

**COMPREHENSIVE OUTREACH AND TRAINING PROGRAM TO EXPAND  
DEVELOPMENT OF NCR AQUACULTURE**

Theme Area C TEA-1: Producer Education

**Chairperson:** Mr. D. Allen Pattillo

**Industry Advisory Council Liaison(s):** Bill Lynch, Mill Creek Perch Farm

**Extension Liaison(s):** Dr. Christopher T. Weeks

**Funding Request:** \$158,963

**Duration:** July 1, 2017 to June 30, 2019 (2 year)

**Objectives:**

1. Develop a comprehensive training program that addresses subject priorities critical to the advancement of NCR aquaculture.
2. Identify a core team of subject experts who can develop and deliver high quality presentations and demonstrations throughout the NCR.
3. In cooperation with NCR states, deliver workshops and training region-wide.
4. Develop a comprehensive evaluation plan to assess the adoption/integration of information to the target audience.

**Deliverables:**

1. Six comprehensive outreach and training workshops held in the NCR.
2. Electronic learning materials dealing with workshop topics.
3. Distance learning opportunities for industry personnel.
4. Evaluation results.

**Proposed Budgets:**

<b>Institution</b>	<b>Principle Investigator</b>	<b>Objective(s)</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Total</b>
Iowa State University (ISU)	D. Allen Pattillo	1,2,3,4	\$44,322	\$39,074	\$83,396
University of Minnesota (UMN)	Nicholas B. D. Phelps	1,2,3,4	\$21,490	\$13,240	\$34,730
Ohio State University (OSU)	Matthew A. Smith	1,2,3,4	\$20,809	\$20,028	\$40,837
<b>Totals</b>			<b>\$86,621</b>	<b>\$72,342</b>	<b>\$158,963</b>

**Non-funded Collaborators:**

<b>Facility</b>	<b>Collaborator(s)</b>
Michigan State University	Christopher T. Weeks
The National Aquaculture Association	Paul W. Zajicek

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## PROJECT SUMMARY

The North Central Regional Aquaculture Center (NCRAC) extension base project continues to be highly desired by the private industry stakeholders; however, lack of funding and aquaculture extension full time employees (FTEs) in the North Central Region (NCR) creates challenges for dissemination of applied research findings. In 2015, the NCR extension base workgroup began the NCRAC Aquaculture Webinar Series by creating an interactive component to the NCR online learning community to extend the reach and impact of their information transfer efforts. The webinar series to date has reached over 1,000 viewers globally, but remains limited in effectiveness because of a lacking hands-on learning component. This project proposal will complement the webinar series, and enhance learning outcomes for participants by providing multiple hands-on, advanced aquaculture techniques workshops throughout the NCR. Topical areas for these fee-based workshops will include but not be limited to culture techniques for important NCR aquaculture species, advanced aquaculture systems design and management, aquaculture business and marketing, water quality maintenance, advanced fish health diagnostics and aquaculture regulatory issues. Additionally, workshop presentations and materials will be posted on the NCRAC website for archival and dissemination. The workshops will be evaluated for quality of content and delivery as well as their effectiveness in improving farmer knowledge, profitability and sustainability. This evaluation data will help refine future NCRAC endeavors optimize the leveraging of funding and learning outcomes and impacts.

## JUSTIFICATION

*Project Relevance* — University Extension programs provide the essential linkage between research and stakeholders. Traditionally, information industry gained much of their aquaculture information through the extension network and printed fact sheets. The NCRAC extension base project continues to be highly desired by the private industry stakeholders; however, lack of funding and aquaculture extension FTEs in the NCR creates challenges for dissemination of applied research findings. New information transfer technology include digital publications, YouTube-style instructional videos, webinars, web forums, social media, etc. The NCR online learning community is currently supported by both the NCRAC website, where one can download a variety of educational materials, and the NCRAC list serve, an email tool that allows timely sharing of information pertinent to the industry. Although useful, feedback in recent years from the industry suggest that there is significant need for hands-on learning to enhance information transfer for both newcomers and seasoned growers while accommodating for those limited by time and travel constraints.

*Who will benefit? Where will it be applied?* — The current project will serve to continue and complement the 1-year webinar series trial, and enhance learning outcomes for participants by providing multiple hands-on, advanced aquaculture techniques workshops to be held throughout the NCR. Additionally, the webinar and workshop series combination will bring together the cumulative knowledge and experience of the NCRAC community, engaging extension specialists, researchers and industry representatives in this effort.

