



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. 751B4300065**  
**Between**  
**STATE OF MICHIGAN**  
**and**

*Required by authority of 1984 PA 431, as amended.*

|   |                                     |   |
|---|-------------------------------------|---|
| <b>Name and Address of Contractor</b><br><br>Michigan State University<br>Office of Sponsored Programs<br>426 Auditorium Rd., Rm 2<br>301 Administration Bldg<br>Lansing, MI 48824-2601 | <b>Primary Contact</b><br>Diane Cox |   |
|   | <b>Email</b><br>coxd@osp.msu.edu    |   |
|   | <b>Telephone</b><br>(517) 884-4243  | <b>Contractor #, Mail Code</b><br>*****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)  
 Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health

|                                      |   |  |   |
|--------------------------------------|---|--|---|
| Effective Date<br>5/26/2014          | Initial Expiration Date<br>4/30/2016  | Initial Available Options<br>2 - 1 year option | Current Expiration Date<br>4/30/2016  |
| Payment Terms<br>Net 45              | F.O.B.<br>N/A   | Shipped<br>N/A                                 | Shipped From<br>N/A   |
| Minimum Delivery Requirements<br>N/A | Alternate Payment Options<br><input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV) |  | Available to MiDeal Participants<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |

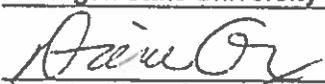
**Description of Change Notice**

Option Exercised:  Yes  No      If Yes, New Expiration Date: August 15, 2016

Provide the detail of the Change Notice  
 Exercise part of option year one to extend contract to August 15, 2016 and update contact information - see below.

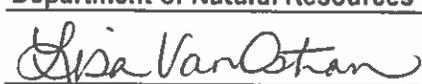
|                                       |   |
|---------------------------------------|---|
| Value/Cost of Change Notice<br>\$0.00 | Estimated Revised Aggregate Contract Value<br>\$64,954.00 |
|---------------------------------------|---|

**FOR THE CONTRACTOR:**

Michigan State University  
  
 Authorized Agent Signature  
 Diane Cox, Manager  
 Authorized Agent (Print or Type)  
12 Feb 2016  
 Date

no

**FOR THE STATE:**

Department of Natural Resources  
  
 Authorized Buyer Signature  
 Lisa VanOstran, Buyer  
 Authorized Buyer (Print or Type)  
2/16/2016  
 Date

Explanation of the change request:

- Exercise part of option year one to extend contract to August 15, 2016.
- Change project completion date in section I-A from April 30, 2016 to August 15, 2016.
- Change contract compliance Inspector in section I-C

From: Marlene D. Sublet-Smith  
Program Support, Fisheries Division  
Constitution Hall, 5<sup>th</sup> Floor, NE  
525 W. Allegan Street  
Lansing, MI 48933  
Telephone: (517) 284-5837  
Email: [subletsmith@michigan.gov](mailto:subletsmith@michigan.gov)

To: Marisa Lay  
Fisheries Division  
525 W. Allegan Street  
Lansing, MI 48933  
Telephone: (517) 284-5837  
Email: [laym@michigan.gov](mailto:laym@michigan.gov)

- Change Deliverables in Section I-E

|   |                 |
|---|-----------------|
| From: Annual Progress Report  | April 30, 2015  |
| Conduct a Risk Assessment Workshop  | (TBD) in 2015   |
| Distribution report on rusty crayfish indicating their locations.   | April 30, 2016  |
| Report which will assess the overall risk for the establishment of red swamp crayfish in the State of Michigan. | April 30, 2016  |
| Final Report  | April 30, 2016  |
| To: Annual Progress Report  | April 30, 2015  |
| Conduct A Risk Assessment Workshop  | (TBD) in 2015   |
| Distribution report on rusty crayfish indicating their locations  | August 15, 2016 |
| Report which will assess the overall risk for the Establishment of red swamp crayfish in the State of Michigan  | August 15, 2016 |
| Final Report  | August 15, 2016 |

- Change Project Control and Reports in section I-F

|   |                |
|---|----------------|
| From: Annual Progress Report  | April 30, 2015 |
| Distribution report on rusty crayfish indicating their locations.   | April 30, 2016 |
| Report which will assess the overall risk for the establishment of red swamp crayfish in the State of Michigan. | April 30, 2016 |
| Final Report  | April 30, 2016 |

|     |  |                 |
|-----|--|-----------------|
| To: | Annual Progress Report   | April 30, 2015  |
|     | Distribution report on rusty crayfish indicating their locations   | August 15, 2016 |
|     | Report which will assess the overall risk for the establishment of red swamp crayfish in the State of Michigan | August 15, 2016 |
|     | Final Report   | August 15, 2016 |

|   |             |
|---|-------------|
| Contract Value before exercising partial option year: | \$64,954.00 |
| Contract Value after exercising partial option year:  | \$64,954.00 |



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. 751B4300065**  
**Between**  
**STATE OF MICHIGAN**  
**and**

*Required by authority of 1984 PA 431, as amended.*

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

| State Contact                 | Agency | Name                   | Telephone      | Email                       |
|-------------------------------|--------|------------------------|----------------|-----------------------------|
| Contract Compliance Inspector | DNR    | Marlene Sublet-Bennett | (517) 284-5837 | Sublet-Bennett@michigan.gov |
| Buyer                         | DNR    | Jana Harding-Bishop    | (517) 373-1190 | HardingJ3@michigan.gov      |

| Initial Contract Summary  |   |   |   |
|---|---|---|---|
| Description (Provide a basic but comprehensive description of services)<br>Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health |   |   |   |
| Effective Date<br><b>5/26/2014</b>  | Initial Expiration Date<br><b>4/30/2016</b> | Initial Available Options<br><b>2 - 1 year option</b>   | Current Expiration Date<br><b>4/30/2016</b>   |
| Payment Terms<br><b>Net 45</b>  | F.O.B.<br><b>N/A</b>                        | Shipped<br><b>N/A</b>   | Shipped From<br><b>N/A</b>  |
| Minimum Delivery Requirements<br><b>N/A</b>   |   | Alternate Payment Options<br><input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV) | Available to MiDeal Participants<br><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<br>See Explanation of change below and Attachment B - Budget for year 2.  |   |   |   |
| Value/Cost of Change Notice<br><b>\$20,000.00</b>   |   | Estimated Revised Aggregate Contract Value<br><b>\$64,954.00</b>  |   |

