

**REGIONAL AQUACULTURE EXTENSION SPECIALIST (RAES)**

**Chairperson:** Christopher T. Weeks, Michigan State University

**Industry Advisory Council Liaison:** William E. Lynch, Jr., Marysville, Ohio

**Extension Liaison:** Kwamena Quagrainie, Purdue University

**Funding Request:** \$103, 347

**Duration:** 1 Year (September 1, 2014 - August 31, 2015)

**Objectives:**

1. Continue RAES support to the NCRA Aquaculture Community through ongoing activities in areas of liaison services, leadership, assessing and addressing industry needs and information transfer.
2. Develop and implement strategies to address AIS in aquaculture and baitfish in the NCR.
3. Develop and strengthen partnerships from within the NCR and outside the region among regulatory agencies, industry, academia, and other relevant entities to foster open, meaningful dialog on critical issues and build support for the NCR aquaculture industry.
4. Coordinate efforts for seeking non-NCRAC support for NCR aquaculture development.

**Deliverables:**

1. Maintaining updates to the NCRAC regulation website.
2. Attend state association meetings and provide support, including updates and presentations.
3. Continue with eXtension.org, Ask-an-Expert.
4. Continue information outlet and topical news on the NCR fish culture list-serv.
5. Provide leadership for AIS HACCP verification.
6. Establish a model for AIS HACCP verification.
7. Represent NCR aquaculture industry at state, regional, and national fisheries/aquaculture meetings.
8. Establish partnerships for NCR aquaculture industry development, submitting at least one grant proposal per year for NCR industry support.

**Proposed Budget:**

<b>Institution</b>	<b>Principal Investigator</b>	<b>Objectives</b>	<b>Year 1</b>	<b>Total</b>
Michigan State University	Christopher T. Weeks	1 - 4	\$103, 347	\$103, 347
<b>Total</b>			<b>\$103, 347</b>	<b>\$103, 347</b>

**Non-funded Collaborators:**

<b>Institution</b>	<b>Collaborator</b>
Michigan Sea Grant	Ronald E. Kinnunen
Iowa State University	D. Allen Pattillo

**TABLE OF CONTENTS**

SUMMARY OVERVIEW (OBJECTIVES, DELIVARABLES, PROPOSED BUDGETS AND PARTICIPANTS) ..... 1

PROJECT SUMMARY ..... 3

JUSTIFICATION ..... 3

RELATED CURRENT AND PREVIOUS WORK ..... 4

ANTICIPATED BENEFITS..... 5

OBJECTIVES ..... 6

PROCEDURES ..... 6

PROJECT DELIVERABLES ..... 8

FACILITIES ..... 8

REFERENCES..... 9

PROJECT LEADERS..... 10

BUDGET

    BUDGET ..... 11

    BUDGET EXPLANATION ..... 12

        Michigan State University (Weeks – Objectives 1-4)

SCHEDULE FOR COMPLETION OF OBJECTIVES..... 13

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS ..... 13

CURRICULUM VITAE FOR PRINCIPAL INVESTIGATORS AND PROJECT LEADERS ..... 14

## PROJECT SUMMARY

This Regional Aquaculture Extension Specialist (RAES) is proposed as a continuation work plan, first undertaken in 2008 by the current PI, to provide leadership and enhance information transfer to the aquaculture industry in the North Central Region (NCR). Objectives have been expanded upon each renewed project cycle and now include maintaining current program activities, as well as finding new avenues for industry support and development towards sustainable aquaculture in the region. To date, the RAES project has helped strengthen partnerships and cooperative effort among academic personnel, regulators, and agricultural business associates across the region, helped make notable strides in addressing regulatory concerns impacting aquaculture and baitfish industries, and identify needs and strategies for sustainable aquaculture development within the NCR. In this project cycle the RAES will complete an assessment of the potential for expanding the Aquatic Invasive Species Hazard Analysis and Critical Control Point (AIS HACCP) plan into a recognized certification program, begin implementation of such a plan provided task force consensus, continue to build partnerships with shared interests for aquaculture development in the region, help coordinate research, development and outreach, and continue to seek non NCRAC support for regional aquaculture and baitfish industry sector development in the NCR.