*Potential collaborations* — This project will be a collaboration of three Land Grant Universities as well as multiple state aquaculture associations and natural resource agencies in the NCR. Workshops will be designed to work in conjunction with State Association and NCRAC meetings whenever possible. This project is designed to work closely with the National Aquaculture Association, a nationally recognized aquaculture industry advocacy group. These partnerships will help ensure the relevancy and timeliness of the information presented.

*Relevance to NCRAC mission* — “The mission of the Regional Aquaculture Centers is to support aquaculture research, development, demonstration, and extension education to enhance viable and profitable U.S. aquaculture which will benefit consumers, producers, service industries, and the American economy.” The workshops will supply extension education opportunities to the aquaculture industry to enhance their knowledge, technical knowledge and operational efficiency. The expected outcome of this work is the continued development and expansion of aquaculture in the NCR.

## RELATED CURRENT AND PREVIOUS WORK

The extension service was initiated out of the Smith-Lever Act of 1914 “In order to aid in diffusing among the people of the United States useful and practical information on the subjects relating to agriculture, home economics, and rural energy...to be carried on in cooperation with the United States Department of Agriculture” (Smith-Lever Act 2016). Extension programming seeks to foster positive change in American society by creating a network of educational resources that improve our quality of life. In the early days this was accomplished through demonstration activities like farm field days during which the learner obtained hands-on experience with new and proven technology. More recently, the traditional extension format has evolved because of 1) decreases in funding, 2) increasing diversity of clientele, 3) increased demand for variety in information delivery methods, and 4) changes in clientele perception of once generally accepted practices (Hildreth and Armbruster 1981). This shift in extension has led to an increased adoption of technology to aid in information transfer to a diverse audience in an easily and permanently accessible format for self-paced learning. Additionally, this has created a shift from many generalized county extension agents to fewer, specialized extension professionals. Fewer extension professionals can create fewer learning opportunities for US citizens; therefore extension has adopted a train-the-trainer format of program delivery such that local volunteer subject educators can be developed. Although dwindling in numbers and funds, extension has proven its worth through effectively fostering a 50% increase of agricultural productivity in the private sector due to Land-Grant University Research and Extension activities (Hildreth and Armbruster 1981). Within NCRAC, Weeks (2014) documented that access to extension specialists and the programs they develop are highly valued by private industry producers. An increased emphasis on extension program evaluation and broader dissemination of extension information through electronic outlets like websites and social media has helped in reaching a younger and more diverse audience and provide the most relevant, timely, and useful information. However, it has been indicated through the NCRAC network that producers, educators, and regulators all value hands-on, workshop-style learning opportunities. Extension remains a complex process of education that combines the art of anticipating the client’s needs, the best delivery method, and the best available science to provide the best learning opportunities and generate the greatest possible socioeconomic impact.

Colyn and Boersen (2015) identified aquaculture production of food fish as the fastest growing field of agriculture and the greatest potential area for growth in the North Central Region (NCR). It is estimated that a 160-300% increase in seafood production from aquaculture will be required to satisfy global demand by the year 2030. Seafood is currently the 2<sup>nd</sup> largest imported product into the United States and the current annual trade deficit is nearly \$12 billion. Additionally, aquaculture has far-reaching economic benefits because it supports associated industries like transportation, processing, retail stores, etc. This means that there is substantial opportunity of aquaculture industry growth and a great need for extension support of this chronically fledgling industry.

Based on the 2014 NCRAC Needs Assessment Survey (Weeks et al. 2014) it is clear that the industry finds value in NCRAC extension efforts. The survey revealed that the most helpful services that NCRAC provides to gain the information needed to optimize private industry aquaculture operations are 1) opportunities to speak with their fellow industry counterparts (i.e. workshops, conferences, aquaculture associations, list serves, social media, etc.), 2) aquaculture informational websites (e.g., Regional Aquaculture Center, state aquaculture extension, USDA, eXtension.org, etc.) and 3) state/regional aquaculture extension contacts. In fact, the recent Originz NCRAC Needs Assessment Report (Colyn and Boersen 2015) suggests that a renewed focus on extension will be required to advance the aquaculture industry forward in the NCR.

