative Expectations

- SIU will be responsible for genetic analysis of fin clips to identify fish as PS, shovelnose or hybrids.

Program Collaborative Expectations

- N/A

TASK: PASSIVE TELEMETRY NETWORK INSTALLATION AND MAINTENANCE

Objective: Establish and maintain a passive telemetry network that will allow tracking of PS movements in the lower Platte and selected tributaries. Passive telemetry will support active tracking efforts and provide information on PS movement patterns in relation to general environmental conditions.

Key Understandings

- 21 listening stations will be placed to develop a passive telemetry network extending from the Missouri River confluence to the Loup River confluence.
- Listening stations will be placed along the main channel of the Platte and along select tributaries potentially including Salt Creek, the Elkhorn River and the Loup River.
- Receivers will remain in place year-round except in situations where ice flow or other conditions could endanger the receivers.

Key Activities

- Preliminary telemetry network locations will be established using GIS and each location will be visited to determine if access and line of sight requirements are met.
- Telemetry equipment (VR2Tx receivers) will be acquired and installed in early 2022, prior to collection and implantation of PS.
- Network locations will be visited a minimum of quarterly to ensure operability and download data. Defective units will be replaced as necessary.

- Specific receivers will be targeted for more frequent download based upon last known locations from extensive and active tracking to provide data on directionality of movement and assist in locating fish.
- Additional telemetry stations may be installed at new locations if needed based on PS movements and/or active telemetry results.
- Stations may be removed during the winter months if susceptible to river ice damage or other physical threats.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will be responsible for siting, installing, downloading data, and maintaining the passive telemetry stations.

Program Collaborative Expectations

- N/A

TASK: EXTENSIVE ACTIVE TRACKING

Objective: Extensive tracking of implanted PS outside of the spawning season (Jan – Mar and Jul – Dec) to locate fish locations and collect micro- and meso-habitat measurements at each location.

Key Understandings

- One field crew will primarily conduct extensive tracking throughout non-spawning months.
- Tracking will occur monthly as conditions allow via airboat (most commonly) using hydrophones to locate fish. PS implanted as part of this study will be tracked as well as PS implanted by the Missouri River Program.
- Search effort will be systematic, starting in the lower segment of the river and radiating upstream and into tributaries as indicated by observed fish behavior and/or passive telemetry.

Key Activities

- Systematic monthly searches by airboat (most commonly) using InnovaSeaVR100 deck box hydrophones to locate implanted PS.
- Collection of meso-habitat measures in the general location area and micro-habitat measures as close as possible to the PS location.
- Collection of side-scan sonar image of PS location when environmental conditions permit.
- Collection of discharge data from nearest USGS stream gage station.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will be responsible for all aspects of this task.

Program Collaborative Expectations

- N/A

TASK: INTENSIVE ACTIVE TRACKING DURING SPAWNING

Objective: Intensive tracking of implanted reproductively ready PS during the spawning season (generally Apr - May) to follow fish, locate potential spawning locations, document spawning behavior, and collect micro- and meso-habitat measurements at each location.

Key Understandings

- Two field crews will conduct active tracking daily during the spawning period.
- Tracking will occur via airboat (most commonly) using hydrophones to locate fish. PS implanted as part of this study will be tracked as well as PS implanted by the Missouri River Program/NGPC PSPAP.
- Habitat information will be recorded at potential spawning locations.
- Following spawning, crews will attempt recapture to determine if the individual successfully spawned.
- Crew will also attempt to capture free embryos in general spawning areas.

Key Activities

- Systematic daily searches by airboat (most commonly) using InnovaSeaVR100 deck box hydrophones to locate and track implanted reproductively ready PS on 15 to 60 minute time scale.
- Collection of meso-habitat measures in suspected spawning areas and micro-habitat measures as close as possible to PS spawning locations.
- Collection of side-scan sonar image of PS spawning locations when environmental conditions permit.
- Collection of discharge data from nearest USGS stream gage station.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will be responsible for all aspects of this task.

Program Collaborative Expectations

- N/A

TASK: YOUNG-OF-YEAR PS COLLECTION

Objective: Verify successful PS spawning via collection of free embryos, larvae, and exogenous feeding individuals in the lower Platte River and/or its tributaries.

Key Understandings

- Intensive tracking crews will conduct sampling downstream of suspected spawning locations via airboat (most commonly).
- Systematic sampling will also occur on the Platte and Missouri Rivers near the confluence to document relative abundance of PS larvae from the Platte and Missouri.
- Sturgeon/paddlefish larvae will be preserved and submitted to SIU for species identification.
- A temporary third field crew will be used as necessary to conduct free embryo, larvae, and exogenous feeding young of the year surveys at the confluence with the Missouri River.

