



Michigan Department of Natural Resources – Procurement Services
P.O. Box 30028, Lansing, MI 48909
OR
525 W. Allegan, Lansing, MI 48933

CHANGE NOTICE NO. 02 TO CONTRACT NO. 751B4300036
Between
STATE OF MICHIGAN
and

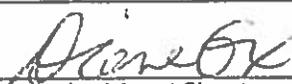
Required by authority of 1984 PA 431, as amended.

Name and Address of Contractor Michigan State University Office of Sponsored Programs 426 Auditorium Rd., Rm 2 301 Administration Bldg Lansing, MI 48824-2601	Primary Contact Diane Cox	
	Email coxd@osp.msu.edu	
	Telephone (517) 884-4243	Contractor #, Mail Code *****5984/283

State Contact	Agency	Name	Telephone	Email
Contract Compliance Inspector	DNR	Marisa Lay	(517) 284-5837	laym@michigan.gov
Buyer	DNR	Lisa VanOstran	(517) 284-5975	vanostranl@michigan.gov

Initial Contract Summary			
Description (Provide a basic but comprehensive description of services) Behavior of Juvenile Lake Sturgeon Stocked above a Hydropower Dam			
Effective Date 6/1/2014	Initial Expiration Date 12/31/2017	Initial Available Options 2 - 1 year option	Current Expiration Date 12/31/2018
Payment Terms Net 45	F.O.B. N/A	Shipped N/A	Shipped From N/A
Minimum Delivery Requirements N/A		Alternate Payment Options <input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV)	Available to MiDeal Participants <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Description of Change Notice			
Option Exercised: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No If Yes, New Expiration Date: _____			
Provide the detail of the Change Notice Re-allocate unspent funds from F2015 to FY2016 per revised budget attached. Change contract compliance inspector in section I-C to: Marisa Lay Financial Analyst, Fisheries Division 525 W. Allegan St Lansing, MI 48933 Phone: 517-284-5837 Email: laym@michigan.gov			
Value/Cost of Change Notice \$0.00		Estimated Revised Aggregate Contract Value \$472,361.00	

FOR THE CONTRACTOR:

Michigan State University

Authorized Agent Signature
Diane Cox, Manager *no*
Authorized Agent (Print or Type)
3 Mar 2016
Date

FOR THE STATE:

Department of Natural Resources

Authorized Buyer Signature
Laura Gyorkos, Purchasing Manager
Authorized Buyer (Print or Type)
3/3/16
Date

Attachment A – Budget

Year 3 of 5 years – FY2016

EXPENSE CATEGORY	Project Costs
Salaries	\$36,946.00
Ph.D. Student	\$20,946.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$16,000.00
Benefits	\$16,086.00
Ph.D. Student	\$14,862.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ 1,224.00
Supplies & Materials (MSU retains after study)	\$47,728.81
Misc. supplies (field)	\$14,378.81
Vemco remote sonic receivers	\$ 2,000.00
PIT Tag implants and receivers	\$10,000.00
full duplex antenna arrays	\$ 5,000.00
lab supplies	\$ 8,350.00
Fish food (brine shrimp and blood worms)	\$ 8,000.00
Other Direct Expenses	\$20,150.00
per-diem (6 mo)	\$ 4,000.00
housing (6 mo)	\$ 8,000.00
vehicle	\$ 4,000.00
meetings	\$ 2,000.00
publication costs	\$ 2,150.00
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$120,910.81



Michigan Department of Natural Resources – Procurement Services
 P.O. Box 30028, Lansing, MI 48909
 OR
 525 W. Allegan, Lansing, MI 48933

CHANGE NOTICE NO. 01 TO CONTRACT NO. 751B4300036
Between
STATE OF MICHIGAN
and

Required by authority of 1984 PA 431, as amended.

Name and Address of Contractor Michigan State University Office of Sponsored Programs 426 Auditorium Rd., Rm 2 301 Administration Bldg Lansing, MI 48824-2601	Primary Contact Diane Cox	
	Email coxd@osp.msu.edu	
	Telephone (517) 884-4243	Contractor #, Mail Code *****5984/283

State Contact	Agency	Name	Telephone	Email
Contract Compliance Inspector	DNR	Marlene Sublet-Smith	(517)284-5837	SubletSmithM@michigan.gov
Buyer	DNR	Jana Harding-Bishop	(517)284-5938	HardingJ3@michigan.gov

Initial Contract Summary

Description (Provide a basic but comprehensive description of services) Behavior of Juvenile Lake Sturgeon Stocked above a Hydropower Dam			
Effective Date 6/1/2014	Initial Expiration Date 12/31/2017	Initial Available Options 2 - 1 year option	Current Expiration Date 12/31/2017
Payment Terms Net 45	F.O.B. N/A	Shipped N/A	Shipped From N/A
Minimum Delivery Requirements N/A		Alternate Payment Options <input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV)	Available to MiDeal Participants <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

Description of Change Notice

Option Exercised: <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	If Yes, New Expiration Date: <u>12/31/2018</u>
Provide the detail of the Change Notice Per Change Notice 001 attached: Extend end date of contract to 12/31/2018 and revise language in Section I-F Change language in sections I-H and I-R to reflect change from fixed price to cost reimbursable Revise budgets and add year 5	
Value/Cost of Change Notice \$0.00	Estimated Revised Aggregate Contract Value \$472,361.00

FOR THE CONTRACTOR:

Michigan State University

On-file in DNR Procurement

Authorized Agent Signature

Diane Cox, Manager

Authorized Agent (Print or Type)

7/23/14

Date

FOR THE STATE:

Department of Natural Resources

On-file in DNR Procurement

Authorized Buyer Signature

Joe Frick, Asst Chief, FOD

Authorized Buyer (Print or Type)

7/23/14

Date

CHANGE AUTHORIZATION REQUEST

Contract No. 751B4300036

Change Authorization Request No. 01

I. General

This Change Authorization Request is subject to all terms and conditions of the subject contract between Michigan State University and the State of Michigan. Except as expressly specified herein, all terms and conditions of the Contract shall remain in full force and effect upon execution of this request.

II. Description of Change

1. Revise End date of the contract from 12/31/2017 to 12/31/2018 and change language in section I-F # 7 to reflect the revised end date.

I-F TASKS AND DELIVERABLES

Michigan State University will:

Current Language

- 7) Provide progress reports twice each year (July 1 and January 1). Additionally, on or before 12/31/2017, submit a FINAL REPORT to the DNR contract administrator addressing completion of the activities described.

Revised Language

- 7) Provide progress reports twice each year (July 1 and January 1). Additionally, on or before 12/31/2018, submit a FINAL REPORT to the DNR contract administrator addressing completion of the activities described.

2. Change Language in Sections I-H (PRICE PROPOSAL) and I-R (ACCOUNTING RECORDS) to reflect the change from fixed cost to cost reimbursable.

I-H PRICE PROPOSAL

Current Language

This is a fixed price contract, and Contractor may invoice at the end of each fiscal quarter (December 31, March 31, June 30, and September 30) for 25% of the annual DNR contribution to the study (the contract cost). Contractor's fiscal contribution to this study (20%) is the waiver of normal overhead charges per the Agreement between MSU and DNR, executed in 2013.

For FY2014 the Contractor may bill 100% of costs on September 30, 2014 if deliverables are on schedule.

Revised Language

This is a cost reimbursable contract. Contractor must bill at a minimum annually and at the end of each budget period (September 30) for actual costs incurred. The Contractor must include with each reimbursement request the Operating Statement-FIN049 showing costs incurred during the billing period.

I-R ACCOUNTING RECORDS

Current Language:

The Contractor will be required to maintain project records pertaining to Appendix A 'Work Statement' for three (3) years from the expiration date of this contract, which access shall be made available to the State upon reasonable notice to Contractor.

Revised Language:

The Contractor will be required to maintain all project records, including but not limited to invoices, hours expended, cancelled checks, etc... which support each reimbursement request (Operating Statement-FIN049) under this contract for three (3) years from the expiration date of this contract. This level of detail shall be made available to the State within 30 days' notice to Contractor.

III. Costs

No Overall Change – See REVISED Attachment B Budgets for yearly allocations

IV. Impact on Contract (\$ and Schedule)

No overall change to contract amount – revised yearly budget

Revise end date of contract to 12/31/2018

Revise language in Section I-H and I-R to reflect change from fixed cost to cost reimbursable

Attachment A –Budget

Year 1 of 5 years – FY 2014

EXPENSE CATEGORY	Project Costs
Salaries	\$ 15,571.00
Ph.D. Student	\$ 2,400.00
hourly techs (2 people for 6 months),	\$ 9,000.00
lab tech for genotyping (1 month) (Jeannette Kanefsky)	\$ 4,171.00
Benefits	\$ 4,868.00
Ph.D. Student	\$ 2,333.00
Lab tech (1 month)	\$ 1,847.00
hourly techs (2 people for 6 months)	\$ 688.50
Supplies & Materials	\$ 151,266.50
Misc. supplies (field) <i>(MSU retains after study)</i>	\$
Computer <i>(MSU retains after study)</i>	\$ 3,000.00
Vemco remote sonic receivers <i>(DNR retains after study)</i>	\$ 42,666.50
Vemco telemetry receivers (upgrade) <i>(DNR retains after study)</i>	\$ 5,500.00
Vemco telemetry implants <i>(Not recoverable after study)</i>	\$ 30,900.00
split-beam hydroacoustics gear with a GPS <i>(DNR retains after study)</i>	\$
full duplex antenna arrays <i>(DNR retains after study)</i>	\$ 40,000.00
batteries and solar chargers <i>(DNR retains after study)</i>	\$ 10,200.00
lab supplies <i>(MSU retains after study)</i>	\$ 4,000.00
boat, motor, trailer <i>(DNR retains after study)</i>	\$ 15,000.00
Other Direct Expenses	\$ 1,850.00
per-diem (6 mo)	\$
housing (6 mo)	\$
vehicle	\$
meetings	\$
publication costs	\$ 1,850.00
Travel for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 173,556.00