Weeks et al. (2014) reported that the top issues identified by the industry as impediments to industry advancement were: 1) regulations that inhibit interstate transport of live fish for sale as sportfish and baitfish for pond stocking and for the live markets located a population centers like Chicago, New York, Toronto, and others; 2) feed costs that are so high that it is cost-prohibitive to feed fish high quality diets for optimized growth rates; and 3) lack of government support for private industry production of fish. Prevention of aquatic invasive species, disease transmission/spread, and environmental pollution are the regulatory foci of state and federal government that affect aquaculture. These issues are particularly controversial because many of the water resources in the NCR are multiple-use public waterways like rivers and lakes. These regulations are particularly prohibitive in the Great Lakes region, containing 20% of the world’s freshwater supply, which would be suitable for the culture of salmonids and other food fish in net pens.

Compliance with the Clean Water Act through the United States’ Environmental Protection Agency is a major

inhibitor to the siting of aquaculture operations because of effluent discharge issues. For example, National Pollution Discharge Elimination System (NPDES) permits are required for aquaculture operations above a certain production capacity [coldwater: 9,072 kg (20,000 lbs) annually; warmwater: 45,360 kg (100,000 lbs) annually] that are discharging into a natural water body to help mitigate potential eutrophication issues related to aquaculture discharges (EPA 2013). Because of such regulations, much of aquaculture production will continue to be forced into intensive indoor recirculating aquaculture (RAS) systems because of their water efficiency and high yielding capacity as well as biosecurity and containment for the prevention of disease and invasive species escapement. However, these systems are costly and typically cost-prohibitive for food fish producers.

Research conducted through the extension service in Arkansas found that more than 1,300 laws apply to U.S. aquaculture producers in the areas of environmental management, food safety, legal and labor standards, interstate transport of aquatic products, fish health, and culture of commercially harvested species (Engle and Stone 2013). Engle and Stone (2013) suggest a considerable amount of time and labor go into regulatory compliance, with an average annual cost per aquaculture farm of nearly \$150,000, which can be cost-prohibitive for many small farmers. Additionally, aquaculture permits can be difficult to obtain, thus preventing the scaling-up of aquaculture operations that would otherwise be able to serve the growing markets of the US. Potential aquacultures will need technical expert support to effectively comply with regulations.

An additional barrier to entry for aquaculture is the steep learning curve for intensive aquaculture production. Direct extension support and educational opportunities for these incoming producers is critical for their success. The 2014 NCRAC conference in Toledo, OH was the first major NCR aquaculture conference to combine the NCRAC research meeting with a State Aquaculture Association meeting to disseminate beginning and advanced level aquaculture information to current and potential producers, as well as create opportunities for social interaction between producers, academics, natural resource agencies. The concurrent sessions covered everything from aquaculture production systems and management to species production techniques to business planning and marketing to aquaponics and more. This event was extremely well received by the attendees according to the post-program evaluations conducted by the Ohio Aquaculture Association. Of all the program areas, the most valued were the Ask-the-Expert session and the networking opportunities provided. The 2016 NCRAC and Wisconsin Aquaculture Association Conference in Milwaukee, WI was also a great success because of expanded learning opportunities and farmer networking.

A drawback of the regional conference format is that many would-be attendees did not have access to the conference due to travel constraints or lack of knowledge about the event. Increasing resistance to travel for state and federal agencies as well as producers has become a major inhibitor to the impact of these valuable programs. To circumvent the travel issue, the NCRAC Extension Base Workgroup developed a proposal in 2014 to create an aquaculture webinar series that would be available online in perpetuity. The currently active 2015 NCRAC extension project is a partnership with the National Aquaculture Association and the United States Aquaculture Society to provide educational opportunities to industry professionals. Thus far, 15 webinars were conducted, with over 1,500 participants and the recorded versions have been viewed over 2,000 times to date through the NCRAC website (<http://www.ncrac.org/>) under the “videos” tab and on the NCRAC vimeo channel (<https://vimeo.com/channels/958980>). Participants in the webinars gained knowledge and shared it, improved their on-farm practices, anticipated more jobs and more profitability for their farm.

- Knowledge Gained - 64% above average knowledge post-webinar
- Knowledge Shared - 1,018-2,313+ estimated shares
- Action Taken - 50% added or enhanced on-farm measures
- Jobs Created - 140 – 200+ current or future jobs created
- Economic Impact - \$600,019 - \$988,981+ estimated annual value to farmers

Producers benefit by gaining information and improving their networks without a huge expense, time or travel obligations. These monthly webinars are designed to provide credible information on topics timely and relevant to industry growth. However, this webinar format is limited because of the lack of hands-on learning and networking opportunities as well as lack of internet access for some producers. The goal of this project is to build upon the current extension project by developing outreach materials in partnership with both extension and research staff.