**FOR THE CONTRACTOR:**

**Michigan State University**

On-file in DNR Procurement

Authorized Agent Signature

Diane Cox, Manager

Authorized Agent (Print or Type)

2/27/15

Date

**FOR THE STATE:**

**Department of Natural Resources**

On-file in DNR Procurement

Authorized Buyer Signature

Jana Harding-Bishop, Buyer

Authorized Buyer (Print or Type)

2/27/15

Date

Explanation of the change request:

Problem:

Per Attachment A Section D Job 1 – the original sample area was determined by “ *If red swamp crayfish have invaded Michigan, they are more likely to occur in the southern or western Lower Peninsula; sampling allocation within the stratified random design will emphasize those fishery management units perceived to be at higher risk.*” After the first sampling season and data collection it became apparent that the study would benefit from capturing data from northern Michigan in order to better detect the spread of the invasive rust crayfish.

Solution:

It was determined that MSU would need to increase the sampling sites to include an additional 100 sites in Northern Michigan. Actual sites to be agreed upon with the DNR Project Manager.

Change Request Includes the following:

Add \$20,000.00 to the Contract for the following items:

\$11,000.00 for hourly students wages and benefits

\$ 8,000.00 for travel – lodging, meals and car rental

\$ 1,000.00 for supplies for the additional study and students – bait, dip nets, field clothing and GPS units

MSU agrees to sample and collect data on an additional 100 sites in Northern Michigan and incorporate the information and results into the study and reports already required under this contract.

Original Contract Value: \$44,954.00

Revised Contract Value: \$64,954.00

## Attachment B REVISED 2/16/15

82650-77505 – 230011/50

PO No.: \_\_\_\_\_

100% Federal Fund

Dates: 05/26/14 - 04/30/15

|  | Original<br>Contract<br>Amount | REVISED<br>Contract<br>Amount |
|--|--------------------------------|-------------------------------|
| <b>SALARY/WAGES (See note below)</b>                 |                                |                               |
| Principal Investigator                               | 0                              |                               |
| Graduate student                                     | 0                              |                               |
| Temp Hourly -  | 5,600                          |                               |
| <b>Total Salary/Wages</b>                            | <b>5,600</b>                   |                               |
| <b>FRINGE BENEFITS</b>                               |                                |                               |
| Principal Investigator                               |                                |                               |
| Graduate student (health care through<br>fellowship) | 2,037                          |                               |
| Temp Hourly -  | 428                            |                               |
| <b>Total Fringe Benefits</b>                         | <b>2,465</b>                   |                               |
| <b>Total Personnel Costs</b>                         | <b>8,065</b>                   |                               |
| <b>OPERATING COSTS</b>                               |                                |                               |
| Research Supplies & lab fees                         | 856                            |                               |
| General Supplies( include computer & Parts)          |                                |                               |
| Phone  |                                |                               |
| Postage  |                                |                               |
| Printing/Copy Charges                                |                                |                               |
| Publication/Page Reprint Charges                     |                                |                               |
| Conference, Workshops                                | 1,500                          |                               |
| Tuition (covered with a fellowship)                  | 9,313                          |                               |
| <b>Total Operating Costs</b>                         | <b>11,669</b>                  |                               |
| <b>TRAVEL</b>  |                                |                               |
| Domestic Travel                                      | 3,500                          |                               |
| <b>Total Travel</b>                                  | <b>3,500</b>                   |                               |
| <b>TOTAL DIRECT COSTS</b>                            | <b>23,234</b>                  |                               |
| Indirect cost base                                   |                                |                               |
| <b>INDIRECT COSTS (may not exceed 5%)</b>            |                                |                               |
| <b>TOTAL COSTS by source</b>                         | <b>23,234</b>                  |                               |