Attachment A –Budget –Cont’d

Year 2 of 5 years – FY2015

EXPENSE CATEGORY	Project Costs
Salaries	\$ 40,247.00
Ph.D. Student	\$ 20,000.00
hourly techs (2 people for 6 months)	\$ 16,000.00
Lab Tech (1 mo) (Jeannette Kanefsky)	\$ 4,247.00
Benefits	\$ 17,202.00
Ph.D. Student	\$ 14,097.00
hourly techs (2 people for 6 months)	\$ 1,881.00
Lab Tech (1 mo) (Jeannette Kanefsky)	\$ 1,224.00
Supplies & Materials	\$ 52,203.50
Misc. supplies (field) (<i>MSU retains after study</i>)	\$ 9,145.00
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ 9,000.00
split-beam hydroacoustics gear with a GPS	\$ 7,000.00
full duplex antenna arrays	\$ 20,525.00
batteries and solar chargers	\$ 283.50
lab supplies (<i>MSU retains after study</i>)	\$ 6,250.00
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 19,500
per-diem (6 mo)	\$ 4,000
housing (6 mo)	\$ 8,000
vehicle	\$ 4,000
meetings	\$ 2,000
publication costs	\$ 1,500
Travel for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 129,152.50

Attachment A –Budget –Cont'd

Year 3 of 5 years – FY2016

EXPENSE CATEGORY	Project Costs
Salaries	\$ 36,946.00
Ph.D. Student	\$ 20,946.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ 16,000.00
Benefits	\$ 16,086.00
Ph.D. Student	\$ 14,862.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ 1,224.00
Supplies & Materials <i>(MSU retains after study)</i>	\$ 17,600.00
Misc. supplies (field)	\$ 9,250.00
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies	\$ 8,350.00
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 20,150.00
per-diem (6 mo)	\$ 4,000.00
housing (6 mo)	\$ 8,000.00
vehicle	\$ 4,000.00
meetings	\$ 2,000.00
publication costs	\$ 2,150.00
Travel costs for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 90,782.00

Attachment A –Budget –Cont’d

Year 4 of 5 years – FY2017

EXPENSE CATEGORY	Project Costs
Salaries	\$ 21,995.00
Ph.D. Student	\$ 21,995.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ -
Salary for PI Baker	
Benefits	\$ 15,483.00
Ph.D. Student	\$ 15,483.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	
Fringe for PI Baker	
Supplies & Materials <i>(MSU retains after study)</i>	\$ 3,195.00
Misc. supplies (field)	\$ -
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies	\$ 3,195.00
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 5,000.00
per-diem (6 mo)	\$ -
housing (6 mo)	\$ -
vehicle	\$ -
meetings	\$ 2,000.00
publication costs	\$ 3,000.00
Travel costs for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 45,673.00

Attachment A –Budget –Cont’d

Year 5 of 5 years – FY2018

EXPENSE CATEGORY	Project Costs
Salaries	\$ 15,473.50
Ph.D. Student	\$ 15,473.50
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ -
Salary for PI Baker	
Benefits	\$ 13,224.00
Ph.D. Student	\$ 13,224.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	
Fringe for PI Baker	
Supplies & Materials <i>(MSU retains after study)</i>	\$ -
Misc. supplies (field)	\$ -
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies	\$ -
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 4,500
per-diem (6 mo)	\$ -
housing (6 mo)	\$ -
vehicle	\$ -
meetings	\$ 1,500
publication costs	\$ 3,000
Travel costs for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 33,197.50



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Required by authority of 1984 PA 431, as amended.

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	Email coxd@osp.msu.edu	
	Telephone (517) 884-4243	Contractor #, Mail Code *****5984/283

State Contact	Agency	Name	Telephone	Email
Contract Compliance Inspector	DNR	Marlene Sublet-Bennett	(517) 284-5837	Sublet-bennettm@michigan.gov
Buyer	DNR	Jana Harding-Bishop	(517) 284-5938	HardingJ3@michigan.gov

Contract Summary			
Description (Provide a basic but comprehensive description of services) Behavior of Juvenile Lake Sturgeon Stocked above a Hydropower Dam			
Initial Term 3 years 7 months	Effective Date June 1, 2014	Initial Expiration Date December 31, 2017	Available Options 3 – 1 year periods
Payment Terms Net 45	F.O.B. N/A	Shipped N/A	Shipped From N/A
Minimum Delivery Requirements N/A	Alternate Payment Options <input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV)		Available to MiDeal Participants <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION: \$472,361.00			



Michigan Department of Natural Resources – Procurement Services
P.O. Box 30028, Lansing, MI 48909
OR
525 W. Allegan, Lansing, MI 48933

CONTRACT NO. 751B4300036

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STATE OF MICHIGAN
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State Contact	Agency	Name	Telephone	Email
Contract Compliance Inspector	DNR	Marlene Sublet-Bennett	(517) 284-5837	Sublet-bennettm@michigan.gov
Buyer	DNR	Jana Harding-Bishop	(517) 284-5938	HardingJ3@michigan.gov

Contract Summary			
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Initial Term 3 years 7 months	Effective Date June 1, 2014	Initial Expiration Date December 31, 2017	Available Options 3 – 1 year periods
Payment Terms Net 45	F.O.B. N/A	Shipped N/A	Shipped From N/A
Minimum Delivery Requirements N/A	Alternate Payment Options <input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV)		Available to MiDeal Participants <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION: \$472,361.00			

THIS IS NOT AN ORDER: Orders for delivery will be issued directly by the Michigan Department of Natural Resources through the issuance of a Purchase Order.

FOR THE CONTRACTOR:

Michigan State University

Firm Name
On-file in DNR Procurement

Authorized Agent Signature
Diane Cox, Manager

Authorized Agent (Print or Type)
6/10/14

Date

FOR THE STATE:

On-file in DNR Procurement

Signature
Joe Frick, Assistant Chief

Name/Title
Financial Services/Procurement

Division/Section
6/10/14

Date

STATE OF MICHIGAN TERMS AND CONDITIONS

I-A PURPOSE

This contract consists of the State of Michigan's (State) terms and conditions and constitutes the complete and exclusive agreement and understanding of the parties as it relates to this transaction. This contract supersedes all proposals, or other prior agreements, and all other communications between the parties relating to this transaction. If there is a conflict between the State's terms and conditions and the Contractor's Proposal, the State's terms and conditions shall take precedence.

The purpose of this contract is to obtain the services of the Department of Fisheries and Wildlife at Michigan State University to conduct research titled: **Behavior of Juvenile Lake Sturgeon Stocked above a Hydropower Dam (MSU #xxxxxx)** in collaboration with Fisheries Division the Michigan Department of Natural Resources (DNR).

I-B ISSUING OFFICE

This contract is issued by the State of Michigan, Department of Natural Resources, Finance and Operations Division (FOD) for Fisheries Division (FD). FOD is the only office authorized to change, modify, amend, alter, clarify, etc., the prices, specifications, terms, and conditions of this contract. All requests for changes, modifications, amendments, etc. must be addressed to:

Jana Harding-Bishop
DNR, FOD
3rd Floor, Constitution Hall
P.O. Box 30028
Lansing, MI 48909
Telephone: (517) 284-5938
Email: hardingj3@michigan.gov

I-C CONTRACT ADMINISTRATOR

Upon receipt of the properly executed contract agreement, it is anticipated that the person named below or any other person so designated be authorized to administer the contract on a day-to-day basis during the term of the contract. However, administration of this contract implies no authority to change, modify, clarify, amend, or otherwise alter the prices, terms, conditions, and specifications of this contract.

The DNR Contract Administrator is: Gary Whelan
Research Program Manager
Department of Natural Resources
Fisheries Division
PO Box 30446
Lansing, MI 48909
Telephone: (517) 284-5840
Email: whelanG@michigan.gov

DNR Project Manager: Ed Baker, Ph.D.
Research Station Manager
Marquette Fisheries Research Station
Michigan Department of Natural Resources
488 Cherry Creek Road
Marquette, MI 49855
Telephone: (906) 249-1611 ext. 309
Email: bakere1@michigan.gov

The MSU Principal Investigator (MSU-PI) for this project is listed below. This person is responsible for the administration and research of the project. The MSU-PI does not have the authority to change, modify, clarify, amend or otherwise alter the prices, terms, conditions and specifications of the contract as that authority is retained by MSU - Office of Sponsored Programs.

Dr. Kim Scribner
Department of Fisheries and Wildlife Services
Michigan State University
2E Natural Resources Building
East Lansing, MI 48824
Telephone: (517) 353-3288
Email: scribne3@msu.edu

Contract Compliance Inspector (CI) named below serves as the DNR day-to-day manager of the awarded contract. Requests to change, modify, amend, alter, or clarify the prices, specifications, terms, or changes, must be addressed to the CI. However, monitoring of the contract implies no authority to change, modify, clarify, amend or otherwise alter the prices, terms, conditions and specifications of the contract as that authority is retained by DNR-Financial Services.