## JUSTIFICATION

Globally, aquaculture production for food fish has grown at a rate of 8.8% annually since 1980 (FAO 2012), and now meets nearly half the world's seafood supply. However, aquaculture production in North America shows only a 2.0% annual increase since the year 2000. US Catfish production (product sold to processors) has dropped dramatically from 662 to 300 million pounds from its peak in 2003 to 2012 (USDA 2013). In Idaho, trout production appears to be at capacity and water resource issues are becoming increasingly more critical at this time. US tilapia production is dominated by 3 major commercial suppliers, although numerous smaller facilities are operating or planned across the nation, including within the North Central Region (NCR). Most of the tilapia market is live fish sales to ethnic markets in US and Canada, and ability of existing markets to absorb additional product is questionable. Fresh and frozen tilapia fillets imports from Asia and South America to North America are priced much lower than what is achievable in indoor recirculating aquaculture systems in the US. Freshwater fish production in the US has declined in value by nearly 14% since 2006 (FAO 2013), and the value of US bait production is down from a peak of over \$70 million in 1997 to less than \$40 million 2005 (MSU 2013). The US marine shellfish industry appears to be the only seafood production sector gaining considerable ground, recently exceeding product value of catfish and growing from a value of 132 million in 2000, to \$432 million in 2011 (FAO 2013).

Aquaculture in the North Central Region (NCR) of the U.S. could be characterized as an industry trying to sustain itself over a period of difficult economic and regulatory uncertainties. Large scale aquaculture operations require high capital investment, and considered by many as a high risk venture for various reasons. The current regulatory environment is more restrictive than promotional in nature and considered by many as a major threat to profitable aquaculture trade within the region. Cooperation among current producers, academia and regulatory authorities could be greatly improved, and the general public remains relatively uneducated about, or misinformed on, the quality, availability, safety and human health benefits associated with regionally grown seafood products. Continued coordinated effort is needed across the NCR in support for a growing aquaculture industry.

Commercial production in the NCR is dominated by pond raised game fish for stocking, cultured and wild harvested baitfish, and flow-through trout production. Food fish in the region is comprised mainly of tilapia and trout, although seafood production is low compared to marine resource regions, southern catfish production and Idaho trout. There appears to be growing interest in recirculating aquaculture systems (RAS) and aquaponics for food. However, few RAS startups in the NCR have shown large scale success to date, and aquaponics is considered a niche market opportunity. According to U.S. Department of Agriculture (USDA 2007) Aquaculture Census Data, the value of commercial aquaculture products sold in the NCR increased from \$28 million in 1998 to \$35.4 million in 2005. This equates to a

3.8% annual increase, which is approximately half of that observed globally. To demonstrate the importance of baitfish in the region, removing Minnesota's production from the census data reduces the NCR aquaculture value increase to 1.3% annually from 1998 to 2005.

The mission of the North Central Regional Aquaculture Center (NCRAC) is to enhance aquaculture through education, research, and technology transfer to support a sustainable profitable industry throughout the NCR (NCRAC 1999). Research projects funded by the Center have focused primarily on native species with good potential as food fish or baitfish, although additional research has been undertaken on fish nutrition, aquaculture effluents, aquaculture drugs, and tilapia. NCRAC also supports regional extension and outreach programs for transfer of research and technologies to the industry. During the NCRAC 2013 Annual Planning Meeting, the Industry Advisory Council (IAC) and the NCRAC Board of Directors lifted up this RAES project for an additional 1-year term spanning September 1, 2014 - August 31, 2015. It is the goal of the RAES project team to support the NCR aquaculture industry by providing the means necessary to meet the objectives described herein.

### **RELATED CURRENT AND PREVIOUS WORK**

NCRAC is one of five Regional Aquaculture Centers (RACs) administered by the U.S. Department of Agriculture's National Institute of Food and Nutrition. Extension and outreach has been an important component to NCRAC since its inception in 1988 (Swann and Morris 2001). Fifteen "Base," or stand-alone, extension projects have been funded through the Center.

In addition to NCR extension activities, there are a number of active local (state), national, and academic aquaculture extension programs for which partnership opportunities exist in the region. Examples include the National Sea Grant College Program, state university aquaculture programs, state commerce and agricultural development programs, Indiana Soybean Board, and Soy Aquaculture Alliance. Maintaining effective partnerships and communications is extremely important for industry development and one of the primary objectives of this work plan.