**Year Two Budget**

**Dates: 05/1/15 – 4/30/16**

|  | <b>Original<br/>Contract<br/>Amount</b> | <b>REVISED<br/>Contract<br/>Amount</b> | <b>Total Project<br/>Cost</b> |
|--|---|--|-------------------------------|
| <b>SALARY/WAGES (See note below)</b>                 |   |  |                               |
| Principal Investigator                               |   |  | 0                             |
| Graduate student                                     |   |  | 0                             |
| Temp Hourly -  | 5,600                                   | 15,760                                 | 21,360                        |
| <b>Total Salary/Wages</b>                            | <b>5,600</b>                            | <b>15,760</b>                          | <b>21,360</b>                 |
| <b>FRINGE BENEFITS</b>                               |   |  | 0                             |
| Principal Investigator                               |   |  | 0                             |
| Graduate student (health care through<br>fellowship) | 2200                                    | 2,200                                  | 4,237                         |
| Temp Hourly -  | 428                                     | 1,268                                  | 1,696                         |
| <b>Total Fringe Benefits</b>                         | <b>2,628</b>                            | <b>3,468</b>                           | <b>5,933</b>                  |
| <b>Total Personnel Costs</b>                         | <b>8,228</b>                            | <b>19,228</b>                          | <b>27,293</b>                 |
| <b>OPERATING COSTS</b>                               |   |  | 0                             |
| Research Supplies & lab fees                         | 300                                     | 900                                    | 1,756                         |
| General Supplies( include computer & Parts)          |   | 400                                    | 400                           |
| Phone  |   |  | 0                             |
| Postage  |   |  | 0                             |
| Printing/Copy Charges                                |   |  | 0                             |
| Publication/Page Reprint Charges                     |   |  | 0                             |
| Conference, Workshops                                |   |  | 1,500                         |
| Tuition (covered with a fellowship)                  | 9,692                                   | 9,692                                  | 19,005                        |
| <b>Total Operating Costs</b>                         | <b>9,992</b>                            | <b>10,992</b>                          | <b>22,661</b>                 |
| <b>TRAVEL</b>  |   |  |                               |
| Domestic Travel                                      | 3,500                                   | 11,500                                 | 15,000                        |
| <b>Total Travel</b>                                  | <b>3,500</b>                            | <b>11,500</b>                          | <b>15,000</b>                 |
| <b>TOTAL DIRECT COSTS</b>                            | <b>21,720</b>                           | <b>41,720</b>                          | <b>64,954</b>                 |
| Indirect cost base                                   |   |  |                               |
| <b>INDIRECT COSTS (may not exceed 5%)</b>            |   |  |                               |
| <b>TOTAL COSTS by source</b>                         | <b>21,720</b>                           | <b>41,720</b>                          | <b>64,954</b>                 |



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

**NOTICE OF CONTRACT NO. 751B4300065**  
**Between**  
**STATE OF MICHIGAN**  
**and**

*Required by authority of 1984 PA 431, as amended.*

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

| State Contact                 | Division               | Name                 | Telephone     | Email                     |
|-------------------------------|------------------------|----------------------|---------------|---------------------------|
| Contract Compliance Inspector | Fisheries              | Marlene Sublet-Smith | (517)284-5837 | Subletsmithm@michigan.gov |
| Buyer                         | Finance and Operations | Jana Harding-Bishop  | (517)284-5938 | HardingJ3@michigan.gov    |

| Contract Summary  |                           |   |   |
|---|---------------------------|---|---|
| Description (Provide a basic but comprehensive description of services)   |                           |   |   |
| <b>“Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health”</b> |                           |   |   |
| Initial Term<br>2 yrs.  | Effective Date<br>5/26/14 | Initial Expiration Date<br>4/30/16  | Available Options<br>2, 1-year periods  |
| Payment Terms<br>Net 45   | F.O.B.<br><b>N/A</b>      | Shipped<br><b>N/A</b>   | Shipped From<br><b>N/A</b>  |
| Minimum Delivery Requirements<br><b>N/A</b>   |                           | Alternate Payment Options<br><input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV) | Available to MiDeal Participants<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| <b>ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION: \$44,954.00</b>   |                           |   |   |

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



**CONTRACT NO. 751B4300065**

**Between  
STATE OF MICHIGAN  
and**

*Required by authority of 1984 PA 431, as amended.*

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

| State Contact                 | Division               | Name                 | Telephone      | Email                     |
|-------------------------------|------------------------|----------------------|----------------|---------------------------|
| Contract Compliance Inspector | Fisheries              | Marlene Sublet-Smith | (517) 284-5837 | Subletsmithm@michigan.gov |
| Buyer                         | Finance and Operations | Jana Harding-Bishop  | (517) 284-5938 | HardingJ3@michigan.gov    |

| Contract Summary   |                           |   |   |
|--|---------------------------|---|---|
| Description (Provide a basic but comprehensive description of services)<br><b>“Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health”</b> |                           |   |   |
| Initial Term<br>2 yrs.   | Effective Date<br>5/26/14 | Initial Expiration Date<br>4/30/16  | Available Options<br>2, 1-year periods  |
| Payment Terms<br>Net 45  | F.O.B.<br>N/A             | Shipped<br>N/A  | Shipped From<br>N/A   |
| Minimum Delivery Requirements<br>N/A   |                           | Alternate Payment Options<br><input type="checkbox"/> P-Card <input type="checkbox"/> Direct Voucher (DV) | Available to MiDeal Participants<br><input type="checkbox"/> Yes <input checked="" type="checkbox"/> No |
| <b>ESTIMATED CONTRACT VALUE AT TIME OF EXECUTION: \$44,954.00</b>  |                           |   |   |

**THIS IS NOT AN ORDER:** This Contract Agreement is awarded based on our Call for Project RFP with a due date of April 9, 2014. Orders for delivery will be issued directly by the Michigan Department of Natural Resources through the issuance of a Purchase Order Form.

**FOR THE CONTRACTOR:**

Michigan State University  
\_\_\_\_\_  
Firm Name  
On-file in DNR Procurement  
\_\_\_\_\_  
Authorized Agent Signature  
Diane Cox, Senior Contract and Grant Administrator  
\_\_\_\_\_  
Authorized Agent (Print or Type)  
8/18/14  
\_\_\_\_\_  
Date

**FOR THE STATE:**

On-file in DNR Procurement  
\_\_\_\_\_  
Signature  
Jana Harding-Bishop/Buyer  
\_\_\_\_\_  
Name/Title  
DNR Finance and Operations/Procurement  
\_\_\_\_\_  
Division/Section  
8/19/14  
\_\_\_\_\_  
Date

## STATE OF MICHIGAN TERMS AND CONDITIONS

### I-A PURPOSE

This contract consists of the State of Michigan's (State) terms and conditions and the work statement (Attachment A). This contract 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: **"Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health"**, MSU Reference No. 136787 in collaboration with Fisheries Division of the Michigan Department of Natural Resources (DNR). Project completion date is **April 30, 2016**.