The 2014 NCRAC Needs Assessment Survey and the work group members have identified the need for workshops in the areas of advanced culture techniques, water quality management, intermediate and advanced fish health

diagnostics, NCR aquaculture regulations, aquaculture business development and marketing, and advanced planning and production techniques for ponds, RAS, and aquaponics. These workshops will provide a knowledge base and resources for beginning and experienced aquaculturists that will help them become more efficient and profitable. Additionally, this series is an opportunity for inter-state collaboration as it can benefit producers in all 12 states who may otherwise be limited by distance from attending other NCRAC programs.

### ANTICIPATED BENEFITS

Hands-on learning is critical to meaningful changes in industry operations; workshops can provide these quality learning opportunities. This comprehensive outreach and training program is designed to blend the benefits of the online and in-person learning opportunities by building on both by supplementing learning opportunities with hands-on, intensive training for serious aquaculturists, while still providing additional in-depth training opportunities for online users. Topical areas for these fee-based workshops will include culture techniques for important NCR aquaculture species, advanced aquaculture systems design and management, water quality management, aquaculture business and marketing, advanced fish health diagnostics and aquaculture regulatory issues. Local learning opportunities from high caliber subject experts for prospective and experienced aquaculturists are expected to have a positive impact on aquaculture production in the NCR with regard to increased production, increased efficiency, and increased farm profitability.

These workshops will provide a knowledge base and resources for beginning and experienced aquaculturists that will help them become more efficient and profitable. Additionally, this series is an opportunity for inter-state collaboration as it can benefit producers, extension, and agency personnel in all 12 states who may be limited by distance from attending other NCRAC programs and catalyze NCR state association functions. Workshop materials and educational videos will be posted on the NCRAC website for archiving and dissemination. Training materials from the intensive workshops will be archived online to extend their impact, while simultaneously creating momentum for future extension programs that will be provided through NCRAC. The workshops will be evaluated for quality of content and delivery as well as their effectiveness in improving farmer knowledge, profitability and sustainability. This evaluation data will help refine future NCRAC endeavors optimize the leveraging of funding and learning outcomes and impacts. Knowledge gained, knowledge shared, action taken, jobs created, and economic impact are areas of focus for evaluation of benefits in this program. Table 1 expresses the anticipated benefits of this project.

Table 1. Anticipated benefits of the comprehensive training program in the short, medium, and long term.

	Goals	Train current and potential aquaculture producers, academics, and agency personnel in the areas of important NCR aquaculture species, advanced aquaculture systems design and management, aquaculture business and marketing, advanced fish health diagnostics and aquaculture regulatory issues
	Outcomes	Improve knowledge of the workshop participants to enhance their production efficiency.
	Goals	Alter workshop participant thinking and behavior to incorporate the learning outcomes of the workshop into their operation.
	Outcomes	Improve production efficiency and profitability of workshop participant aquaculture operations.
	Goals	Total adoption and integration of the workshop learning outcomes into workshop participant operations as well as the NCR aquaculture industry as a whole.
	Impacts	Expand the development of NCR the Aquaculture industry in terms of growth and profitability.

## OBJECTIVES

1. Develop a comprehensive training program that addresses subject priorities critical to the advancement of NCR aquaculture.
2. Identify a core team of subject experts who can develop and deliver high quality presentations and demonstrations throughout the NCR.
3. In cooperation with NCR states, deliver workshops and training region-wide.
4. Develop a comprehensive evaluation plan to assess the adoption/integration of information to the target audience.

## DELIVERABLES

1. Six comprehensive outreach and training workshops held in the NCR.
2. Electronic learning materials dealing with workshop topics.
3. Distance learning opportunities for industry personnel.
4. Evaluation results.