Originally awarded to Ohio State University (OSU) for the period 2005 – 2007, the RAES project was extended through August 31, 2009. The current Project Chairperson, Chris Weeks, took on the RAES position on a contractual basis through OSU in March 2008. The project was lifted up for open proposal submission by NCRAC for three consecutive continuation cycles 2008-2014.

Objectives for the original RAES project were as follow:

1. Provide leadership for the aquaculture industry in the NCR.
2. Enhance information transfer.

For 2009 – 2014 RAES continuations, objectives were expanded to include:

- Continue RAES support to the NCR aquaculture community through ongoing activities through liaison services, leadership responsibilities, assessing and addressing industry needs, and information transfer.
- In conjunction with the NCRAC Industry Advisory Council and state aquaculture extension contacts, assess and prioritize North Central Region (NCR) industry needs, focusing on issues with regional significance.
- Develop and implement strategies to address pertinent needs - interact with pertinent NCRAC and non-NCRAC aquaculture initiatives to accomplish identified strategies.
- Develop and implement strategies to address and promote aquaculture sustainability in the NCR.

- Develop and strengthen partnerships and facilitate “linkages” among agencies, industry, academia, and other relevant entities to foster open, meaningful dialog on critical NCR issues.
- Coordinate efforts for seeking non-NCRAC support to facilitate information and technology transfer to the industry.
- Examine regional aquaculture development and assess NCRAC research and extension activities in terms of impacts on the NCR aquaculture industry. Make recommendations for improving NCRAC projects in terms of incorporating measures of program success.

In the position of RAES, Weeks has attended association meetings in each state across the NCR where such meetings have been held. He has facilitated, or helped facilitate, a VHS Summit (U.S. Trout Farmers’ Association Annual Conference, Milwaukee, Wisconsin, 2008), a tuition waiver program for on-line aquatic animal veterinarian training (Fish Health Course, University of Wisconsin School of Veterinary Medicine, 2009), and a number of workshops across the region (e.g., Largemouth Bass Nutrition Workshop, Purdue University, 2008; NCRAC Baitfish Workshop, La Crosse Fish Health Center, 2010; AIS HACCP and Aquaculture Business Development, Dundee, Michigan 2012).

Past and current activities undertaken by the RAES also include:

- 2009 NCRAC Aquaculture Industry Needs Survey;
- Development and administration of two websites:
  - 1) NCRAC Roadmap information transfer website – provides easy information access to all RAC and former Aquaculture Network Information Center (AquaNIC) publications, industry related contacts, NCR state associations, events, etc.;
  - 2) North Central Region Aquaculture Contacts, Transport Regulations, and Approved Aquatic Species – summaries and access to all aquaculture and baitfish regulations for 12 NCR states and nine adjacent states, fish health contacts and laboratories, and approved aquatic species;
- Facilitate NCR aquaculture List Serve (140+ subscribers);
- Partnership with Michigan Department of Agriculture for the USDA 2008 Cooperative Agreements for VHS; alleviating VHS testing costs for Michigan producers and providing USDA APHIS important VHS surveillance information;
- Numerous presentations specific to commercial aquaculture development in the NCR, effect of VHS regulations on NCR aquaculture, interstate transport regulations, NCRAC protocols, sustainable aquaculture development, fish health maintenance, global aquaculture trends and impediments to the NCR aquaculture industry.
- Serving on various aquaculture development, editorial, and panel review boards including: Michigan Farm Bureau Aquaculture Advisory Board, Great Lakes Panel for Aquatic Nuisance Species, NOAA and state Sea Grant funding review committees, NSF Food Division Advisory Council, Regulatory/Seafood sector.

### **ANTICIPATED BENEFITS**

Over the past 5½ years, the RAES project has made a number of strides towards improving the NCR aquaculture industry, including: providing liaison and leadership services, program facilitation, identifying and addressing industry needs, streamlining information and technology to the industry, voicing industry concerns to regulators and rallying aquaculture community members to comment on Federal Register

Postings of great importance to the NCR aquaculture Industry. This work plan includes continuing all current responsibilities and building upon these accomplishments.