Marlene D. Sublet-Bennett
Financial Analyst, Program Support, Fisheries Division
Constitution Hall, 5th Floor, NE
525 W. Allegan
Lansing, MI 48933
Telephone: (517) 284-5837
Email: [sublet-](mailto:sublet-bennettm@michigan.gov)

bennettm@michigan.gov

I-D PROJECT DESCRIPTION - *“Research Behavior of Juvenile Lake Sturgeon Stocked above a Hydropower Dam”*

Hydropower dams exist on most large Great Lakes tributaries and limit lake sturgeon access to historic spawning and juvenile rearing habitats. Providing lake sturgeon passage (adults upstream and adults and juveniles downstream) is widely believed to be a management action that could improve lake sturgeon rehabilitation in Great Lakes tributaries. Investigations of lake sturgeon behavior, habitat use, duration of reservoir occupancy, and survival in relation to passage at hydropower dams are needed to better inform managers and dam owners of the likelihood of success of efforts to improve fish passage.

Previously in the Black River system we have estimated survival during the larval dispersal period. We also demonstrated differences in survival in stream reaches below the dam as a function of age at release. Similar age and size specific assessments in reservoir habitats above the dams and following passage through the dams if collected from multiple facilities, in multiple years and though periods of different environmental conditions and dam operational levels, will provide managers with information on expected rates of passage and contributions of passed individuals to annual recruitment. Research is also needed to inform design and construction activities to provide for infrastructure that enables quantitative monitoring of fish movements and passage effectiveness such as passive integrated transponder (PIT) antenna arrays, forebay and tail-race collection of larval, juvenile and adult lake sturgeon.

This project will provide insight into the likelihood of success of upstream lake sturgeon passage by evaluating whether young stocked fish (simulating offspring produced by passed adults) continue to pass downstream and through dams or cease downstream movement and reside in reservoir habitat. By monitoring young of the year, yearling, and age 2 lake sturgeon behavior and habitat use in reservoirs and by quantifying conditions that we believe will predict when and at what size juveniles are likely to pass, we will also be able to provide recommendations regarding probabilities of survival

during passage under status quo conditions (i.e., through turbines) or through other downstream passage structures.

I-E OBJECTIVES/GOALS –

The goals of this project are to evaluate hypotheses relative to the behavior of juvenile lake sturgeon stocked above a hydropower dam. The null hypothesis of the proposed research is that juvenile lake sturgeon stocked upstream of a hydropower dam will quickly pass through reservoir habitats that are encountered as the fish migrate downstream (i.e. continue to drift downstream as if in a free flowing river). An alternative hypothesis is that juvenile lake sturgeon residence time in reservoirs will be dictated by the amount and distribution of suitable rearing habitat which will vary by life stage. Under this hypothesis we predict that timing of lake sturgeon larval/juvenile passage would be dictated by age/size-specific habitat use or selectivity relative to availability. Alternatively, timing of passage could be dictated by the seasonal chronology of aquatic macrophyte growth which is expected to increase in area and extent in the reservoir through the spring and summer season.

The results of this research will be applicable across the Great Lakes where lake sturgeon passage is being considered. Information from this research will be disseminated to fisheries managers, natural resources policy makers, and dam owners in the form of bi-annual reports, peer-reviewed publications, talks and seminars at technical symposia and meetings at state and Lake Basin Committee levels and at regional and national fisheries management conferences.

(Exhibit 1, the proposal awarded to the DNR by the Great Lakes Fishery Trust, expounds upon the objectives and goals of this project which are shared tasks between the DNR and MSU.)

I-F TASKS AND DELIVERABLES

Michigan State University will:

- 1) Raise, mark, and stock larval, fall fingerling, age 1, and age 2 lake sturgeon into the Black River system to meet needs of study design. Fish will be marked with uniquely numbered PIT tags. Age 1 and 2 fish will also have sonic transmitters implanted.
- 2) Monitor movement of PIT tagged fish with passive PIT tag antennas deployed across the system.
- 3) Conduct associated research activities to quantify and predict rates of downstream passage and survival of lake sturgeon associated with fish age and size or seasonal or other environmentally (e.g., temperature, precipitation, vegetative cover) mediated timing of movements above and through dams.
- 4) Create detailed maps of river and reservoir habitat using side-scan sonar equipment coupled to high-resolution GPS. Habitat maps will include delineation of substrate types, vegetation and other in-water features (e.g. woody debris), and depths.
- 5) Sample lake sturgeon habitat use in the riverine and reservoir habitats using a combination of active sonar tracking and triangulation, electrofishing gear, and snorkeling/scuba surveys.
- 6) Communicate research findings to the DNR and the broader Great Lakes fishery management community (state, federal, tribal agencies and university collaborators) through publications, web-based updates and public meetings. Additionally, make summaries of databases accessible to stakeholders, resource managers, the general public and K-12 educators, and continue outreach and extension work with regional citizen groups including Sturgeon For Tomorrow, the hydroelectric industry, and management agencies.
- 7) Provide progress reports twice each year (**July 1** and **January 1**). Additionally, on or before 12/31/2017, submit a **FINAL REPORT** to the DNR contract administrator addressing completion of the activities described.

Michigan DNR (Fisheries Division) will collaborate on these general activities which will fluctuate over the course of the contract period:

- 1) Commit staff from the Northern Lake Huron Management Unit and Marquette Fisheries Research Station to assist MSU staff in fish rearing, stocking, and research operations.
- 2) Support staff will be made available for consultation on Black River lake sturgeon culture infrastructure.
- 3) Collaborate on data analysis and publication of study results.

I-G PROJECT CONTROL AND REPORTS

The Contractor will carry out this project under the direction and control of the DNR, Fisheries Division.

The MSU PI is responsible for providing the reports above at the times designated to the DNR contract administrator in written and electronic format by the specified date. A template for reports will be provided by the DNR Contract Administrator and submitted reports must use the template or contain all information requested on the template. The reports shall be mailed and transmitted electronically to the DNR Project Manager listed in **I-C**.

Final payment will be withheld until all reports have been submitted. Electronic data files and mapping products will be shared in electronic format with the DNR Project Manager.

The DNR contract administrator will meet as needed with the PI for the purpose of reviewing progress and providing necessary guidance in solving problems which arise.

The PI will submit deliverables as listed in Section **I-F** above, and identify any problems, real or anticipated, which should be brought to the attention of the DNR Project Manager to insure that the contract remains on schedule and will be completed as scheduled.

I-H PRICE PROPOSAL

This is a fixed price contract, and Contractor may invoice at the end of each fiscal quarter (December 31, March 31, June 30, and September 30) for 25% of the annual DNR contribution to the study (the contract cost). Contractor's fiscal contribution to this study (20%) is the waiver of normal overhead charges per the Agreement between MSU and DNR, executed in 2013.

For FY2014 the Contractor may bill 100% of costs on September 30, 2014 if deliverables are on schedule.

I-I MODIFICATIONS OF CONTRACT

This contract may be modified provided that any changes proposed by either party are requested in writing and mutually agreed to by the official representative of the Contractor shown in this contract and the DNR contract administrator. This request is not valid until it is signed by all parties, a Contract Change Notice is issued by the Issuing Office, and a Purchase Order is issued by the DNR.

I-J NO WAIVER OF DEFAULT

The failure of a party to insist upon strict adherence to any term of this contract shall not be considered a waiver or deprive the party of the right thereafter to insist upon strict adherence to that term, or any other term, of this contract.

I-K SEVERABILITY

Each provision of this contract shall be deemed to be severable from all other provisions, and if one or more of the provisions shall be declared invalid, the remaining provisions of this contract shall remain in full force and effect.

I-L HEADINGS

Captions and headings used in this contract are for information and organization purposes. Captions and headings, including inaccurate references, do not, in any way, define or limit the requirements or terms and conditions of this contract.

I-M RELATIONSHIP OF THE PARTIES

The relationship between the State and the Contractor is that of client and independent contractor. No agent, employee, or servant of the Contractor or any of its subcontractors shall be or shall be deemed to be an employee, agent, or servant of the State for any reason.

I-N COST LIABILITY

The State of Michigan assumes no responsibility or liability for costs incurred by the Contractor prior to the signing this contract. Total liability of the State is limited to the terms and conditions of this contract.

I-O CONTRACTOR RESPONSIBILITIES

The Contractor is responsible for the performance of all of its obligations under this contract, whether the obligations are performed by the Contractor or a subcontractor. The State reserves the right to approve any subcontractor hired to perform the Contractor's obligations under this contract, and the right to require the Contractor to replace any subcontractor deemed unacceptable by the State. The Contractor is exclusively responsible for adherence by subcontractors to all provisions of this contract. Further, the State will consider the Contractor to be the sole point of contact with regard to contractual matters, including but not limited to payment of any and all costs resulting from the contract.

I-P INFORMATION RELEASE / OWNERSHIP

News Releases

News releases pertaining to this Contract or the services, study, data, or project to which it relates will not be made without prior written State approval, which will not be unduly withheld. MSU may publish information concerning the award of this in the MSU Board of Trustees report only, without prior written consent.