Three aquaculture workshops will be held per year in strategic locations to maximize attendance and learning outcomes. Each workshop will feature presentations from various subject area experts covering topics relevant for the region. Suggested workshop topical areas include baitfish and water quality management (OSU), fish health and aquaculture regulatory issues (UMN) and advanced production techniques for pond, RAS, biofloc and aquaponics as well as aquaculture business and marketing (ISU). These intensive, multi-day, hands-on workshops (n=3 per year) will target beginner and/or advanced fish farmers, depending on topic and format, and may be held in conjunction with a state or regional aquaculture conference. A series of short (3-5 minute) training videos will be produced on the subject areas covered in the workshops. All presentations will be recorded and archived on the NCRAC.org website for distance education. A program evaluation that describes changes in knowledge, practices and conditions will be administered and the results will be delivered in the final project report. Knowledge gained, knowledge shared, action taken, jobs created, and economic impact are areas of focus for evaluation of benefits in this program.

## PROCEDURES

**OBJECTIVE 1:** The proposed project will provide in-depth, hands-on workshops on NCR relevant aquaculture topics and enhance state association meetings and regional aquaculture conferences by bringing in subject area experts. This project is designed to blend the benefits of the online and in-person learning opportunities by building on both the NCRAC conference and webinar format by creating more local learning opportunities from high caliber subject experts for prospective and experienced aquaculturists. These workshops will provide a knowledge base and resources for beginning and experienced aquaculturists that will help them become more efficient and profitable. All of these events will be video-recorded and uploaded to NCRAC.org for remote access by users. Additionally, this series is an opportunity for inter-state collaboration as it can benefit producers, extension, and agency personnel in all 12 states who may be limited by distance from attending other NCRAC programs and catalyze NCR state association functions. Through the Brenton Center services at ISU, training videos, recorded presentations and workshop materials will be digitized and archived on NCRAC.org to extend their impact, while simultaneously creating momentum for future extension programs that will be provided through NCRAC. This will provide NCRAC the optimum leveraging of funding and learning outcomes through dissemination of NCRAC research-generated knowledge. Workshop topics, presenters, format, and content will be vetted through a collaborative effort amongst the PIs (Pattillo, Phelps and Smith) and the collaborators (Weeks and Zajicek) and industry liaison (Lynch) as well as representatives from the NCR aquaculture industry (to be determined). This program committee will also assist with advertisement of the events for broader impact.

Because of the breadth of aquaculture production techniques, species used, producer skill level, and information needs within the NCR, a multi-pronged approach to program delivery must be used. A comprehensive outreach and training program should include a combination of remotely accessible audiovisual learning opportunities such as YouTube-style training videos, in addition to hands-on workshops, and supplemental digital print materials such as fact sheets. Additionally, advertisement of the events must be done through a variety of methods, such as email,

flyers, social media, and word of mouth advertising to ensure a broad reach to potential participants. Learning outcomes must be developed based on the clientele's needs, which will require a needs-assessment for the NCR aquaculture community. Needs data collected by Weeks (2014) as well as information requests solicited from each of the PIs in their respective extension programs have been used to develop an initial list of workshop topics. As the programs develop, the program committee will assist in directing the program content and methodologies to best serve the target audience. In general, NCR aquaculturists can be divided into beginner and advanced levels of skill and expertise. Beginner aquaculturists have little to no experience in aquaculture, but have a vested interest in obtaining information that would culminate in an aquaculture production business. Advanced aquaculturists have considerable experience producing aquaculture products and require continuing education programs to address specific farm issues to enhance production efficiency and/or profitability. Participant applications will be accepted and candidates will be screened to ensure that the funds and program impact are optimized.

### **Beginner Track**

#### *NCR Aquaculture Regulations*

Regulations have been identified as a major impediment to aquaculture advancement in the NCR. Disease issues and concerns over the spread of aquatic invasive species have caused agencies to tighten regulations in an attempt to limit their spread and impact on the natural ecosystem. Additionally, water usage from limited aquifers and aquaculture effluents are regulated at the state level to comply with the Clean Water Act. Compliance with these regulations can be time consuming and costly to the farmer. Navigating these regulations, particularly with the differences in regulations amongst NCR states, can be difficult. Training in this area is needed to improve farm profitability and environmental sustainability.

Learning outcomes may include: 1) identify the state regulatory bodies, 2) navigating the NCRAC regulations website, 3) familiarity with regulations associated with interstate transport of fish and fish health certifications.