Key Activities

- Deployment of ichthyoplankton netting downstream of suspected Platte River spawning locations beginning 3 days post-spawning and continuing for 5 to 7 days depending on the number of larvae being collected. Three replicate samples will be collected at each site at a minimum of five times per day.
- Weekly ichthyoplankton net sampling during May and June near the mouth of the Platte River and in the Missouri River upstream and downstream of the Platte River confluence. Sampling will be transect based and include collection of samples at three locations along each transect.
- All samples will be immediately screened to identify paddlefish/sturgeon individuals. Acipenseriformes individuals will be immediately preserved in 70% ethanol and submitted to SIU for genetic identification along with associated sample metadata. Paddlefish will be eliminated through alternative means of genotyping, whereas sturgeon will be identified using the proposed SNP markers and GT-seq technology proposed by SIU.

UNL/NGPC Collaborative Expectations

- UNL/NGPC will be responsible for all aspects of this task.

Program Collaborative Expectations

- N/A

TASK: DATA ANALYSIS

Objective: With input from all parties including UNL, NGPC and ED Office, collaboratively develop and utilize methods for data analysis that are deemed appropriate for the data collected, achieve research objectives, and are reflected in the current published literature.

Key Understandings

- Years 1 – 4 will primarily be devoted to data collection with some data analysis occurring, especially as related to completion of student dissertations/theses.
- Genotyping results within the SIU scope of work will be provided to UNL/NGPC in a timely manner to facilitate the field component of this research.
- The Program ED Office has special expertise in hydrology, hydraulics and fluvial geomorphology.
- Program ED Office (together with Program Independent Scientific Advisory Committee (ISAC)) will take an active part, together with UNL/NGPC principal investigators, graduate students and technical staff in evaluating data analysis methods and developing alternatives as appropriate.

Key Activities

- Maintaining accurate and up to date sample and results databases
- Review of the literature to assess data analysis options for similar datasets and questions
- Exercises utilizing similar datasets to evaluate alternative methods of analysis
- Meetings to present, review, and discuss data analysis methods proposed and alternatives

UNL/NGPC Collaborative Expectations

- UNL will conduct a thorough literature review documenting the use of proposed data analysis methods and propose potential alternatives.
- UNL will remain up to date with current analytical methods relevant to the proposed scope of work.
- UNL will be responsive to ED Office and ISAC suggestions to reach a consensus on data analysis.
- UNL will provide the results of data analysis reviews to the ED Office Technical Point of Contact in the form of published articles, R code, exemplary datasets, etc. for review.

Program Collaborative Expectations

- ED Office with input from ISAC, will review suggested data analysis options presented by UNL in the form of published articles, R code, exemplary datasets, etc.
- ED Office will organize, participate in, and document the pre-project meeting and periodic update meetings to discuss data analysis methods.
- ED Office will be responsive to UNL suggestions to reach a consensus on data analysis.

TASK: DATA USE, REPORTING OF RESULTS AND WORK PRODUCTS

Objective: Establish joint ownership of all information, data, and samples generated from the proposed scope of work; establish guidelines for data sharing, publication, and use of data for other work; and define required work products under contractual obligation.

Key Understandings

- Data and genetic samples collected under this contract are jointly owned by the Program, UNL/NGPC, and SIU. As such, the use of these samples or resulting data by the Program, UNL/NGPC, and SIU (genetics) for publication and related work by the any party must be conducted with full disclosure and coordination.
- Authorship and order of authorship of published and presented works will be decided with consensus by all involved parties including SIU, UNL/NGPC and ED Office, except in the case of academic theses and dissertations when the graduate student is the sole author.

Key Activities

- Development and maintenance of a cumulative results database
- Development of annual and final reports to the Program that address the objectives specified in the research proposal
- Development of two MS theses and a PhD dissertation
- Development of manuscripts to be published in peer-reviewed journals
- Participation in scientific/academic meetings including the Program's annual Adaptive Management Reporting Session

UNL/NGPC Collaborative Expectations

- UNL/NGPC will provide written annual progress reports to the program and a final report describing methods, results, accomplishments, and interpretations relative to Program objectives.
- Annual reports will be submitted by December 1 of each year.
- The final report will be submitted prior to the termination date of the contract.
- UNL/NGPC will consult with the Program's Technical Point of Contact to review manuscripts, including theses and dissertations, developed using work products associated with this Contract.
- UNL/NGPC will participate in the Program's annual Adaptive Management Reporting Session.