### I-B ISSUING OFFICE/CONTRACT ADMINISTRATOR

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  
(517) 284-5938

### I-C CONTRACT STAFFING

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 oversee the contract on a day-to-day basis during the term of the contract. However, oversight 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 Project Manager is:

Nicholas Popoff  
Department of Natural Resources  
Fisheries Division  
P.O. Box 30444  
Lansing, MI 48909  
Telephone: (517) 284-6235  
Fax: (517) 373-0381  
Email: [popoffn@michigan.gov](mailto:popoffn@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. Brian Roth, (PI)  
Department of Fisheries and Wildlife  
Michigan State University  
334F Natural Resources Bldg.  
East Lansing, MI 48824  
Telephone: (517) 353-7854  
Email: rothbri@msu.edu

Dr. Michael Jones, (Co-PI)  
Department of Fisheries and Wildlife  
Michigan State University  
7 Natural Resources Bldg.  
East Lansing, MI 48824  
Telephone: (517) 353-0647  
Email: jonesm30@msu.edu

Daniel Hayes (Co-PI)  
Department of Fisheries and Wildlife  
Michigan State University  
334C Natural Resources Bldg.  
East Lansing, MI 48824  
Telephone: (517) 432-3781  
Email: hayesdan@msu.edu

DNR 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 modifications, amendments, and conditions of this 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-Smith  
Program Support, Fisheries Division  
Constitution Hall, 5<sup>th</sup> Floor, NE  
525 W. Allegan Street  
Lansing, MI 48933  
Telephone: (517) 284-5837  
Email: [subletsmithm@michigan.gov](mailto:subletsmithm@michigan.gov)

#### I-D PROGRAM OF WORK

Specific program objectives and deliverables are detailed in the attached statement of work (**ATTACHMENT A**).

#### I-E DELIVERABLES

|   |                |
|---|----------------|
| Annual Progress Report  | April 30, 2015 |
| Conduct a Risk Assessment Workshop  | (TBD) in 2015  |
| Distribution report on rusty crayfish indicating their locations.   | April 30, 2016 |
| Report which will assess the overall risk for the establishment of red swamp crayfish in the State of Michigan. |                |
|   | April 30, 2016 |
| Final Report  | April 30, 2016 |

## I-F PROJECT CONTROL AND REPORTS

### Reports:

|   |                |
|---|----------------|
| Annual Progress Report  | April 30, 2015 |
| Distribution report on rusty crayfish indicating their locations.   | April 30, 2016 |
| Report which will assess the overall risk for the establishment of red swamp crayfish in the State of Michigan. | April 30, 2016 |
| Final Report  | April 30, 2016 |

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

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

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

The MSU Principal Investigator is responsible for providing annual progress reports, conduct of a Risk Assessment workshop, master's thesis, Crayfish distribution maps, Crayfish survey design, and manuscript based on risk analysis. A final report to the DNR contract manager in written and electronic format by the specified dates(s). A template for these reports will be provided by the DNR contract manager 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 contract manager listed in I-C.

## I-G 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 (34%) is the waiver of normal overhead charges per the Agreement between MSU and DNR, executed September 5, 2013.

Determination on whether submitted invoices will be processed is at the discretion of the DNR Project Manager. Upon receipt of the invoice the Project Manager will review the project, determine if work is being accomplished to contract standards and whether the tasks and deliverables are on schedule.

Final payment will be withheld until final report is submitted.

## I-H MODIFICATIONS OF CONTRACT

This contract may be modified if 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-I 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-J SEVERABILITY

Each provision of this contract shall be deemed 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-K 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-L 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 an employee, agent, or servant of the State for any reason.

#### I-M 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-N 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-O 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 that was compensated under the contract.

#### Ownership of Samples\Equipment

Any samples provided by the DNR for use under this contract will remain the sole property of the DNR and must be returned upon the request of the DNR Project Manager

At the end of the project period, the DNR will retain ownership of any supplies/equipment purchased with funding under this contract and for the purposes of the project which are not consumed while completing the project. The supplies/equipment must be returned to the State upon the request of the DNR Project Manager.

#### I-P 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-Q 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-R 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-S 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-T 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-U 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-V 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 DNR, 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-W 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-X 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-Y 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-Z 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-AA 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-BB 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-CC 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-DD 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-EE 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-FF 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 two (2) one (1) year periods.

#### I-GG 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-HH 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.

# Attachment A

Michigan Department of Natural Resources  
Study Proposal 230011/50

Proposed Timeframe: May 2014-May 2016

**Name of Study:** Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health.

**A. Problem:** Crayfish are critical components of freshwater diversity and ecology. In many aquatic systems, crayfish comprise more biomass than all other benthic invertebrates combined. Crayfish are often considered ‘keystone species’, in that their influence on ecosystem properties extends both above and below their own trophic level (Lodge et al. 1994). Much of the knowledge regarding the ecological effects of crayfish derives from studies of invasive crayfish species that have caused substantial disruption of aquatic food webs in inland lakes. In the Great Lakes region, effects of non-native rusty crayfish (*Orconectes rusticus*) are particularly well-studied and include direct and cascading effects on periphyton, macrophytes, benthic invertebrates, and fish (Lodge and Lorman 1987; Olsen et al. 1991; Roth et al. 2006). The potential effects of non-native crayfish invasions on food webs in Michigan inland lakes is thus of considerable concern to Michigan fishery managers. Our ability to assess these effects is constrained by limited knowledge of the current distribution of invasive crayfish in Michigan, and by the lack of a comprehensive assessment of the risks of new invasions and the further spread of existing populations.