Publication

The Contractor will not use, release, publish or present any analyses, findings, results, or techniques developed under this agreement, or any information derived therefrom until such analyses, findings, or techniques have been reported to the State in the manner prescribed by this agreement. No material may be published that is exempt from disclosure under Public Act No. 442 of 1976, known as the "Freedom of Information Act," without express permission from the State. The Contractor will provide the State, for its review, copies of all presentations or articles being submitted for publication at least forty-five (45) days in advance. The State will review the proposed publication and provide comments. A response shall be provided to the Contractor within forty-five (45) days; otherwise, the Contractor may assume that the State has no comments. The Contractor agrees to address any concerns or issues identified by the State with respect to the State-supplied information prior to

submission for publication or presentation. Co-authorship on any presentations at professional meetings and publications resulting from this project will be agreed upon by the Co-PIs.

Acknowledgement of State Participation/Support

All publications or oral presentations concerning the analyses, findings, results or techniques developed under this contract will contain an acknowledgement, of the State's participation and support unless the State requests in writing that their participation and support not be acknowledged. Furthermore, Contractor may not receive fees for any article in excess of the cost of preparation of published article and excluding the cost of the research and compilation which was compensated under the contract.

Ownership of Supplies\Equipment

At the end of the project period, the DNR will retain ownership of any equipment purchased with funding under this contract and for the purposes of the project which are not consumed while completing the project. The equipment must be returned to the State upon completion of the contract. Exact ownership of supplies are listed in Attachment A – Budget Sheets

I-Q DISCLOSURE

All information in this contract is subject to the provisions of the Freedom of Information Act, 1976 Public Act No. 442, as amended, MCL 15.231, et seq.

I-R ACCOUNTING RECORDS

The Contractor will be required to maintain project records pertaining to Appendix A 'Work Statement' for three (3) years from the expiration date of this contract, which access shall be made available to the State upon reasonable notice to Contractor.

I-S AUDIT OF CONTRACT COMPLIANCE

The Contractor agrees that the State may, upon 24-hour notice, perform an audit at Contractor's location(s) to determine if the Contractor is complying with the requirements of this contract. The Contractor agrees to cooperate with the State during the audit and produce all records and documentation that verifies compliance with the requirements of this contract.

I-T SAFETY AND ACCIDENT PREVENTION

In performing work under this contract on State premises, the Contractor shall conform to any specific safety requirements contained in this contract or as required by law or regulation. The Contractor shall take any additional precautions as the State may reasonably require for safety and accident prevention purposes. Any violation of such safety requirements, rules, laws or regulations shall be a material breach of this contract and shall be grounds for cancellation of this contract in accordance with the Cancellation provisions contained herein.

I-U TAXES

Employment Taxes

Contractors are expected to collect and pay all applicable federal, state, and local employment taxes.

Sales and Use Taxes Contractors are required to be registered to remit sales and use taxes on taxable sales of tangible personal property or services delivered into the State.

I-V GENERAL INDEMNIFICATION

Each party to this contract must seek its own legal representative and bear its own costs; including judgments, in any litigation that may arise from performance specific to each party's responsibilities. It is specifically understood and agreed that neither party will indemnify the other party in such litigation.

I-W INSURANCE REQUIREMENTS

The Contractor shall purchase and maintain such insurance as will protect them from claims set forth below which may arise out of, or result from, the Contractor's operations under the Contract (Purchase Order), whether such operations be by themselves or by any Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

NOTE: CONTRACTOR MAY SUBMIT EVIDENCE OF SELF-INSURANCE AND/OR AMENDMENT OF EXISTING LIABILITY COVERAGE IN FULFILLMENT OF ABOVE PROVISIONS, IF THE STATE ACCEPTS THE EVIDENCE OR AMENDED LIABILITY COVERAGE AS PROVIDING COMPARABLE PROTECTION OF THE STATE'S INTEREST.

The Contractor is required to provide proof of the minimum levels of insurance coverage as indicated below. The purpose of this coverage shall be to protect the State from claims which may arise out of, or result from, the Contractor's performance of services under the terms of this Contract, whether such services are performed by the Contractor, or by any subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable.

The Contractor waives all rights against the State of Michigan, its departments, divisions, agencies, offices, commissions, officers, employees, and agents for recovery of damages to the extent these damages are covered by the insurance policies the Contractor is required to maintain pursuant to this contract, unless such damages are the result of the negligence or omission of the State of Michigan.

The insurance shall be written for not less than any minimum coverage herein specified or required by law, whichever is greater.

BEFORE THE CONTRACT IS SIGNED BY BOTH PARTIES OR BEFORE THE PURCHASE ORDER IS ISSUED BY THE STATE, THE CONTRACTOR MUST FURNISH TO THE DNRE, FS, CERTIFICATE(S) OF INSURANCE VERIFYING INSURANCE COVERAGE. THE CERTIFICATE MUST BE ON THE STANDARD "ACCORD" FORM. THE CONTRACT OR PURCHASE ORDER NUMBER MUST BE SHOWN ON THE CERTIFICATE OF INSURANCE TO ASSURE CORRECT FILING. All such Certificate(s) shall contain a provision indicating that coverage afforded under the policies WILL NOT BE CANCELLED OR MATERIALLY CHANGED without prior written notice having been given to the DNR, FS. Such NOTICE must include the CONTRACT NUMBER affected.

The Contractor is required to provide the type and amount of insurance checked () below:

- 1. Commercial General Liability with the following minimum coverage:
 - \$2,000,000 General Aggregate Limit other than Products/Completed Operations
 - \$2,000,000 Products/Completed Operations Aggregate Limit
 - \$1,000,000 Personal & Advertising Injury Limit
 - \$1,000,000 Each Occurrence Limit
 - \$500,000 Fire Damage Limit (any one fire)

- 2. If a motor vehicle is used to provide services or products under this Contract, the Contractor must
 - have vehicle liability insurance for bodily injury and property damage as required by law.

- 3. Worker's disability compensation, disability benefit or other similar employee benefit act with minimum statutory limits. NOTE: (1) If coverage is provided by a State fund or if Contractor has qualified as a self-insurer, separate certification must be furnished that coverage is in the state fund or that Contractor has approval to be a self-insurer; (2) Any citing of a policy of insurance must include a listing of the States where that policy's coverage is applicable; and (3) Any policy of insurance must contain a provision or endorsement providing that the insurers' rights of subrogation are waived. This provision shall not be applicable where prohibited or limited by the laws of the jurisdiction in which the work is to be performed.

- 4. Employers liability insurance with the following minimum limits:
 - \$100,000 each accident
 - \$100,000 each employee by disease
 - \$500,000 aggregate disease

I-X NOTICE AND RIGHT TO CURE

In the event of a curable breach by the Contractor, the State shall provide the Contractor written notice of the breach and a time period to cure said breach described in the notice. This section requiring notice and an opportunity to cure shall not be applicable in the event of successive or repeated breaches of the same nature or if the State determines in its sole discretion that the breach poses a serious and imminent threat to the health or safety of any person or the imminent loss, damage or destruction of any real or tangible personal property.

I-Y CANCELLATION

The State may cancel this contract without further liability or penalty to the State, its departments, divisions, agencies, offices, commissions, officers, agents, and employees for any of the following reasons:

1. **Material Breach by the Contractor.** In the event that the Contractor breaches any of its material duties or obligations under this contract, which are either not capable of or subject to being cured, or are not cured within the time period specified in the written notice of breach provided by the State, or pose a serious and imminent threat to the health and safety of any person, or the imminent loss, damage or destruction of any real or tangible personal property, the State may, having provided written notice of cancellation to the Contractor, cancel this contract in whole or in part, for cause, as of the date specified in the notice of cancellation.

In the event the State chooses to partially cancel this contract for cause charges payable under this contract will be equitably adjusted to reflect those services that are cancelled. In the event this contract is cancelled for cause pursuant to this section, and it is therefore determined, for any reason, that the Contractor was not in breach of contract pursuant to the provisions of this section, that cancellation for cause shall be deemed to have been a cancellation for convenience, effective as of the same date, and the rights and obligations of the parties shall be limited to that otherwise provided in this contract for a cancellation for convenience.

2. **Cancellation for Convenience by the State.** The State may cancel this contract for its convenience, in whole or part, if the State determines that such a cancellation is in the State's best interest. Reasons for such cancellation shall be left to the sole discretion of the State and may include, but not necessarily be limited to (a) the State no longer needs the services or

products specified in this contract, (b) relocation of office, program changes, changes in laws, rules, or regulations make performance of the services under this contract no longer practical or feasible, and (c) unacceptable prices for additional services requested by the State. The State may cancel this contract for its convenience, in whole or in part, by giving the Contractor written notice 30 days prior to the date of cancellation. If the State chooses to cancel this contract in part, the charges payable under this contract shall be equitably adjusted to reflect those services that are cancelled.

3. **Non-Appropriation.** The State may cancel this contract in the event that funds to enable the State to effect continued payment under this contract are not appropriated or otherwise made available. The Contractor acknowledges that, if this contract extends for several fiscal years, continuation of this contract is subject to annual appropriation or availability of funds for this contract. If funds are not appropriated or otherwise made available, the State shall have the right to cancel this contract at the end of the last period for which funds have been appropriated or otherwise made available by giving written notice of cancellation to the Contractor. The State shall give the Contractor written notice of such non-appropriation or unavailability within 30 days after it receives notice of such non-appropriation or unavailability.
4. **Criminal Conviction.** In the event the Contractor, an officer of the Contractor, or an owner of a 25% or greater share of the Contractor, is convicted of a criminal offense incident to the application for or performance of a State, public or private contract or subcontract; or convicted of a criminal offense including but not limited to any of the following: embezzlement, theft, forgery, bribery, falsification or destruction of records, receiving stolen property, attempting to influence a public employee to breach the ethical conduct standards for State of Michigan employees; convicted under State or federal antitrust statutes; or convicted of any other criminal offense which in the sole discretion of the State, reflects upon the contractor's business integrity, the State may cancel this contract.
5. **Approvals Rescinded.** In the event any final administrative or judicial decision or adjudication disapproves a previously approved request for purchase of personal services pursuant to Article 11, Section 5 of the Michigan Constitution of 1963, and Chapter 7 of the Civil Service Rules, the State may cancel this contract. Notwithstanding any other provision of this contract to the contrary, the State Personnel Director is authorized to disapprove contractual disbursements for personal services if the Director determines that disbursements under this contract violate Article 11, Section 5 of the Michigan Constitution or violate applicable Civil Service rules or regulations. Cancellation may be in whole or in part and may be immediate as of the date of the written notice to the Contractor or may be effective as of the date stated in such written notice.