Anticipated benefits include:

- Information transfer to the aquaculture community via list serve, websites, and state association events and other direct contact methods
- Continued updates on the NCRAC regulation website
- An industry voice on state, regional and national regulatory issues such as AIS
- A better understanding on ability to develop the current AIS HACCP program into a recognized certification or verification program
- Strengthened partnerships for NCR aquaculture development
- Submission of at least one grant proposal for NCR industry support in 2014-2015

## OBJECTIVES

1. Continue RAES support to the NCRA Aquaculture Community through ongoing activities in areas of liaison services, leadership, assessing and addressing industry needs and information transfer.
2. Develop and implement strategies to address AIS in aquaculture and baitfish in the NCR.
3. Develop and strengthen partnerships from within the NCR and outside the region among regulatory agencies, industry, academia, and other relevant entities to foster open, meaningful dialog on critical issues and build support for the NCR aquaculture industry.
4. Coordinate efforts for seeking non-NCRAC support for NCR aquaculture development.

## PROCEDURES

### RAES Program Design Plan

The RAES project team consists of the Principal Investigator (PI), two non-funded project collaborators (Co-PIs), a NCRAC Industry Advisory Council Liaison, and a NCRAC Extension Liaison. While NCRAC funded projects typically involve active participation by extension and research groups residing within two or more states in the NCR, the project team feels the RAES program is well suited for committee oversight of a single full time extension specialist to achieve RAES plan objectives. The PI, then, will fill a 92.75 % RAES position, and the remaining team members will serve as the project oversight committee. The RAES will provide team members a status update twice per year and facilitate a minimum of two teleconferences annually. Decisions necessary for project planning will be by team consensus or by vote if the need arises.

### **Continue RAES Support to the NCRA Aquaculture Community Through Ongoing Activities in Areas of Liaison Services, Leadership, Assessing and Addressing Industry Needs and Information Transfer (Objective 1)**

The following RAES extension activities will continue under this 2013 - 2014 work plan:

- a) Project PI will continue to actively provide leadership and liaison services to the NCR aquaculture community as necessary to carry forward industry interests. The RAES shall maintain an open-door communication policy and be available via e-mail and telephone (land and cell lines) on a daily basis.
- b) Project PI will continue to support the NCR aquaculture industry through meetings, speaking opportunities and committee representation (examples: National Institute for Animal Agriculture, Great Lakes Panel for Aquatic Nuisance Species Task Force, NSF Food Division Advisory Council, Regulatory/Seafood sector).

- c) Project PI will continue to maintain and update the NCRAC Transportation Regulations, and Approved Aquatic Species website (<http://www.ncrac.org/Info/StateImportRegs/stateregsmain.htm>) which provides summaries of all aquaculture and baitfish regulations including health certification and interstate transport requirements for the 12 NCR states and 9 adjacent states. .
- d) The RAES will continue to offer services to the NCR aquaculture community to help facilitate workshops intended to provide pertinent and useful information to the industry (example: coordination role in partnership conference with NCRAC and OH, MI, IN aquaculture associations Feb 21-23, 2013, Toledo, OH).

**Develop and Implement Strategies to Address AIS in Aquaculture and Baitfish in the NCR (Objective 2)**

The RAES will work with project collaborator Ron Kinnunen (Michigan Sea Grant), Nicholas Phelps (Veterinary Diagnostic Laboratory, University of Minnesota), and other key individuals in the US on the potential development of current AIS Hazard Analysis and Critical Control Points (HACCP) from its current voluntary program towards a nationally recognized certifiable and/or verifiable program. This activity will build upon RAES 2013-2014 project objectives which include:

- a) Form a task force comprised of key individuals necessary to carry out such a program.
- b) Develop strategies within the task force required to implement such a plan.
- c) Undertake a vetting process from across stakeholder groups.
- d) Begin implementation of strategies to the extent possible.

This activity request was brought forward jointly by NCRAC Industry Advisory Committee and Technical Committee members at the 2012 Annual Program Planning Meeting. Currently the RAES is conducting an assessment of the status of ANS prevention and control in the US and forming justification why AIS HACCP should be looked at as a potential partnership program to be utilized to a greater degree for control and monitoring ANS.