Program Collaborative Expectations

- The ED Office will examine all data, reports and other work products presented by UNL/NGPC within 30 days and render in writing whether the submitted work product is acceptable in terms of relevance to addressing Program objectives, amount of information and detail provided, progress made in attaining objectives, and use of appropriate analytical techniques given the data available.
- Manuscripts, including theses and dissertations, prepared for publication by UNL/NGPC will be reviewed by the Program within 30 days of receipt of the manuscript.

EXHIBIT "C"
PROJECT BUDGET

CATEGORY	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Labor						
PhD Student	$ 30,000	$ 30,900	$ 31,827	$ 32,782	$ 33,765	$ 159,274
Masters Student	$ 25,000	$ 25,750	$ 26,523	$ 27,318	$ 28,138	$ 132,728
Research Associate	$ 7,000	$ 7,210	$ 7,426	$ 7,649	$ -	$ 29,285
Field Technicians	$ 22,560	23,237	23,934	24,652	14,046	$ 108,429
Labor Subtotal	*$ 84,560*	*$ 87,097*	*$ 89,710*	*$ 92,401*	*$ 75,949*	*$ 429,717*
Fringe Benefits	$ 8,356	$ 9,106	$ 9,938	$ 10,864	$ 8,740	$ 47,004
Tuition Remission	$ 20,460	$ 21,278	$ 22,130	$ 23,014	$ 23,936	$ 110,818
Facilities and Admin*	$ 24,158	$ 25,013	$ 25,908	$ 26,849	$ 22,019	$ 123,947
Total Labor Costs	***$ 137,534***	***$ 142,494***	***$ 147,686***	***$ 153,128***	***$ 130,645***	***$ 711,486***
Expenses						
Equipment	$ 74,000	$ -	$ -	$ -	$ -	$ 74,000
Travel	$ 23,740	$ 24,452	$ 25,186	$ 25,941	$ 9,432	$ 108,751
Supplies	$ 15,000	$ 10,000	$ 5,000	$ 5,000	$ 5,000	$ 40,000
Other	$ 102,500	$ 44,500	$ 23,000	$ 3,000	$ 1,500	$ 174,500
Rent	$ 2,000	$ 2,000	$ 2,000	$ 2,000	$ -	$ 8,000
Facilities and Admin**	$ 36,722	$ 20,528	$ 13,828	$ 8,825	$ 4,142	$ 84,045
Total Expenses	***$ 253,962***	***$ 101,480***	***$ 69,014***	***$ 44,766***	***$ 20,074***	***$ 489,296***
TOTAL BUDGET	**$ 391,497**	**$ 243,973**	**$ 216,700**	**$ 197,894**	**$ 150,719**	**$ 1,200,783**

*26% of Labor Subtotal & Fringe Benefits

**26% of Travel, Supplies, and Other

Budget Comments

The total project cost is $1,200,783 broken down to $711,486 in labor costs and $489,296 in expenses. Unless otherwise noted, budget amounts below are for Year 1 of the project.

Facilities and Administrative (F&A) costs, sometimes referred to as indirect costs, are costs incurred for common or joint objectives and therefore are not readily identifiable with a particular sponsored project, an instructional activity, or any other institutional activity. Facilities costs include, but are not limited to, utilities, custodial services, plant operations such as heating and cooling services, and maintenance expenses. Administrative costs include, but are not limited to, payroll and accounting services, office supplies, departmental administration, procurement services, library services and sponsored projects administration. F&A costs are charged at a rate of 26% of eligible labor and expense categories.

Labor ($711,486)

- Project supports 1 PhD student ($30,000/yr.) and 2 consecutive M.S. students ($25,000/yr.) plus tuition remission and benefits for each.

- Two additional field technicians to assist the graduate students will be hired seasonally. All seasonal technicians will be hired at a starting hourly rate of $12/hr. Duration of employment for each season technician will be:
    - Technician 1 at 1,040 hours ($12,480) annually during years 1-4 to facilitate field planning, preparation, data collection, and sample processing). This technician will be used to assist with project completion (e.g., data entry, final lab sample processing, etc.) in year 5.
    - Technician 2 at 520 hours ($6,240) annually during years 1-4 will be used to complete field work as part of the two-crew telemetry effort.

- A short-term, third crew will be used for larval sampling at the Platte River confluence only. This crew will consist of one research associate and one field technician.
    - The research associate is currently on staff at UNL and time can be allocated to larval sampling before field work on other projects begins each year. The budget includes 2 months ($7,000) of the associate's time to lead this effort during years 1-4.
    - Technician 3 at 320 hours ($3,840) during years 1-4 will be used to complete field sampling and processing larval fish data collections.