**Problem statement #1:** *Relatively little information exists about crayfish in Michigan. Crayfish were last comprehensively surveyed in Michigan in 1931 (Creaser 1931), with limited coverage thereafter (Charlebois and Lamberti 1996). A comprehensive assessment of the distribution of native and non-native crayfish in Michigan lakes and streams is long overdue.*

Surveying a large water-rich state like Michigan to determine the distribution of any aquatic species poses numerous fiscal and logistic challenges; simply put it is not feasible to conduct a census of all water bodies across the state. As such, it is critical to use a method for site selection that allows for inference across the population of water bodies state-wide. It is also important that the sampling approach allows for sampling to emphasize areas likely to contain the target species. A number of sampling designs could be applied to this problem; however stratified random sampling provides the capacity to provide state-wide estimates while allowing for finer scale spatial inference as well as greater sampling allocation to areas of higher importance.

Cataloging current crayfish distributions in Michigan is becoming more critical with the imminent invasion of red swamp crayfish (*Procambarus clarkii*). Red swamp crayfish are notorious invaders, and have been introduced to many countries worldwide (Hobbs et al. 1989). More locally, red swamp crayfish have been found in Lake Michigan and Lake Erie (Simon and Thoma 2006), but no documented cases exist for Michigan inland waters. A key to managing the threat posed by invasive crayfish in Michigan is an objective assessment of the risk of both new invasions and of the spread of already established populations. This should assist development and implementation of preventative strategies to minimize the probability of new invasions and further spread. For example, one preventative strategy, currently used by MDNR, is to prohibit the possession of live crayfish to minimize the probability that live individuals are introduced to new water bodies. A potential drawback of this strategy is that intensive harvest of live crayfish from existing populations could reduce negative effects of invasions (Hein et al. 2006). However, an inherent risk of this alternative strategy would be the potential for further range expansion due to mishandling live crayfish.

**Problem statement #2:** *The risks associated with management strategies currently in place or under consideration for prevention and control of rusty and red swamp crayfish invasions are*

*not well understood, which limits the ability of managers to make informed decisions about this issue.*

Risk assessments are intended to assist decision-makers by informing them about the expected consequences of alternative management strategies. Virtually any significant fisheries management decision involves uncertainty, and a risk assessment provides a systematic approach to account for this uncertainty, and to determine whether what is judged to be the most appropriate course of action is altered when uncertainty (and the risk that is caused by uncertainty) is considered. A comprehensive risk assessment involves careful consideration of the range of management options available to the decision-maker, the set of ecological and socio-economic outcomes that would inform the decision-maker about whether management objectives are being met, and a synthesis of the available knowledge that can contribute to forecasts of how these outcomes might be affected by the alternative management options.

A risk assessment for invasive crayfish in Michigan would need to consider management options that are intended to affect the probability of new introductions, such as live possession bans, and options that are intended to reduce the probability of spread of established populations, such as suppression of relatively abundant populations. The probabilities associated with such management options are generally not well understood, but plausible estimates can be obtained through literature review and engagement with experts and decision-makers. Even when confidence in the conclusions of a risk assessment is reduced by limited knowledge of these probabilities, the process of conducting such an assessment can be very insightful for managers because of the systematic and objective nature of the analysis.

#### **B. Objectives:**

- 1) Determine the distribution of all crayfish (but focusing on invasive rusty and red swamp crayfish) in Michigan lakes and streams using a statistically valid sampling frame.
- 2) Assess the risks of invasive crayfish introduction and spread into Michigan lakes and streams and quantify how the risks are influenced by alternative management strategies.

**C. Expected Outcomes and Benefits:** Given the importance of crayfish in aquatic ecosystems, knowledge of how invasive crayfishes are distributed will provide valuable information regarding where best to conserve native crayfish species. Further, this study will provide baseline information (i.e., maps) on crayfish distributions for comparison with future surveys so potential invasion pathways can be quickly determined and mitigated. Our risk assessment will aid managers in determining the most appropriate strategy for limiting the threats to ecological and socio-economic values in Michigan waters potentially caused by these invasive species. Lastly, our sampling design will create a model for future surveys to examine crayfish distributions.

#### **D. Procedure/Methods:**

Job 1. Develop a sampling protocol for assessing crayfish distributions in Michigan

Our approach will be to develop a stratified random sampling design for lakes with public access and for stream segments across the state of Michigan. In 2014, we will use the sampling frame (i.e., list of lakes and stream segments) and stratification levels currently used in the Status and Trends program within the Fisheries Division. Following the 2014 sampling season, we will evaluate the effectiveness of these strata for estimating the overall distribution of these crayfish species.

Stratification for lakes currently is based on lake size and fishery management unit, which represents elements of geographic location (e.g., north-south gradients) as well as connectivity to Great Lakes basins. These factors are anticipated to have some relationship to the probability that a lake contains invasive crayfish species. If red swamp crayfish have invaded Michigan, they are more likely to occur in the southern or western Lower Peninsula; sampling allocation within the stratified random design will emphasize those fishery management units perceived to be at higher risk. We will determine final sampling allocation in consultation with fisheries division staff and other experts. Stratification for streams is currently based on stream size, fishery management unit, and broad temperature designation (i.e., cold, cool, warm). As above, sampling allocation will emphasize strata judged to be at higher risk.

In implementing this sampling design, we propose to focus our initial sampling on lakes and stream segments that have recently been sampled in the status and trends program. These sites, having been chosen at random, will allow us to maintain the statistical rigor of the stratified random sampling design, but will allow us to integrate the crayfish data with previously collected data on habitat and fish community composition, factors that are likely to have an influence on the probability of occurrence of invasive crayfish species.