I-Z ASSIGNMENT

The Contractor shall not have the right to assign this contract or to assign or delegate any of its duties or obligations under this contract to any other party (whether by operation of law or otherwise), without the prior written consent of the State. Any purported assignment in violation of this section shall be null and void. Further, the Contractor may not assign the right to receive money due under this contract without the prior written consent of DNR Financial Services.

I-AA DELEGATION

The Contractor shall not delegate any duties or obligations under this contract to a subcontractor other than a subcontractor named in the bid unless DNR Financial Services has given written consent to the delegation.

I-BB NON-DISCRIMINATION CLAUSE

In the performance of any contract or purchase order resulting herefrom, the Contractor agrees not to discriminate against any employee or applicant for employment, with respect to their hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment, because of race, color, religion, national origin, ancestry, age, sex, height, weight, marital status, physical or mental disability unrelated to the individual's ability to perform the duties of the particular job or position. The Contractor further agrees that every subcontract entered into for the performance of any contract or purchase order resulting herefrom will contain a provision requiring non-discrimination in employment, as herein specified, binding upon each subcontractor. This covenant is required pursuant to the Elliot Larsen Civil Rights Act, 1976 Public Act 453, as amended, MCL 37.2101, et seq, and the Persons with Disabilities Civil Rights Act, 1976 Public Act 220, as amended, MCL 37.1101, et seq, and any breach thereof may be regarded as a material breach of the contract or purchase order.

I-CC UNFAIR LABOR PRACTICES

Pursuant to 1980 Public Act 278, as amended, MCL 423.231, et seq, the State shall not award a contract or subcontract to an employer whose name appears in the current register of employers failing to correct an unfair labor practice compiled pursuant to Section 2 of the Act. This information is compiled by the United States National Labor Relations Board.

A Contractor of the State, in relation to the contract, shall not enter into a contract with a subcontractor, manufacturer, or supplier whose name appears in this register. Pursuant to Section 4 of 1980 Public Act 278, MCL 423.324, the State may void any contract if, subsequent to award of the contract, the name of the Contractor as an employer, or the name of the subcontractor, manufacturer or supplier of the Contractor appears in the register.

I-DD SURVIVOR

Any provisions of this contract that impose continuing obligations on the parties shall survive the expiration or cancellation of this contract for any reason.

I-EE PERFORMANCE REVIEWS

DNR may review with the contractor their performance under the contract. Performance reviews shall be conducted quarterly, semi-annually or annually depending on contractor's past performance with the State. Performance reviews shall include, but are not limited to, quality of service being delivered and provided, timeliness, percentage of completion, accuracy of billings, customer service, completion and submission of required paperwork, and other requirements of the contract.

Upon a finding of poor performance, which has been documented by DNR Financial Services, the Contractor shall be given an opportunity to respond and take corrective action. If corrective action is not taken in a reasonable amount of time as determined by DNR Financial Services, the contract may be canceled for default.

I-FF ELECTRONIC PAYMENT AVAILABILITY

Electronic transfer of funds is available to State contractors. Contractor is required to register with the State electronically at <http://www.cpexpress.state.mi.us>. Public Act 533 of 2004 requires all payments made by the State of Michigan be transitioned to Electronic Funds Transfers (EFT).

I-GG RENEWALS

This contract may be renewed by a written and mutually executed agreement of the parties, in accordance with Section I-I above, not less than 30 days before its expiration. The contract may be renewed for up to one (3) one (1) year periods.

I-HH COMPLIANCE WITH LAWS

The Contractor represents to the best of its knowledge and belief that, in performing the services called for by this Contract, it will not violate any applicable law, rule, or regulation, or any intellectual rights of any third party; including but not limited to, any United States patent, trademark, copyright, or trade secret.

I-II Legal Effect

Contractor must show acceptance of the Contract by signing the Contract and returning it to the Contract Administrator. The Contractor must not proceed with the performance of the work to be done under the Contract, including the purchase of necessary materials, until both parties have signed the Contract to show acceptance of its terms, and the Contractor receives a Contract release/purchase order that authorizes and defines specific performance requirements.

82650-97300 – 230118

PO No.: _____ University Reference No.: _____

Attachment A –Budget

Beginning: 2014Ending: 02/28/2018Year 1 of 4 years – FY 2014

EXPENSE CATEGORY	Project Costs
Salaries	\$ 41,150.00
Ph.D. Student	\$ 19,000.00
hourly techs (2 people for 6 months),	\$ 18,061.00
lab tech for genotyping (1 month) (Jeannette Kanefsky)	\$ 4,089.00
Benefits	\$ 16,918.00
Ph.D. Student	\$ 13,694.00
Lab tech (1 month)	\$ 1,842.00
hourly techs (2 people for 6 months)	\$ 1,382.00
Supplies & Materials	\$ 210,470.00
Misc. supplies (field) (<i>MSU retains after study</i>)	\$ 9,145.00
Computer (<i>MSU retains after study</i>)	\$ 3,000.00
Vemco remote sonic receivers (<i>DNR retains after study</i>)	\$ 46,950.00
Vemco telemetry receivers (upgrade) (<i>DNR retains after study</i>)	\$ 5,500.00
Vemco telemetry implants (<i>Not recoverable after study</i>)	\$ 39,900.00
split-beam hydroacoustics gear with a GPS (<i>DNR retains after study</i>)	\$ 7,000.00
full duplex antenna arrays (<i>DNR retains after study</i>)	\$ 60,525.00
batteries and solar chargers (<i>DNR retains after study</i>)	\$ 12,200.00
lab supplies (<i>MSU retains after study</i>)	\$ 11,250.00
boat, motor, trailer (<i>DNR retains after study</i>)	\$ 15,000.00
Other Direct Expenses	\$ 19,500.00
per-diem (6 mo)	\$ 4,000.00
housing (6 mo)	\$ 8,000.00
vehicle	\$ 4,000.00
meetings	\$ 2,000.00
publication costs	\$ 1,500.00
Travel for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 288,038.00

Attachment B –Budget –Cont’d

Year 2 of 4 years – FY2015

EXPENSE CATEGORY	Project Costs
Salaries	\$ 42,182.00
Ph.D. Student	\$ 19,950.00
hourly techs (2 people for 6 months)	\$ 18,062.00
Lab Tech (1 mo) (Jeannette Kanefsky)	\$ 4,170.00
Benefits	\$ 17,558.00
Ph.D. Student	\$ 14,266.00
hourly techs (2 people for 6 months)	\$ 1,382.00
Lab Tech (1 mo) (Jeannette Kanefsky)	\$ 1,910.00
Supplies & Materials	\$ 15,500.00
Misc. supplies (field) (<i>MSU retains after study</i>)	\$ 9,250.00
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies (<i>MSU retains after study</i>)	\$ 6,250
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 19,500
per-diem (6 mo)	\$ 4,000
housing (6 mo)	\$ 8,000
vehicle	\$ 4,000
meetings	\$ 2,000
publication costs	\$ 1,500
Travel for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 94,740

Attachment B –Budget –Cont’d

Year 3 of 4 years – FY2016

EXPENSE CATEGORY	Project Costs
Salaries	\$ 20,948.00
Ph.D. Student	\$ 20,948.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ -
Benefits	\$ 14,862.00
Ph.D. Student	\$ 14,862.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	
Supplies & Materials <i>(MSU retains after study)</i>	\$ 2,095.00
Misc. supplies (field)	\$ -
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies	\$ -
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 5,500.00
per-diem (6 mo)	\$ -
housing (6 mo)	\$ -
vehicle	\$ -
meetings	\$ 2,500.00
publication costs	\$ 3,000.00
Travel costs for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 43,405.00

Attachment B –Budget –Cont’d

Year 4 of 4 years – FY2017

EXPENSE CATEGORY	Project Costs
Salaries	\$ 21,995.00
Ph.D. Student	\$ 21,995.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	\$ -
Salary for PI Baker	
Benefits	\$ 15,483.00
Ph.D. Student	\$ 15,483.00
hourly techs (2 people for 6 months), lab tech for genotyping (1 month)	
Fringe for PI Baker	
Supplies & Materials (<i>MSU retains after study</i>)	\$ 2,200.00
Misc. supplies (field)	\$ -
Computer	\$ -
Vemco remote sonic receivers	\$ -
Vemco telemetry receivers (upgrade)	\$ -
Vemco telemetry implants	\$ -
split-beam hydroacoustics gear with a GPS	\$ -
full duplex antenna arrays	\$ -
batteries and solar chargers	\$ -
lab supplies	\$ -
boat, motor, trailer	\$ -
Other Direct Expenses	\$ 6,500.00
per-diem (6 mo)	\$ -
housing (6 mo)	\$ -
vehicle	\$ -
meetings	\$ 3,500.00
publication costs	\$ 3,000.00
Travel costs for PI Baker	
Contract Services	\$ -
Indirect Costs (Administrative/Overhead)	
20% of salaries only (waived by MSU per PERM Agreement of 2013)	
Totals	\$ 46,178.00