Expenses ($489,296)

Travel

- Current budget puts 1 crew in the field during winter and early spring (January - March) and late summer - winter (August through December) as conditions allow. We will use 2-3 field crews on the river during spring and summer (late March - July). Crew 1 would initially include the PhD student and 1 M.S. student when the hourly technicians are not available. The graduate students will then lead their independent crews during May through July. Travel expenses largely cover vehicle rental, mileage, and fuel per the UNL currently published rates for ¾-ton trucks that can pull airboats (e.g., current rate is $500/month plus $0.29 per mile above 1,110 miles per month and actual fuel costs) and travel to meetings with PRIPP EDO as needed.
    - Crew 1 would focus on passive telemetry setup, fish collection, transmitter implantation, active tracking to document spawning and support free embryo sampling and habitat associations.

- Crew 2 would focus on active tracking to document spawning and support free embryo sampling and habitat associations.
- Crew 3 will be used to sample embryos and larvae at the confluence of the Platte River with the Missouri River when Crews 1 & 2 are engaged in intensive, active tracking during and following spawning events.

Equipment

The University of Nebraska-Lincoln's policy is that any single item over $5,000 is inventoried equipment. The following identifies equipment needs for this project.

- Four (4) VR-100 receivers ($10,000 each X 4 = $40,000), including omnidirectional and directional hydrophones, to support active tracking for both field crews. Two receivers per crew are needed to simultaneously operate the omnidirectional and directional hydrophones and is consistent with Missouri River Pallid Sturgeon telemetry protocols that are currently in use.

- Two (2) multi-probe sensors ($9,000 each X 2 = $18,000) to assess water quality parameters (e.g., temperature, dissolved Oxygen, Conductivity, etc.) to support active tracking for both field crews.

- Two (2) flow meters ($8,000 each X 2 = $16,000) to measure water velocity at fish locations in support active tracking for both field crews.

Supplies + Other

The University of Nebraska-Lincoln lists individual items under $5,000 as supplies or other items. Specific breakdowns of those items are:

- Supplies for field work and sample collection ($40,000) include fuel for 2-3 boats, rope, ichthyoplankton nets, surgical supplies, etc.

- Other
  - Listening Stations ($75,000) – VR-X2Tx receivers (30 X $2,500 each and includes supplies needed to deploy the receiver like anchors, weighted base, bridge bolts, etc.)
  - Transmitters ($80,000) – V16TP and V13TP transmitters with Temperature and Pressure (Depth) sensors ($1000 each X up to 80 transmitters).
  - Computers and software ($10,500) - Field rugged laptops (e.g., Toughbooks; $4,500 each x 2 = $9,000) and software (e.g., ArcView, InnnovaSea dedicated telemetry data, etc.; $1,500) for data entry and receiver download data collection.

- Temperature loggers ($6,000) – 30 data loggers will be purchased ($200 each) to monitor temperature conditions in specific habitats during spawning and other key time periods.
- Publication/printing ($3,000) – Costs incurred for printing and publication fees for reports, publications, etc.

Rent

- The University of Nebraska-Lincoln does not currently have sufficient space to store large boats and sampling equipment. We currently rent commercial storage space with annual rent currently at about $40,000. The university has partially subsidized commercial storage space ($15,000 per year), but a consortium of four researchers (Pegg and Spurgeon are 2 of the 4) pay the remainder plus utilities. The $2000 per year supports airboat/gear storage for this project in a secured location and is prorated to reflect current use and space allocations relevant to this project.

EXHIBIT "D"

Certification Regarding Lobbying

The undersigned certifies, on behalf of Contractor, that to the best of his or her knowledge and belief:

1. No federal appropriated funds have been paid or will be paid, by or on behalf of Contractor, to any person for influencing or attempting to influence an officer or employee of any federal agency, a 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, or the extension, continuation, renewal, amendment, or modification of any federal contract, grant, loan, or cooperative agreement.

2. No registrant under the Lobbying Disclosure Act of 1995 has made any lobbying contacts on behalf of the Contractor with respect to the federal grant or cooperative agreement under which the Contractor is receiving monies.

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 section 1352, title 31, U.S. Code. Any person who makes an expenditure prohibited by Section 1 above or who fails to file or amend the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

BOARD OF REGENTS OF THE UNIVERSITY OF NEBRASKA ("CONTRACTOR")

By:

_____ _____

David B. Doty

Date