**Develop and strengthen partnerships from within the NCR and outside the region among regulatory agencies, industry, academia, and other relevant entities to foster open, meaningful dialog on critical issues and build support for the NCR aquaculture industry. (Objective 3)**

Over the span of the RAES project, the PI has developed working relationships across the NCR aquaculture community. This work plan is intended to strengthen existing ties and strives to build new partnerships for the purpose of achieving common goals that benefit from increased fish production.

- a) PI will continue voting memberships within World Aquaculture and US Aquaculture Societies, the National Aquaculture Association, Michigan Farm Bureau, and Farm Bureau Aquaculture Advisory Committee providing special approval is granted by Michigan State University (MSU) for a portion of the dues of these programs (MSU policy does not allow for payment of membership dues unless special permission is obtained; PI is asking for \$300 maximum to pay a portion of these dues).
- b) PI will continue to serve on the Great Lakes Panel for Aquatic Nuisance Species, NSF Food Division Advisory Council, and various funding review panels when asked.
- c) PI will seek to develop partnerships among other agricultural commodity organizations (e.g., national and state soybean councils), aquatic animal health groups, and state, federal and tribal agencies, both inside and outside the NCR.
- d) PI will attempt to engage and interact with environmental groups to the extent possible.

**Coordinate efforts for seeking non-NCRAC support for NCR aquaculture development.  
(Objective 4)**

Objective 4 focuses on utilizing opportunities (e.g., funding) and partnerships (Objective 3) from non-NCRAC sources for regional industry development.

- a) In 2013 through project continuation, the PI will seek non-NCRAC support including, but not limited to, grant solicitations, requests for proposals, and commercial agriculture developmental and marketing programs.
- b) PI will work to form coalitions with common objectives to pursue and obtain non-NCRAC support for NCR aquaculture development.
- c) PI will provide support necessary in order to submit one or more grant application over the 2014-2015 project period for NCR industry development from a non-NCRAC source.

**PROJECT DELIVERABLES**

1. Maintaining updates to the NCRAC regulation website.
2. Attend state association meetings and provide support, including updates and presentations.
3. Continue with eXtension.org, Ask-an-Expert.
4. Continue information outlet and topical news on the NCR fish culture list-serv.
5. Provide leadership for AIS HACCP verification.
6. Establish a model for AIS HACCP verification.
7. Represent NCR aquaculture industry at state, regional, and national fisheries/aquaculture meetings.
8. Establish partnerships for NCR aquaculture industry development, submitting at least one grant proposal per year for NCR industry support.

**FACILITIES**

MSU – Land Grant College; Agriculture Experiment Station; Director office of MSU Extension; close proximity to Ohio, Indiana, Illinois.

MSU Sea Grant Upper Peninsula of Michigan; close proximity to Wisconsin and Minnesota.

ISU – ISU extension; aquaculture research facilities for walleye, golden shiner, bluegill, yellow perch and largemouth bass; close proximity to South Dakota, Nebraska, Kansas, Illinois, Wisconsin.



## REFERENCES

- FAO. 2013. Global Aquaculture Production 1950-2011. GIGIS Fisheries Statistics. Food and Agricultural Organization of the United Nations. Rome, Italy. Available: <http://www.fao.org/fishery/statistics/global-aquaculture-production/query/en>
- FAO. 2012. The state of world fisheries and agriculture 2012. Food and Agricultural Organization of the United Nations. Rome, Italy.
- MSU (Mississippi State University). 2013. US aquaculture production baitfish. Mississippi State University Agriculture Experiment Station. Available: <http://coastal.msstate.edu/aquabait.html> (Sept 2013)
- NCRAC (North Central Region Aquaculture Center). 1999. A strategic plan for the North Central Regional Aquaculture Center. North Central Regional Aquaculture Center, Michigan State University, East Lansing, Michigan. Available: <http://www.ncrac.org/>. (May 2013).
- Swann, L., and J. Morris. 2001. A white paper on the status and needs of aquaculture extension outreach for the North Central Region. North Central Regional Aquaculture Center, East Lansing, Michigan. Available: <http://www.ncrac.org/Topics/ext0901.htm>. (May 2013).
- USDA (U.S. Department of Agriculture). 2007. Census of Aquaculture (2005). Volume 3, Special Studies, Part 2, AC-02-SP-2. USDA, Washington, D.C. Available: <http://www.agcensus.usda.gov/Publications/2002/Aquaculture/index.asp> . (May 2013).
- USDA (U.S. Department of Agriculture). 2013. Aquaculture dataset. Economic Research Service, US Department of Agriculture. Available: <http://www.ers.usda.gov/data-products/aquaculture-data.aspx#.Uml70nCsiSp>