Exhibit 1

Full Proposal to Great Lakes Fishery Trust

Project Description

Hydropower dams exist on most large Great Lakes tributaries (Holey et al. 2001) and limit lake sturgeon (*Acipenser fulvescens*) access to historic spawning and juvenile rearing habitats. Providing lake sturgeon passage (adults upstream and adults and juveniles downstream) is widely believed to be a management action that could improve lake sturgeon rehabilitation in Great Lakes tributaries (Auer 1996; Daugherty et al. 2009; Coscarelli et al. 2011). However, managers have limited information on the behavior of juvenile lake sturgeon of different ages as they proceed downstream, during times they reside in reservoir habitats above dams or their fate as they pass through hydroelectric facilities. Investigations of lake sturgeon behavior, habitat use, duration of reservoir occupancy, and survival in relation to passage at hydropower dams are needed to better inform managers and dam owners of the likelihood of success of passage efforts in the currency of quantifiable increases in recruitment. Fundamental biological research is also needed to inform decision makers and passage engineers about aspects of the species ecology that could be used to create downstream passage devices in ways that would be most effective for juvenile lake sturgeon as they migrate downstream. Research that can quantify and predict rates of downstream passage and survival would inform managers of important operational windows associated with fish age and size or seasonal or other environmentally (e.g., temperature, precipitation, vegetative cover) mediated timing of movements above and through dams. Development of passage and transport management prescriptions should be developed on pre-construction baseline data (Cowx et al. 1998).

Exogenous (environmental, structural and behavioral factors) and endogenous (e.g., phenotype/age and physiological) factors affecting passage success of young lake sturgeon should be studied in an integrated fashion to improve predictability of passage efficiency (Roscoe and Hinch 2010). Studies of the potential ecological consequences of fish passage through dams have largely focused on species other than sturgeon (review in Ickes et al. 2001). Estimates of turbine-induced mortality of salmonids have been produced (e.g., Stier and Kynard 1986). Studies of stream salmonids suggest that adult passage around dams increases recruitment (Schmetterling 2003). However, comparable data are generally lacking or may not be applicable to other species (Mallen-Cooper 2007) including sturgeon. Some research has been conducted on survival of juveniles above reservoirs for other sturgeon species (e.g., white sturgeon, *A. transmontanus*; Rien and North 2002). However, little is known of habitat use or survival of young lake sturgeon in reservoirs used as nursery areas or of the propensity of lake sturgeon of different ages to remain in these habitats. Downstream movements of larvae, limitations of juvenile habitat, mortality during summer episodes of poor water quality in reservoirs, and entrainment mortality of juveniles have been identified as important factors affecting white sturgeon recruitment (Jager et al. 2001) and are widely believed to significantly impact lake sturgeon recruitment in rivers with hydropower development (e.g., Menominee River, WI).

Research on juvenile lake sturgeon passage would be best conducted in multiple years and through multiple seasons because environmental conditions and dam operations are likely to vary. Within and across seasons and years, environmental variables including flow, temperature, and habitat conditions in upstream areas above dams are likely to be important predictors of passage times and rates of passage-induced mortality. Monitoring and assessment protocols would be best directed in a framework that would promote adaptive management (Coscarelli et al. 2011).

Managers also lack information pertaining to the level of increased recruitment that can be expected by passing adults upstream of hydropower dams. For lake sturgeon, extremely high and variable mortality during the egg and larval period means there is no functional relationship between the number of spawning adults and levels of recruitment (Forsythe 2010). Thus, managers cannot predict what the increase in expected recruitment of juveniles would be based on the number of adults passed above dams. Many important questions remain unanswered due to lack of empirical data. What is the expected rate of mortality during downstream passage through dams? Can aspects of dam operation predict probability of mortality and as a function of age? If multiple dams and reservoirs are

encountered, is the probability of surviving a second passage event conditional on surviving a prior passage event? By stocking known numbers of individuals of different size and age and quantifying habitat use and passage through dams and downstream our proposed research will provide critical data to address these questions.

Previously in the Black River system we have estimated survival during the larval dispersal period (Duong et al. 2011a). In Crossman et al. (2011) we demonstrated differences in survival in stream reaches below the dam as a function of age at release. Similar age and size specific assessments in reservoir habitats above the dams and following passage through the dams if collected from multiple facilities, in multiple years and through periods of different environmental conditions and dam operational levels, will provide managers with information on expected rates of passage and contributions of passed individuals to annual recruitment.

Research directed at downstream passage of juvenile lake sturgeon should make use of natural sources of variability in natural lake sturgeon populations, for example by assessing the fate of larvae and juveniles from multiple spawning runs and from multiple families. Multiple temporally-separated spawning runs are common on most rivers (Forsythe et al. 2012a, 2012b). Environmental conditions vary as a function of spawning time and consequently juvenile size varies in relation to spawning time as well (larvae hatching later are significantly smaller than larvae and juveniles hatching in colder waters and earlier in the year).

Construction of passage devices is expensive and not all rivers with dams will have sufficient resources to construct passage devices or to physically pass juveniles should adults be passed upstream of dams. It would be important to study systems without passage devices to learn about juvenile behavior in reservoirs as well as the fate of individuals that pass through turbines. Research is needed to inform design and construction activities to provide for infrastructure that enables quantitative monitoring of fish movements and passage effectiveness (Coscarelli et al. 2011) such as passive integrated transponder (PIT) antenna arrays, forebay and tail-race collection of larval, juvenile and adult lake sturgeon. This project will provide insight into the likelihood of success of upstream lake sturgeon passage by evaluating whether young stocked fish (simulating offspring produced by passed adults) continue to pass downstream and through dams or cease downstream movement and reside in reservoir habitat. By monitoring young of the year, yearling, and age 2 lake sturgeon behavior and habitat use in reservoirs and by quantifying conditions that we believe will predict when and at what size juveniles are likely to pass, we will also be able to provide recommendations regarding probabilities of survival during passage under status quo conditions (i.e., through turbines) or through other downstream passage structures.

Hypotheses To Be Tested

The null hypothesis of our proposed research is that juvenile lake sturgeon stocked upstream of a hydropower dam will quickly pass through reservoir habitats that are encountered as the fish migrate downstream (i.e. continue to drift downstream as if in a free flowing river). This hypothesis is based on prior work by Benson et al. (2005) that demonstrated young-of-the-year lake sturgeon occupy sand and small gravel substrates devoid of aquatic vegetation and our assumption that this type of habitat will be rare or absent in the reservoirs.

An alternative hypothesis is that juvenile lake sturgeon residence time in reservoirs will be dictated by the amount and distribution of suitable rearing habitat which will vary by life stage. Under this hypothesis we predict that timing of lake sturgeon larval/juvenile passage would be dictated by age/size-specific habitat use or selectivity relative to availability. Alternatively, timing of passage could be dictated by the seasonal chronology of aquatic macrophyte growth which is expected to increase in area and extent in the reservoir through the spring and summer season.

The two reservoirs on the upper Black River differ in size and habitat features (depth and in levels of aquatic macrophyte coverage) which we hypothesize will affect passage time through each reservoir. However, if fish continue to migrate downstream through reservoir habitat and survive passage either through or over the two hydropower dams on the upper Black River, then data quantifying the survival of individuals that pass the dams could indicate that engineered passage structures for this life stage may not be necessary.

Our project assumes that lake sturgeon raised in a streamside hatchery will behave as wild fish after they are stocked into the upper Black River. This assumption is supported by previous research in the Manistee River (Mann et al. 2011) that showed young-of-the-year lake sturgeon raised in a

streamside hatchery and released in the river occupied the same habitats as wild fish. Further, we assume that the number of fish we are proposing to mark and stock will be adequate to test the proposed hypotheses. We have based our stocking targets for sonic-tagged fish on previous research on lake sturgeon in the Black River watershed that demonstrated high post-stocking survival of relatively large fish implanted with sonic transmitters (Crossman et al. 2009). Stocking targets for larval fish are also based on our estimates of expected mortality (Duong et al. 2011; Crossman 2011) through the first summer that will result in detectable abundance of young-of-the-year fish in reservoir/river habitats.

The relatively small size of the upper Black River and Tower and Kleber reservoirs provides an ideal setting for this type of research because adequate numbers of fish can be obtained and used relative to expected probabilities of capture based on the array of assessment methods we will employ. Further, the relatively small size of both reservoirs will allow us to search all portions of each reservoir exhaustively to quantify habitats available, habitats used, changes in habitat availability and use through seasons, and effects of reservoir habitat on probability of passage. We are not aware of any other system in the Great Lakes basin where this type of research would be possible. We have 11 years of experience producing fish for stocking using our streamside hatchery facility on the Black River and have stocked over 30,000 fall fingerling lake sturgeon in the Cheboygan River watershed since 2001. Associations between passage attempts, passage survival and predictor variables of fish size and turbine operational levels can be quantified based on the large number of recovered individuals possible compared to other larger or less studied systems. Our project also assumes that results of this research will be generally applicable to larger systems with hydropower dams and that our results can be used to inform design decisions for downstream fish passage devices specifically for lake sturgeon.