Issues of incomplete detectability are currently a major research theme in terrestrial wildlife research (e.g. MacKenzie et al. 2006), but have not been as well recognized or addressed in aquatic studies. Of particular importance are false negatives, where a species is present within a lake or stream segment, but is not detected with the level of sampling applied. We propose to explore methods for estimating detection probability by sampling a subset of sites two or more times, and applying an occupancy model. Our initial thoughts on this are to sample a subset of sites in both 2014 and 2015, but we will refine details of this in consultation with fisheries division staff.

## Job 2. Perform a survey to determine crayfish distributions in Michigan

We will sample lakes and streams according to the sampling framework described in Job 1. We will use sampling methods described by Olden et al. (2006), which consist of a combination of baited modified minnow traps and dip netting. Briefly, lakes and riverine locations only navigable by boat (e.g. drowned river mouths) will be sampled with 10 modified minnow traps (entrance holes ca. 5 cm diameter) baited with beef liver or sardines that are set on a variety of substrate types, set overnight. Discussion with one of the authors of the Olden et al. (2006) study suggested that minnow traps were less effective in wadeable streams, and that dip netting alone provided the best catch rates. Each stream site will be sampled by two people for 30 minutes, which will provide an adequate assessment of crayfish presence and species composition (WW Fetzer, personal communication). Wetland and pond sites are of particular interest for species composition information and risk assessment, as these locations often host semi-terrestrial native crayfish species (e.g. devil crayfish, *Cambarus diogenes*; digger crayfish *Fallicambarus fodiens*; calico crayfish *Orconectes immunis*), and are likely vulnerable to red swamp crayfish invasion given their semi-terrestrial lifestyle. To sample these areas, we will use dip nets, as minnow traps are not an efficient means to capture wetland crayfish (Dorn et al. 2005).

We will sample approximately 200 sites per year over the two-year study period. Roughly half (100) will be from lake sites, whereas the other half will be divided between stream and wetland/pond sites. Final site locations will be determined in concert with our sampling protocol and with consultation with MDNR collaborators. All site locations will be recorded with a hand-held GPS unit, and transferred to a GIS framework to create a map of sampled locations. As we plan to sample more than one site per day, care will be taken to treat vehicles, boats, and gear with a bleach solution to avoid transferring VHS and invasive species between water bodies.

Individuals captured at each site will be identified to species and counted. Standardized collection methods will allow us to develop an index of abundance, although quantitative comparison between lakes (traps) and rivers (dip-nets) will not be possible. Voucher specimens collected from each site will be stored in ethanol for identification in the laboratory. While *Orconectes* crayfishes are generally easy to identify, Cambarid crayfishes (e.g. *Fallicambarus* and *Procambarus*) species are more difficult.

Job 3. Perform a risk analysis to assess the potential for invasion of rusty crayfish and red swamp crayfish into Michigan lakes and streams and the ecological consequences of this invasion

Our risk assessment will rely on a thorough review of the literature on invasion dynamics of non-native aquatic species (e.g., Cruz and Rubelo 2006, Olden et al, 2011), with a focus on macro-invertebrates but not limited to these taxa. We will also examine published models of invasion risk and spread (e.g., Kolar and Lodge 2002; Hyder et al, 2008) and reviews of invasion risk assessments from other regions and ecosystems (e.g., Simberloff 2003, Leung et al. 2002). Considerable research has been conducted on the threats and consequences of rusty crayfish invasion in Wisconsin lakes and streams (e.g. Olden et al. 2011, Hansen et al. 2013), which will greatly facilitate the development of an initial risk model. This literature assessment will set the stage for a workshop with DNR biologists, aquatic invasive species experts, and possibly stakeholders with experience related to risks of accidental introductions (e.g., bait shop operators). At the workshop we will present a preliminary (qualitative) risk model for rusty and red swamp crayfish introduction and spread, identifying the sequence of risks (and probabilities) associated with initial introduction, population establishment, spread to other systems, and impacts on native species and communities. The model will, in part, be based on an initial determination of the management options that could be considered (or are currently in place) to affect these risks, developed in consultation with DNR staff. The participants at the workshop will be asked to critique the model, suggest additional management options to consider, and provide expert opinion on the probabilities associated with each component risk. Following the workshop we will refine the risk model based on input from the participants, and use the probabilities derived from both expert opinion and published research to enable a quantitative assessment of risks. We emphasize that while this engaged model-building approach will provide an objective and transparent approach to quantifying invasion risk, the uncertainties associated with this analysis will most likely be very large, making unequivocal conclusions about appropriate management strategies elusive. Nevertheless we contend that this approach is substantially more likely to yield useful guidance for managers than a more ad-hoc, qualitative methodology.

We will complete the literature review and initial model development during the fall and winter of 2014/15, after one field season is complete but before the second field season. The workshop will be held in spring 2015, at a time when the discussions can benefit from the results of the first field season, and at the same time potentially influence the design of the sampling program in Year 2, because the modeling discussions may lead to identification of a critical information need that could be addressed through sampling (e.g., quantification of the average distance between infested water bodies), and that would in turn reduce uncertainty in the risk models.

Job 4. Write annual performance report.

Job 5. Write final report. A final report citing the publication produced under job # will be prepared.

Job 6. Write manuscript(s) based on risk analysis and results of distribution sampling.

**G. Schedule:**

---

| Proposed Work Schedule                | 2014-<br>Summer | 2014-<br>Fall | 2015-<br>Spring | 2015-<br>Summer | 2015-Fall,<br>Winter | 2016-<br>Spring |
|---------------------------------------|-----------------|---------------|-----------------|-----------------|----------------------|-----------------|
| Job 1 Develop a sampling protocol     | X               |               |                 |                 |                      |                 |
| Job 2 Perform survey                  | X               | X             | X               | X               |                      |                 |
| Job 3 Perform risk analysis           |                 |               | X               |                 | X                    |                 |
| Job 4 Write annual performance report |                 | X             |                 |                 | X                    | X               |
| Job 5 Write final report              |                 |               |                 |                 | X                    | X               |
| Job 6 Write manuscript(s)             |                 |               |                 |                 | X                    | X               |

---

**H. Geographical locations:** Please identify the locations where the study will occur. Specific locations are not required, but waterbodies or watersheds are.