## PROJECT LEADERS

<u>State</u>	<u>Name/Institution</u>	<u>Area of Specialization</u>
Iowa	D. Allen Pattillo Iowa State University	Fish culture, water quality, fisheries, regional extension
Michigan	Christopher T. Weeks – Lead PI Michigan State University	Aquaculture facility design, fish culture, aquaculture extension
	Ronald E. Kinnunen Michigan State University Michigan Sea Grant	Fish culture, Hazardous Analysis and Critical Control Point (HACCP), aquaculture and baitfish extension

## BUDGET

ORGANIZATION AND ADDRESS Michigan State University Dept. of Fisheries & Wildlife, 13 Natural Resources, East Lansing, MI 48824				<b>USDA AWARD NO.</b> Year 1: Objectives 1-4				
PROJECT DIRECTOR(S) Christopher T. Weeks				Duration Proposed Months: <u>12</u>  <b>Funds Requested by Proposer</b>	Duration Proposed Months: _____  <b>Funds Approved by CSREES (If different)</b>	Non-Federal Proposed Cost-Sharing/Matching Funds (If required)	Non-federal Cost-Sharing/Matching Funds Approved by CSREES (If Different)	
<b>A. Salaries and Wages</b>				<b>CSREES FUNDED WORK MONTHS</b>				
1. No. of Senior Personnel				Calendar	Academic	Summer		
a. ___ (Co)-PD(s) . . . . .								
b. ___ Senior Associates . . . . .								
2. No. of Other Personnel (Non-Faculty)								
a. ___ Research Associates-Postdoctorates . . .								
b. <u>1</u> Other Professionals . . . . .				11.8			\$ 67,268	
c. ___ Paraprofessionals . . . . .								
d. ___ Graduate Students . . . . .								
e. ___ Prebaccalaureate Students . . . . .								
f. ___ Secretarial-Clerical . . . . .								
g. ___ Technical, Shop and Other . . . . .								
<b>Total Salaries and Wages</b> . . . . . <input type="checkbox"/>							\$67,268	
B. Fringe Benefits (If charged as Direct Costs)							\$25,199	
<b>C. Total Salaries, Wages, and Fringe Benefits (A plus B)</b> . . . . . <input type="checkbox"/>							\$92,467	
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)								
E. Materials and Supplies							\$ 600	
F. Travel							\$5,100	
G. Publication Costs/Page Charges								
H. Computer (ADPE) Costs								
I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.)								
J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.)							\$5,180	
<b>K. Total Direct Costs (C through I)</b> . . . . . <input type="checkbox"/>							\$103,347	
L. F&A/Indirect Costs. (If applicable, specify rate(s) and base(s) for on/off campus activity. Where both are involved, identify itemized costs in on/off campus bases.)								
<b>M. Total Direct and F&amp;A/Indirect Costs (J plus K)</b> . . . . . <input type="checkbox"/>								
N. Other . . . . . <input type="checkbox"/>								
<b>O. Total Amount of This Request</b> . . . . . <input type="checkbox"/>							\$103,347	
<b>P. Carryover -- (If Applicable)</b> . . . . . <b>Federal Funds: \$</b>				<b>Non-Federal funds: \$</b>		<b>Total \$</b>		
<b>Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)</b>								
Cash (both Applicant and Third Party) . . . . . <input type="checkbox"/>								
Non-Cash Contributions (both Applicant and Third Party) . . . . . <input type="checkbox"/>								
<b>NAME AND TITLE</b> (Type or print)			<b>SIGNATURE</b> (required for revised budget only)				<b>DATE</b>	
<b>Project Director</b>								
<b>Authorized Organizational Representative</b>								
<b>Signature (for optional use)</b>								

According to the Paperwork Reduction Act of 1995, an agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0524-0039. The time required to complete this information collection is estimated to average 1.00 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing the reviewing the collection of information.