Methods

Study Area

The Black Lake watershed is a sub-watershed of the Cheboygan River drainage and is home to a relatively large lake sturgeon population (~1,000 adults; Pledger et al. in review) that has been the subject of our ongoing research since 2000 (Crossman et al. 2009; 2011a; 2011b; Duong et al. 2011a; 2011b; Forsythe et al. 2012a; 2012b). Lake sturgeon ascend the upper Black River in April and May to spawn over a 1.5 km reach of river downstream from the Kleber Dam hydropower generating station (Smith and Baker 2005, Figure 1). Kleber Dam was constructed on the upper Black River in 1949 and is 11 km upstream from Black Lake. Kleber Dam is a 1.4 megawatt hydropower generating facility that forms the Kleber Reservoir. Kleber Reservoir is 119 hectares at normal water level and has a storage capacity of $3.7 \times 10^6 \text{ m}^3$ (average depth 3 m). The dam is 14 m high, 163 m long, and has a maximum discharge of $405 \text{ m}^3/\text{s}$ through the generating station. A second hydropower dam on the upper Black River, Tower Dam (0.6 megawatt capacity), was constructed in 1918 and forms a 41 hectare reservoir with a storage capacity of $764,759 \text{ m}^3$ (average depth 2 m). The dam is 15 m high, 222 m in length, and has a maximum discharge of $94 \text{ m}^3/\text{s}$ through the generating station. Both Tower and Kleber dams are surface draw facilities with surface draw spillways. The Tower dam is approximately 4 km upstream of Kleber Dam and there is a short reach of river habitat between Tower Dam and the upper end of Kleber Reservoir (Figure 1). Upstream of Tower Reservoir the upper Black River is free flowing and drains a watershed of approximately 782 km^2 . We propose to mark fish of different ages and sizes and deploy monitoring devices to characterize habitats used in reservoirs, rates of passage, and survival through each dam.

Larval and juvenile assessments

We will take advantage of our access to several hundred spawning adults in the Black River below Kleber Dam to produce fish for this project. We are able to collect hundreds of thousands of eggs annually and have produced several thousand fall fingerling lake sturgeon in our streamside hatchery each year since 2005 (Crossman 2008; Michigan DNR Fish Stocking Database <http://www.michigandnr.com/FISHSTOCK/>). We will produce lake sturgeon for stocking upstream of the Tower and Kleber dams on the upper Black River (Fig. 1) and monitor stocked fish as they descend the river into reservoir habitats, quantify habitat use in the reservoirs, document passage events, and monitor fish after dam passage. The portions of Black River below Kleber dam are the only known spawning habitats for Black Lake sturgeon and there are no lake sturgeons in the Black River upstream of the Tower/Kleber dams. Therefore, any lake sturgeon we sample upstream of the

Tower and Kleber dams will be of stocked origin associated with this project. If individuals from the study pass the lower (Kleber) dam, individuals will be identified as associated from the project based on tags (PIT or sonic) or based on genotype.

We will mark and stock lake sturgeon of 4 age/sizes (Table 1) upstream of the Tower Dam as well as immediately below the Tower Dam and upstream of the Kleber reservoir. The fish stocked upstream of the Tower dam will be stocked in the river upstream of the reservoir so they may acclimate to the river as they progress downstream. Because the Tower Reservoir is smaller (102 acres) and shallower than the Kleber Reservoir (295 acres) we will be able to evaluate whether reservoir size, depth, and vegetation influence fish behavior and the probability and timing of passage. We will also be able to evaluate whether fish passage is seasonal and related to changing habitat conditions in the reservoirs (e.g. increased macrophyte growth through summer).

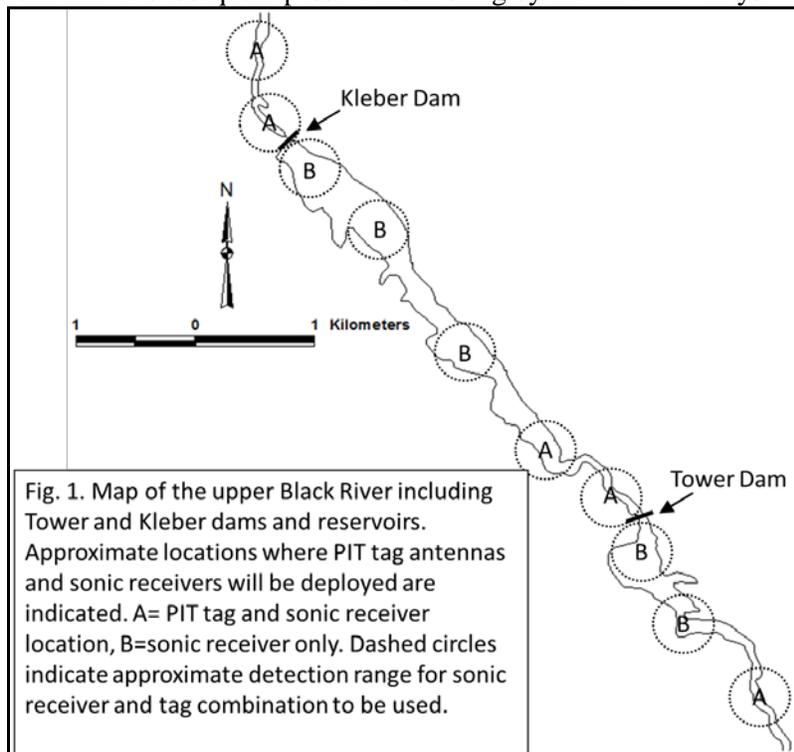
Age	Stocking Target	Frequency of stocking	Mark Type	Assessment Gear
larvae	Up to 40,000	Annually in spring	none, genetic ID	drift nets
fall fingerlings	300	Annually in fall	PIT tag	visual, electrofishing, drift nets, PIT tag antennas
yearlings	30	Annually in spring	PIT tag, sonic tag	electrofishing, sonic receivers, PIT tag antennas
Age 2	30	Annually in spring	PIT tag, sonic tag	electrofishing, sonic receivers, PIT tag antennas

We will mark all stocked fish before stocking events. Fall fingerling, age 1 and 2 fish will be marked with uniquely numbered PIT tags. We will monitor movement of PIT tagged fish with passive PIT tag antennas deployed across the entire width of the river at the head of the Tower and Kleber reservoirs to determine when fish enter the reservoirs. We will also deploy PIT tag antennas immediately downstream of the Tower and Kleber dams to monitor fish passage and survival through the dams (Fig. 1). Because PIT tag antennas will span the width of the river, we will be able to detect any movement of lake sturgeon past the antennas.

We will also implant 60 (15 age 1 and 15 age 2 above both Tower and Kleber dams) larger fish (minimum weight=50 g or approximately 20 cm TL) per year of the study with sonic transmitters and monitor these fish with a combination of passive and active sonic receivers. Individuals from the 2012 cohort have been retained in the Michigan DNR Wolf Lake Hatchery and will be available for release as age 2 fish during the 2014 field season We will also retain fish from the 2013 field season to release as age 1 fish in 2014 and age 2 fish in 2015. Juvenile lake sturgeon will be surgically implanted with small coded ultrasonic transmitters (Vemco, model V7, Nova Scotia, Canada) as described in our previous telemetry study in Black Lake (Crossman et al. 2009). Fish will be anesthetized using tricaine methane sulfonate in an aerated container prior to surgery. Transmitters will be anchored to the wall of the peritoneal cavity using non-absorbable sutures to reduce movements of the transmitter in the body cavity. We will use passive Vemco sonic receivers in the river and reservoir habitats to monitor and record fish movement downstream and through the reservoirs. We will deploy passive sonic receivers at the head of each reservoir and at selected locations throughout each reservoir (Fig. 1). In addition, we will deploy sonic receivers immediately below each dam to monitor for fish passing through or over the dams. Because the detection range of the receivers exceeds the width of the reservoirs (Fig. 1) we will be able to detect and monitor all fish that carry sonic transmitters. We will also monitor and record fish habitat use and movement by actively searching for fish using a portable hydrophone deployed from a boat. Active monitoring efforts will occur weekly and will be accompanied by habitat measurements (water depth, bottom substrate, percent submerged or emergent vegetation in a 1 m² plot at the point of capture or observation) where fish are located to quantify habitat use.

We will also stock up to 40,000 larval lake sturgeon annually (5,000 per male-female cross year). We will collect gametes from 4 males and females from the early and late spawning periods and

will fertilize gametes using known crosses. Sufficient egg numbers will be fertilized to ensure hatch and survival of sufficient numbers of larvae per family for release into the river either above or below Tower reservoir. Eggs will be incubated in heath trays in our streamside hatchery. Larvae from 4 crosses of early and 4 crosses of late spawning adults will be passively released (yolk-sac larvae placed in river in constructed boxes filled with gravel substrate). The number of larvae released will approximate numbers collected during 2001-2011 in the river below Kleber Dam and thus be representative of natural larval drift abundance in the river. Based on previous work in the Black River below Kleber Dam documenting larval mortality during the drift period, the number of larvae proposed for release will result in detectable abundance of young of the year fish in the reservoirs and river (Duong et al. 2011). Larvae from 2 adult crosses during the early and late spawning period will be stocked above Tower dam and larvae from the other crosses will be released in the river between Tower and Kleber dams so genotyping will be able to place larvae to a release site and family. We will sample below both Tower and Kleber dams using larval drift nets to monitor for passage and survival of stocked larvae. Drift sampling for released larvae will begin immediately following larval release and continue throughout the open water season. Released larvae will be too small to mark. Therefore, for subsequent identification of recaptured fish released as larvae we will use genetic analysis (see Duong et al. 2011a; 2011b) to identify fish to family and stocking event. For purposes of assessment upon capture, a fin clip will be taken from each unmarked individual to be genotyped at 5 microsatellite loci that are routinely used for the Black Lake project (Crossman et al., 2011, Duong et al. 2011a, 2011b) and which have sufficient statistical power to resolve parentage for this number of adults (Duong et al. 2011a). We will use likelihood-based parentage analysis implemented in program Cervus (Kalinowski et al. 2007) to assign parents and thus time and location of release. We have successfully conducted lake-wide pedigree analyses of large-mouth bass (Hessanaur et al. 2012) and juvenile lake sturgeon in large Lake Michigan tributaries (Scriber, unpubl. data) using similar methods. If unmarked individuals captured have grown to sufficient size, a PIT tag will be implanted to facilitate subsequent passive monitoring by the antenna arrays.