We will perform the survey throughout the state of Michigan, focusing on the western and southern portions of the Lower Peninsula. Specific sampling locations will be determined in consultation with collaborators from the Michigan DNR.

**I. Personnel:**

Brian Roth (PI)-Crayfish identification, sampling design

Dan Hayes (Co-PI)-Sampling design

Michael Jones (Co-PI)-Risk assessment

Master's level Graduate Assistant (TBD)-Sampling, risk assessment

Undergraduate assistant (TBD)-Sampling

**J. Products and deliverables:** Identify all manuscripts, presentations, workshops, etc. that are expected during and at the end of the project timeframe.

Annual reports (2015)

Risk assessment workshop (2015)

Final report (2016)

Master's thesis (2016)

Crayfish distribution maps (2016)

Crayfish survey design (2015)

Manuscript based on risk analysis (2016)0

**K. Detailed Budget:** Please see **Attachment B**

## Literature Cited

- Charlebois, P. M., and G. A. Lamberti. 1996. Invading crayfish in a Michigan stream: direct and indirect effects on periphyton and macroinvertebrates. *Journal of the North American Benthological Society* 15(4):551-563.
- Creaser, E. P. 1931. The Michigan decapod crustaceans. *Papers of the Michigan Academy of Science, Arts and Letters* 13:257-276.
- Cruz, M.J., and R. Rubelo 2006. Colonization of freshwater habitats by an introduced crayfish, *Procambarus clarkii*, in Southwest Iberian Peninsula. *Hydrobiologia* 575: 191-201
- Dorn, N., R. Urguelles, and J. Trexler. 2005. Evaluating active and passive sampling methods to quantify crayfish density in a freshwater wetland. *Journal of the North American Benthological Society* 24(2):346-356.
- Hansen, G.J.A., C.L. Hein, B.M. Roth, M.J. Vander Zanden, J.W. Gaeta, A.W. Latzka, and S.R. Carpenter. 2013. Food web consequences of long-term invasive crayfish control. *Can. J. Fish. Aquat. Sci.* 70: 1109–1122.
- Hein, C. L., B. M. Roth, A. R. Ives, and M. J. V. Zanden. 2006. Fish predation and trapping for rusty crayfish (*Orconectes rusticus*) control: a whole-lake experiment. *Canadian Journal of Fisheries and Aquatic Sciences* 63(2):383-393.
- Hobbs, H. H. I., J. P. Jass, and J. V. Huner. 1989. A review of global crayfish introductions with particular emphasis on two North American species (Decapoda, Cambaridae). *Crustaceana* 56(3):299-316.
- Hyder, A., B. Leung, and Z. W. Miao. 2008. Integrating data, biology, and decision models for invasive species management: Application to leafy spurge (*euphorbia esula*). *Ecology and Society* 13.
- Kolar, C. S., and D. M. Lodge. 2002. Ecological predictions and risk assessment for alien fishes in North America. *Science* 298:1233-1236.
- Leung, B., D. M. Lodge, D. Finnoff, J. F. Shogren, M. A. Lewis, and G. Lamberti. 2002. An ounce of prevention or a pound of cure: Bioeconomic risk analysis of invasive species. *Proceedings of the Royal Society of London Series B* 269:2407-2413.
- Lodge, D. M., M. W. Kershner, J. E. Aloï, and A. P. Covich. 1994. Effects of an omnivorous crayfish (*Orconectes rusticus*) on a freshwater littoral food web. *Ecology* 75(5):1265-1281.
- Lodge, D. M., and J. G. Lorman. 1987. Reductions in submersed macrophyte biomass and species richness by the crayfish *Orconectes rusticus*. *Can. J. Fish. Aquat. Sci.* 44:591-597.
- MacKenzie, D. I., and coauthors. 2006. *Occupancy Estimation and Modeling: Inferring Patterns and Dynamics of Species Occurrence*. Academic Press, San Diego, CA, USA.
- Olden, J., J. McCarthy, J. Maxted, W. Fetzer, and M. Vander Zanden. 2006. The rapid spread of rusty crayfish (*Orconectes rusticus*) with observations on native crayfish declines in Wisconsin (U.S.A.) over the past 130 years. *Biological Invasions* 8:1621-1628.
- Olden, J., VanderZanden, M.J., and Johson, P.T.J. 2011. Assessing ecosystem vulnerability to invasive rusty crayfish (*Orconectes rusticus*). *Ecological Applications* 21:2587-2599.
- Olsen, T. M., D. M. Lodge, G. M. Capelli, and R. J. Houlihan. 1991. Mechanisms of impact of an introduced crayfish (*Orconectes rusticus*) on littoral congeners, snails, and macrophytes. *Can. J. Fish. Aquat. Sci.* 48:1853-1861.
- Roth, B. M., C. L. Hein, and M. J. V. Zanden. 2006. Using bioenergetics and stable isotopes to assess the trophic role of rusty crayfish (*Orconectes rusticus*) in lake littoral zones. *Canadian Journal of Fisheries and Aquatic Sciences* 62(3):335-344.
- Simberloff, D. 2003. How much information on population biology is needed to manage introduced species? *Conservation Biology* 17:83-92.
- Simon, T., and R. Thoma. 2006. Native and alien distribution of crayfish assemblages in drowned river mouth coastal wetlands of Lake Michigan. Pages 375-382 in T. Simon, and P. Stewart, editors. *Coastal wetlands of the Laurentian Great Lakes: health, habitat, and indicators*. AuthorHouse, Bloomington, IN.