## BUDGET EXPLANATION FOR MICHIGAN STATE UNIVERSITY

(Weeks)

### Objectives 1-4

- A. Salaries and Wages.** Salary is requested for one 92.75% FTE extension specialist to act in capacity of Regional Aquaculture Extension Specialist (\$67,268).
- B. Fringe Benefits.** Fringe benefit rate is 37.46% (\$25,199).
- E. Materials and Supplies.** General office and workshop supplies and materials (\$600).
- F. Travel.** Travel, lodging, and meals for PI to attend 3 state aquaculture association/development meetings (3 x \$800), NCRAC Annual Program Planning Meeting (\$800), 1-3 meetings in representation of NCR industry members (\$600, e.g. Great Lakes panel on Aquatic Nuisance Species), and 1 national aquaculture association meeting/conference (\$1,300) at locations to be determined (total \$5,100).
- J. All Other Direct Costs.** Cell phone and office phone service (\$1,080); membership fees for RAES to maintain memberships with NAA and Farm Bureau (\$300 maximum per year), and workshops and/or meeting facilitation (\$3,800) including travel, lodging, and meals for speakers and attendees designed for aquaculture industry development within the NCR US (total \$5,180).

## **SCHEDULE FOR COMPLETION OF OBJECTIVES**

All (1-4) objectives will be initiated sometime during the current RAES project period (2014-2015), and the deliverables will be made available to the NCR aquaculture community by the project completion date of 8/31/2015.

## **PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS**

### **Iowa State University**

D. Allen Pattillo

### **Michigan State University**

Ronald E. Kinnunen

Christopher T. Weeks – Lead PI

## VITA

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Department of Fisheries and Wildlife  
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### EDUCATION

B.S. San Diego State University, 1986, Aerospace Engineering  
M.S. Michigan State University, 1997, Fisheries and Wildlife – Fish Population Dynamics  
Ph.D. Michigan State University, 2007, Fisheries and Wildlife – Aquaculture/Fish Nutrition

### POSITIONS

Regional Aquaculture Extension Specialist, NCRAC and Ohio State University (March 2008 – Present)  
Consultant, Aquaculture Bioengineering Corp., Rives Junction, Michigan (October 2001–2009, June 1996–May 1998)  
Research Associate, Michigan State University Department of Fisheries and Wildlife (January 2007 – March 2008)  
Lab Manager, Michigan State University Aquatic Animal Health Lab (October 2003 – January 2007)  
Aquaculture Facility Manager, Stoney Creek Fisheries, Harrietta, Michigan (August 2000 – October 2001)  
Hatchery Manager, Great Black Creek Fish Co., Black Creek, Wisconsin (May 1998 – August 2000)  
Cade Industries, Engineer, San Diego, California; Lansing, Michigan (January 1989 – February 1993)

### SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

World Aquaculture Society, National Aquaculture Association,  
Michigan Aquaculture Association, President 2003 - 2008

### SELECTED PUBLICATIONS

- Weeks C.T. 2013. Sustainable Aquaculture in the North Central Region US - A Review of perceptions and recommendations from the aquaculture community. *Journal of Extension* v51 no.2 - 2COM1.
- Weeks C.T., R. Kim, M. Wolgamod, G. Whelan and M. Faisal. 2011. Experimental infection studies demonstrate the high susceptibility of the salmonid, lake herring (*Coregonus artedii*), to the Great Lakes strain of viral hemorrhagic septicemia virus (Genotype IVb). *Journal of Fish Disease*.
- Weeks, C.T., D. Garling, F.T. Barrows, and M. Faisal. 2010. The effect of feeding varying levels of soybean meal in high-nutrient-density diets on growth performance and body composition of juvenile Atlantic salmon. *North American Journal of Aquaculture* 72(4):279-289.
- Weeks C.T., R. Kim, M. Wolgamod, G. Whelan and M. Faisal. 2011. Experimental infection studies demonstrate the high susceptibility of the salmonid, lake herring (*Coregonus artedii*), to the Great Lakes strain of viral hemorrhagic septicemia virus (Genotype IVb). *Journal of Fish Disease*.
- Westers, H., and C.T. Weeks. 2003. Determining annual production capabilities for sequential rearing programs through use of routine fish culture data. *North American Journal of Aquaculture* 65:269-277.