We will also sample river and reservoir habitats using active fish capture methods (electrofishing, visual surveys) and passive capture techniques (drift netting) to follow stocked fish, including those that lack tags (larvae of known parentage). Habitat will be quantified at each location fish are observed and as previously described for telemetry data. We will monitor river discharge and temperature with flow and temperature data loggers deployed upstream of the Tower Reservoir, between Tower and Kleber reservoirs, and downstream of Kleber Reservoir.

Assessment of effects of habitat used by juvenile sturgeon

We will create detailed maps of river and reservoir habitat using side-scan sonar equipment coupled to high-resolution GPS (Kaeser and Litts 2010). Habitat maps will include delineation of substrate types, vegetation and other inwater features (e.g. woody debris), and depths. We will also monitor vegetation growth through the summer using side-scan sonar once monthly.

We will sample lake sturgeon habitat use in the riverine and reservoir habitats using a combination of active sonar tracking and triangulation, electrofishing gear, and snorkeling/scuba surveys. Sample locations will be stratified among substrate types and depths in the reservoir and recorded using a Garmin GPSmap 76 hand held GPS receiver.

Beginning immediately after fish are released in the spring, a three person crew will conduct systematic visual transect surveys in each reservoir at least twice/month. The crew will consist of a boat driver, an observer monitoring the snorkeler from the boat, and an individual in a wetsuit and snorkel gear towed behind the boat. Surveyed transects will span all areas of the reservoir that match transects covered during the side-scan sonar surveys. When a lake sturgeon is observed, we will record the location using a Garmin GPSmap 76 hand held GPS receiver as well as fish size and PIT tag number (if present). Depth, bottom substrate, and vegetation characteristics would be recorded with the side-scan sonar and confirmed by the diver.

Statistical analysis

Point Pattern Analysis of heterogeneity in spatial distribution of individuals in reservoirs

Kernel density estimation is a simple tool to model sample distribution patterns. We will use an adaptive kernel estimate to reduce the variance of areas of low sample size and reduce the bias of areas of high sample size (Silverman 1986). Kernel estimation will be weighted to account for sampling effort. We will compare the spatial distribution and density of individual samples for each release size of fish, reservoir, sampling period within a year (summer and fall), and between years. All maps will be produced in SPATSTAT package in R 2.13 (R Development Core Team 2011). To compare the differences between capture point patterns from different seasons, reservoirs, release sizes, and years, we will calculate differences between their K-functions. Ripley's K function is a measure of cluster or dispersion of observations that uses the distance between all pairs of observations to examine spatial patterns for a range of distances (Dixon 2002). We will analyze differences in mapped spatial distributions between data sets by comparing K-functions for a homogeneous Poisson process using a complete spatial randomness model (CSR) for seasons within a year, between years, between Tower and Kleber reservoirs, and among release sizes.

Assessment of effects of habitat features in reservoirs on capture of juvenile sturgeon

We will use a regression tree (CART) analysis to determine the relative influence of juvenile release size and age and habitat on habitat use. This method constructs a dichotomous tree dividing observations into groups that minimize within group variation in the response variable (number of lake sturgeon of a particular release size) as a function of the predictor variables. Predictor variables will include habitat features at the location of capture (e.g. depth, substrate, percent plant cover).

Factors associated with sturgeon passage

Time to passage will be used as a measure of duration of occupancy of each reservoir. PIT tag antenna arrays, sonar buoys, and drift nets will detect fish presence at the penstock or below dams. We will use a Generalized Linear Model (GLMM) to quantify effects of release size on residence time in the reservoir.

We will use a Generalized Linear Mixed Model (GLMM) with a binomial distribution to quantify the time of occupancy of reservoir habitats, and effects of passage through an upstream dam on probability of passage (0, 1). We will also quantify reservoir habitat use and selectivity and use these data as additional predictor variables in the passage models. Analyses will be conducted separately by release sizes because of the differences in detectability based on different gear types. We will use the antenna and sonar arrays to detect fish at the penstock entrance above the dam (1) and whether the fish is detected at arrays established below the dam (0 or 1).

Comparisons of size and time since release on dam passage

Two dependent variables, the proportion of fish recaptured below a dam from a release size/age class and the TL of recaptured fish will be examined. A general linear mixed-effects model will be used to examine the effects and interactions of independent variables on the proportion of fish recaptured. Data collected from each data collection method (antenna arrays, sonic buoy and drift nets) will be analyzed separately because of lack of comparability and because it will not possible to replicate the sampling strategy across all release ages.

For all stocking ages/sizes, the response variable TL of recaptured juveniles will be analyzed using a general linear mixed effects model. In this model, the response will be the observation of TL for a specific fish at a distinct sampling time and at a specific sampling site. Fixed effects include capture site, collection method and release size. Time of capture will be used as a random effect in the model. The interaction effects between all independent variables will also be examined. All statistical analyses will be performed using R (R Development Core Team 2007, <http://www.rproject.org>).

Potential Management Benefits and Outcomes of Proposed Project

Fish passage designed to benefit lake sturgeon is being considered or implemented on several Great Lakes tributaries. This project will provide valuable data that will inform decision makers about when and where downstream passage facilities for lake sturgeon may be successful. Results of this project may also be used to make decisions about when downstream passage may not be needed for particular life stages of lake sturgeon. Data generated during this project could also be used by engineers in the design of effective attractants to increase the likelihood of downstream passage for juvenile lake sturgeon. We will also be able to predict the benefits of downstream passage for lake sturgeon in terms of increased recruitment to the downstream population. Results of this project will also provide insights into young of the year lake sturgeon behavior, survival, and habitat use that can be used to improve sampling efforts directed at young of the year lake sturgeon in other systems.

Geographic Focus Area

This project will take place in the Black River watershed in Cheboygan County, Michigan. The Black River is a tributary to the Cheboygan River, Lake Huron drainage. However, the results of this research will be applicable across the Great Lakes where lake sturgeon passage is being considered.

Communication of Findings

Information from this project will be disseminated to fisheries managers, natural resources policy makers, and dam owners in the form of bi-annual reports, peer-reviewed publications, talks and seminars at technical symposia and meetings at state and Lake Basin Committee levels and at regional and national fisheries management conferences. PIs have close ties to management agencies across the Great Lakes and a history of broadly communicating research findings in the Great Lakes fishery management community. Research conducted, and management recommendations offered on the basis of our research have been widely available to managers, the public, and other researchers. Limited information regarding lake sturgeon passage is currently available to the public and to agencies charged with lake sturgeon management. We will make summaries of databases accessible to stakeholders, resource managers, the general public, and K-12 educators including members of GLFT Stewardship Hubs using our e-learning web site (www.fw.msu.edu/glsturgeon). We will continue our outreach and extension work with regional citizen groups including Sturgeon For Tomorrow, the hydroelectric industry, and management agencies.

Relationship to Ongoing Activities

Dr. Nancy Auer (Michigan Technological University) and Dr. Edward Baker (project applicant) are conducting a sonic telemetry study on the Menominee River funded by the Wilderness

Shores Mitigation and Enhancement Fund to evaluate the behavior of and spawning success of adult lake sturgeon passed upstream over two dams. This project will complement that work by examining another significant area of uncertainty regarding the impacts of and potential benefits of passing lake sturgeon upstream of dams (i.e. larval and young of the year behavior, movements, and habitat use in reservoirs). We are not aware of any other research in the region that is examining these post-hatch movements or passage for lake sturgeon larvae and young of the year. In addition, the upper Black River provides an ideal setting for conducting this research because of the proximity of 2 hydroelectric facilities and reservoirs of contrasting size and habitat. We have access to abundant adults spawning in the river and can collect and rear large numbers of juveniles for release. We are not aware of any other setting in the Great Lakes region where this type of controlled research on downstream passage of young of the year lake sturgeon is possible.

Applicant Capacity

Ed Baker (MDNR) has 25 years experience as a researcher working on Great Lakes fisheries issues, including lake sturgeon. Kim Scribner (faculty Michigan State University) has 25 years experience working in the fields of ecological genetics, fish life history, and population ecology. PI's Baker and Scribner have collaborated on research at Black Lake since 2000 and have successfully completed several large projects funded by the Great Lakes Fishery Trust, US Fish and Wildlife Service, and MDNR. PI's Baker and Scribner have built strong partnerships with local stakeholders and Tower-Kleber Ltd., owner of the Tower and Kleber hydropower dams that will help to insure the success of this project. Furthermore, PI's have 12 years experience in the Black River collecting gametes and producing large numbers of fish for stocking in the Cheboygan River watershed and have the ability to produce thousands of fish annually in support of this project.

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