82650-77505 – 230011/50

PO No.: \_\_\_\_\_

100% Federal Fund

**Attachment B**

Dates: 05/26/14 - 04/30/15

|  | <b>Contract<br/>Amount</b> | <i>Matching<br/>Funds*</i> | <b>Total Project<br/>Cost</b> |
|--|----------------------------|----------------------------|-------------------------------|
| <b>SALARY/WAGES (See note below)</b>                 |                            |                            |                               |
| Principal Investigator                               | 0                          |                            | 0                             |
| Graduate student                                     | 0                          |                            | 0                             |
| Temp Hourly -  | 5,600                      |                            | 5,600                         |
| <b>Total Salary/Wages</b>                            | <b>5,600</b>               | <b>0</b>                   | <b>5,600</b>                  |
| <b>FRINGE BENEFITS</b>                               |                            |                            |                               |
| Principal Investigator                               |                            |                            | 0                             |
| Graduate student (health care through<br>fellowship) | 2,037                      |                            | 2,037                         |
| Temp Hourly -  | 428                        |                            | 428                           |
| <b>Total Fringe Benefits</b>                         | <b>2,465</b>               | <b>0</b>                   | <b>2,465</b>                  |
| <b>Total Personnel Costs</b>                         | <b>8,065</b>               | <b>0</b>                   | <b>8,065</b>                  |
| <b>OPERATING COSTS</b>                               |                            |                            |                               |
| Research Supplies & lab fees                         | 856                        |                            | 850                           |
| General Supplies( include computer & Parts)          |                            |                            | 0                             |
| Phone  |                            |                            | 0                             |
| Postage  |                            |                            | 0                             |
| Printing/Copy Charges                                |                            |                            | 0                             |
| Publication/Page Reprint Charges                     |                            |                            | 0                             |
| Conference, Workshops                                | 1,500                      |                            | 1,500                         |
| Tuition (covered with a fellowship)                  | 9,318.75                   |                            | 9,319                         |
| <b>Total Operating Costs</b>                         | <b>11,715</b>              | <b>0</b>                   | <b>11,669</b>                 |
| <b>TRAVEL</b>  |                            |                            |                               |
| Domestic Travel                                      | 3,500                      |                            | 3,500                         |
| <b>Total Travel</b>                                  | <b>3,500</b>               | <b>0</b>                   | <b>3,500</b>                  |
| <b>TOTAL DIRECT COSTS</b>                            | <b>23,234</b>              | <b>0</b>                   | <b>23,234</b>                 |
| Indirect cost base                                   |                            | 12,430                     | 12,430                        |
| <b>INDIRECT COSTS (may not exceed 5%)</b>            |                            |                            |                               |
| <b>TOTAL COSTS by source</b>                         | <b>23,234</b>              | <b>0</b>                   | <b>35,664</b>                 |

**Year Two Budget**

**Dates: 05/1/15 – 4/30/16**

|   | <b>Contract Amount</b> | <i>Matching Funds*</i> | <b>Total Project Cost</b> |
|---|------------------------|------------------------|---------------------------|
| <b>SALARY/WAGES (See note below)</b>              |                        |                        |                           |
| Principal Investigator                            |                        |                        | 0                         |
| Graduate student                                  |                        |                        | 0                         |
| Temp Hourly -                                     | 5,600                  |                        | 5,600                     |
| <b>Total Salary/Wages</b>                         | <b>5,600</b>           | <b>0</b>               | <b>5,600</b>              |
| <b>FRINGE BENEFITS</b>                            |                        |                        | 0                         |
| Principal Investigator                            |                        |                        | 0                         |
| Graduate student (health care through fellowship) | 2200                   |                        | 2,200                     |
| Temp Hourly -                                     | 428                    |                        | 428                       |
| <b>Total Fringe Benefits</b>                      | <b>2,628</b>           | <b>0</b>               | <b>2,628</b>              |
| <b>Total Personnel Costs</b>                      | <b>8,228</b>           | <b>0</b>               | <b>8,228</b>              |
| <b>OPERATING COSTS</b>                            |                        |                        | 0                         |
| Research Supplies & lab fees                      | 300                    |                        | 300                       |
| General Supplies( include computer & Parts)       |                        |                        | 0                         |
| Phone   |                        |                        | 0                         |
| Postage   |                        |                        | 0                         |
| Printing/Copy Charges                             |                        |                        | 0                         |
| Publication/Page Reprint Charges                  |                        |                        | 0                         |
| Conference, Workshops                             |                        |                        | 0                         |
| Tuition (covered with a fellowship)               | 9,692                  |                        | 9,692                     |
| <b>Total Operating Costs</b>                      | <b>9,992</b>           | <b>0</b>               | <b>9,992</b>              |
| <b>TRAVEL</b>                                     |                        |                        |                           |
| Domestic Travel                                   | 3,500                  |                        | 3,500                     |
| <b>Total Travel</b>                               | <b>3,500</b>           | <b>0</b>               | <b>3,500</b>              |
| <b>TOTAL DIRECT COSTS</b>                         | <b>21,720</b>          | <b>0</b>               | <b>21,720</b>             |
| Indirect cost base                                |                        | 11,620                 | 11,620                    |
| <b>INDIRECT COSTS (may not exceed 5%)</b>         |                        |                        |                           |
| <b>TOTAL COSTS by source</b>                      | <b>21,720</b>          | <b>0</b>               | <b>33,340</b>             |