#### *Aquaculture Business and Marketing*

Aquaculture is a business and profitability is vital to the sustainability of the industry. Business planning and marketing are areas of concern for all farmers, but are often not given proper attention in the startup phases of an aquaculture business, which has led to considerable failure for farmers. An example of an identified business strategy is for farmers to utilize and form cooperatives in order to reach a goal that is unattainable on their own. Also, many beginning farmers are not able to self-fund their operations and must apply for funding from a bank or credit union; institutional funding is difficult to obtain without a viable business plan. Education in business plan development and marketing techniques will be extremely relevant and timely for enhancing aquaculture profitability and sustainability.

Learning outcomes may include: 1) identifying a specie(s) for production and potential markets, 2) development of a business plan, 3) identifying potential lending agencies for capital investment.

#### *Water Quality Management*

Proper water quality is known to be at the forefront in proper fish husbandry. Without adequate knowledge and hands-on experience farmers are unlikely to sustain their operation. Many believe that if the fish are not dying then the system must be doing its job. Unfortunately, even a seemingly rudimentary concept such as proper oxygen concentration alludes many. Recent research has shown that oxygen concentrations in ponds that are at the lower end of acceptable leads to substantially poorer yields in comparison to identical ponds that were held at a minimum of 2 mg/L higher. Knowledge and hands-on experience far exceeds oxygenation of culture systems and this topic will focus on all necessary parameters which will include system specific considerations, reliability of available test kits, and ample hands-on experience utilizing commercial available water quality test kits. Additionally, emphasis on how poor water quality affects stress, growth, fish health, and ultimately the bottom line will be addressed.

Learning outcomes may include: 1) understanding the importance of and how to use a water quality probe, 2) understanding the importance of and how to use a water chemistry kit, 3) understanding the importance of and how to keep proper water quality records, 4) identifying emergencies based on water quality data.

### *Aquaculture Production Systems*

According to the 2014 NCRAC Needs Assessment survey, the most common production systems for aquaculture are 1) Ponds, 2) Recirculating Aquaculture Systems, 3) Flow-through Systems, 4) Aquaponics and 5) Cages. Management techniques required to operate these facilities effectively and economically is critical to beginning aquaculture producers. A course in design considerations and culture techniques for each of the major production areas with a particular emphasis on ponds, RAS, biofloc, and aquaponic systems is timely and appropriate. Live demonstrations will be used where appropriate to enhance the participant's learning experience.

Learning outcomes may include: 1) understanding the general functioning and components of multiple aquaculture production systems, 2) identifying a system that will be used in the participant's operation, 3) identifying production goals, 4) understanding how to manage the system to achieve their production goals.

### **Advanced Track**

#### *Fish Health*

Fish health is of utmost importance for farmers because healthy fish grow fast and are the most marketable. Sick fish are very difficult to keep alive, and treatment options may be cost prohibitive. Early recognition of disease symptoms can allow for some less expensive and invasive treatments to be effective and proactive culling of the sick fish can occur, saving the farmer a great deal of money. Additionally, highly virulent diseases like viral hemorrhagic septicemia (VHS) have resulted in massive mortality events in wild fish stocks in the Great Lakes Region, which has led to strict regulations being applied to fish that are to be hauled live between facilities and particularly across state lines. Fish health testing can be a very expensive process and certifications are temporary. This essentially creates an ongoing cost that small and diversified farms may not be able to afford, thus limiting the expansion of aquaculture production in the NCR. Applied and hands on training in the area of fish health clinical signs, treatment options, and navigating fish health regulations, and choosing the appropriate fish health monitoring plan for the individual farmer will have great impact of aquaculture profitability and sustainability.

Learning outcomes may include: 1) understanding the potential diseases relevant for aquaculture in the NCR, 2) identifying specific diseases to monitor for in the participant's operation, 3) recognizing signs of disease and establishing a monitoring protocol, 4) identifying one or more fish health specialists for their operation.

#### *Advanced Aquaculture Production Systems*

Experienced aquaculture producers have a firm grasp on the operation of the systems they use in their operation. However, scale-up or regulatory concerns of specific species or discharge practices, or entering new markets may require the adoption of a new technology. An up and coming focus in some NCR states is the use of biofloc technology as a zero-discharge means of producing marine shrimp. Given the regulatory climate and concerns over sustainability, closed systems like RAS, aquaponics, and biofloc systems are considered among the most important systems to the future of aquaculture production. A course in advanced design considerations and culture techniques for each of the major production areas with a particular emphasis on in-pond raceways, RAS, biofloc, and aquaponic systems is timely and appropriate. Live demonstrations will be used where appropriate to enhance the participant's learning experience.