## VITA

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### EDUCATION

B.S. Michigan State University, 1976  
M.S. Michigan State University, 1979  
Ph.D. Michigan Technological University, 1997

### POSITIONS

Michigan Sea Grant Extension Agent (1982-present), Upper Peninsula, Michigan State University  
Fisheries Pathologist (1981), Rangen Research Laboratory, Hagerman, Idaho  
Fisheries Biologist (1979-1980), U.S. Fish and Wildlife Service, Leetown, West Virginia

### SCIENTIFIC and PROFESSIONAL ORGANIZATIONS

American Fisheries Society, Salmonid Section  
International Association for Great Lakes Research  
Alliance for Marine Remote Sensing

### SELECTED PUBLICATIONS

Kinnunen, R.E., M.C. Gould, and P. Cambier. 2005. Composting commercial fish processing waste from fish caught in the Michigan waters of the Great Lakes. Michigan State University Technical Bulletin. East Lansing, Michigan.

Pangle, K.L., T.M. Sutton, R.E. Kinnunen, and M.H. Hoff. 2005. Effects of body size, condition, and lipid content on the survival of juvenile lake herring during rapid cooling events. Journal of Great Lakes Research 31:360-366.

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Hinshaw, J.M., G. Fornshell, and R.E. Kinnunen. 2004. A profile of the aquaculture of trout in the United States. Report for USDA Risk Management Agency, Federal Crop Insurance Corporation, through Mississippi State University, Starkville, Mississippi.

Kinnunen, R.E., editor. 2002. Environmental Strategies for Aquaculture Symposium Proceedings (December 2000). 62<sup>nd</sup> Midwest Fish and Wildlife Conference, Minneapolis, Minnesota. NCRAC CD Series #101, NCRAC Publications Office, Iowa State University, Ames, Iowa.

Gunderson, J.L., and R.E. Kinnunen. 2001. Aquatic nuisance species-Hazard analysis and critical control point training curriculum. Michigan Sea Grant Publication No. MSG-00-400.

Kinnunen, R.E. 2000. A white paper on the status and needs of salmonid aquaculture in the North Central Region. North Central Regional Aquaculture Center. Michigan State University, East Lansing, Michigan.

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## EDUCATION

B.S. The University of Georgia, 2008, Fisheries and Aquaculture  
M.S. Auburn University, 2010, Aquaculture

## POSITIONS

Aquaculture Extension Specialist III, Natural Resource Ecology and Management, Iowa State University, 2011-present  
Graduate Research Assistant, Department of Fisheries and Allied Aquacultures, Auburn University, 2008-2010  
Aquarium Technician, Department of Marine Sciences, University of Georgia, 2007-2008  
Fisheries Technician, Warnell School of Forestry and Natural Resources, University of Georgia, 2007-2008

## SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society  
World Aquaculture Society  
United States Aquaculture Society  
International Association of Astacology  
Xi Sigma Pi

## SELECTED PUBLICATIONS

Pattillo, D. A. , C. E. Hicks, J. E. Wetzel, P. B. Brown, R. A. Rode, J. E. Morris. *In Prep.* Evaluation of the Newly-Developed, Least-Cost Experimental Diet for Bluegill at Commercial Densities.

Pattillo, D. A. and J. A. Stoeckel. *In Review.* The effectiveness of AQUI-S™ and temperature manipulation for anesthetizing juvenile redclaw crayfish (*C. quadricarinatus*). *Aquaculture*.

Pattillo, D. A. and J. A. Stoeckel. *In Prep.* The effectiveness of androgenic gland ablation for the sex reversal of juvenile male redclaw crayfish (*C. quadricarinatus*).

Pattillo, D. A. and J. A. Stoeckel. *In Prep.* Potential escapement effects of the Australian redclaw crayfish (*Cherax quadricarinatus*), on a common crayfish species, (*Procambarus acutissimus*) in the Southeastern United States.