Learning outcomes may include: 1) understanding the general functioning and components of multiple aquaculture production systems, 2) identifying a system that will be used in the participant's operation, 3) identifying production goals, 4) understanding how to manage the system to achieve their production goals.

**OBJECTIVE 2:** A team of regionally-relevant subject area experts from academia, agency, private industry and extension and outreach will be identified to deliver presentations and workshops to current and prospective aquaculture producers throughout the NCR. Workshop topics, presenters, format, and content will be vetted through a collaborative effort amongst the PIs (Pattillo, Phelps and Smith) and the collaborators (Weeks and Zajicek) and industry liaison (Lynch) as well as representatives from the NCR aquaculture industry (to be determined).

Mr. Smith will lead workshops and deliver presentations in the areas of water quality maintenance, and alternative production techniques. Dr. Phelps will lead workshops and deliver presentations in the areas of fish health and

aquaculture regulatory issues. Mr. Pattillo will lead workshops and deliver presentations in the areas of advanced production techniques, including in-pond raceways, aquaponics, recirculating aquaculture systems, and marine shrimp production methods including biofloc, as well as aquaculture business and marketing. Additional presenters (n=4 per workshop) will be identified to assist the topic leaders. Individuals will be selected based on subject matter expertise, geographic proximity to workshop location, and a mix of academic, industry, and agency personnel.

Workshop Topic (tentative)	Potential Subject Experts as Workshop Presenters (tentative)			
Water Quality	Claude Boyd Auburn University	Craig Tucker, Mississippi State University	Joseph Morris Iowa State University	Matthew Smith The Ohio State University
Aquaculture Production Systems	Luke Roy, Auburn University	Andrew Ray, Kentucky State University	Allen Pattillo, Iowa State University	Greg Fischer, Northern Aquaculture Demonstration Facility
Fish Health	Nicholas Phelps, University of Minnesota	Andrew Goodwin, US Fish & Wildlife Service	Kathleen Hartman, USDA APHIS Veterinary Services	Roy Yanong, University of Florida
NCR Aquaculture Regulations	Chris Weeks, Michigan State University	Nicholas Phelps, University of Minnesota	Alan Johnson, Iowa Dept. of Natural Resources	Carole Engle, Engle-Stone Aquatic\$
Advanced Aquaculture Systems	Tzachi Samocha, Texas A&M	Ryan Chatterson, Chatterson Farms	Steven Summerfelt, Freshwater Institute	Jesse Chappell, Auburn University
Aquaculture Business and Marketing	Carole Engle, Engle-Stone Aquatic\$	Matthew Parker, University of Maryland	Kwamena Quagraine, Purdue University	Terry Hansen, Auburn University

**OBJECTIVE 3:** This project is designed to support and integrate with both the NCRAC conference and webinar format by creating more local learning opportunities from high caliber subject experts for prospective and experienced aquaculturists. These workshops will provide a knowledge base and resources for beginning and experienced aquaculturists that will help them become more efficient and profitable. Additionally, this series is an opportunity for inter-state collaboration as it can benefit producers, extension, and agency personnel in all 12 states

who may be limited by distance from attending other NCRAC programs and catalyze NCR state association functions. These training programs will be delivered based on a multi-pronged approach that will maximize participation and extend impact. Through the Brenton Center services at ISU, training videos, recorded presentations and workshop materials will be digitized and archived on NCRAC.org to extend their impact, while simultaneously creating momentum for future extension programs that will be provided through NCRAC.

It is known that workshop participation and value to the participant is directly related to the cost of the workshop, thus these workshops will be operated on a cost-recovery basis. Although the goal of the workgroup is to minimize the cost to participants, it is imperative to the quality and success of the workshops, and long term sustainability of the workshop series to charge participants. Charges to the attendees and participant limitations will be appropriate for the nature of the workshop and the cost of supplies and facility rentals. For example, workshops on aquaculture business and marketing and regulations will likely have less expense for setup and relatively simple hands-on activities, whereas water chemistry, fish health diagnostics, and system construction will have more cost associated for materials. Workshop cost to participants will likely range from \$50 to \$300 per participant depending on the subject, materials and duration of the workshop. Participant attendance will be capped to a level that is as inclusive as would be feasible for the delivery of the highest quality learning experience for participants. Workshop attendance will likely be capped at 10 to 50 participants depending on the subject and workshop coordinator. For the future sustainability of this program, funds generated (minimal) from these workshops will be used to invest into future extension programming opportunities for aquaculture. These funds will be used at the discretion of the PIs to provide timely programming to suit the needs of their aquaculture clientele.

**OBJECTIVE 4:** The workshops will be evaluated for content quality and delivery as well as their effectiveness in improving the knowledge of the farmer in a way that helps them become more profitable and sustainable in the long term. Evaluation of these programs will allow for refinement of the series for future endeavors. This will provide NCRAC the optimum leveraging of funding and learning outcomes through dissemination of NCRAC research-generated knowledge. Knowledge gained, knowledge shared, action taken, jobs created, and economic impact are areas of focus for evaluation of benefits in this program.

With the development and implementation of webinars and face-to-face workshops on various topics related to aquaculture production, we intend to increase the knowledge and stimulate the adoption of skills related to aquaculture production provided in these educational efforts. Participants' level of knowledge will be measured prior to the event at the time of registration (table 2) a minimum of 2 weeks before the event to help direct the activities and content provided during the event.

Learning during the workshop can be enhanced using polling technology for real-time feedback. For example, as the presentation begins, a short pre-test polling of the participants will be conducted anonymously using classroom response system or "clicker" technology. A series of multiple choice and true/false questions will be presented in the PowerPoint presentation that the participants will respond to using their clickers. Once all participants have submitted their answers, the clicker computer software will tabulate the answers and create a histogram displaying the distribution of participant answers. The instant feedback from this exercise helps to direct participant learning outcomes by giving them instant correction, but also they are more apt to listen for more information regarding these questions (particularly if the participant initially chose incorrectly). This data will be saved and the test will be administered again at the end of the workshop to evaluate changes in knowledge resulting from the workshop. Upon completion of the workshop, the attendees will receive a certificate of completion that may be used as continuing education credits for professional development.

Changes in knowledge will be assessed immediately following the event (table 3) using the Pre-then-Post Survey technique. Survey questions will be used to evaluate the quality of the workshop venue, meals, presentation effectiveness, presenter effectiveness, usefulness of the supplemental materials, and the overall acceptance of the workshop. This information will be used to guide future workshop events.

Changes in behavior will be assessed through follow-up surveys (table 4) 6 months after participation in the webinars and workshops will be conducted. Post-workshop evaluation will be completed online by the ISU Brenton Center using the Qualtrics survey platform and follow up with traditional paper survey methods where needed. Evaluation surveys will be delivered through email or postal mail to the workshop participants. This evaluation will

help determine how the skills and knowledge were put to use and the decisions and actions that were taken by participants toward establishing an aquaculture operation or managing an existing operation. These outcomes and impacts will be recorded in the final report of this project.

**Table 2. Potential pre-workshop survey questions.**

Aquaculture and Aquaponics System Production Workshop Survey						
Please indicate your response to the following questions in the columns to the right.		True		False		
1.	I currently own/operate an aquaculture operation.					
2.	I currently own/operate an aquaponics operation.					
3.	I am a commercial-scale producer.					
4.	I am a hobby-scale producer.					
5.	I am a current/aspiring private industry producer.					
6.	I am an academic research or extension employee.					
7.	I am a natural resource agency employee.					
		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
		1	2	3	4	5
1.	I have significant experience in aquaculture.					
2.	I have significant experience in aquaponics.					
3.	I want to learn about aquaponics production as a business.					
4.	I want to learn about aquaculture production as a business.					
5.	I want to learn about new aquaculture species.					
6.	I want to learn about different aquaculture systems.					
7.	Increasing profitability is a major concern for my business.					

**Table 3. Potential post-workshop survey questions.**

<b>Aquaculture and Aquaponics System Production Workshop Survey</b>						
<b>Please indicate your response to each of the following statements in the column to the right.</b>		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
<b>Changes in Knowledge</b>		1	2	3	4	5
1.	I learned useful information about aquaculture production.					
2.	I learned useful information about aquaponic production.					
3.	I plan begin/expand my operation using knowledge gained from this workshop.					
4.	I believe my new knowledge will improve my production efficiency/profitability.					
5.	I want to learn about new aquaculture species.					
6.	I want to learn about different aquaculture systems.					
7.	Increasing profitability is a major concern for my business.					
8.	Overall this workshop was valuable to me.					
9.	I would recommend this workshop to others.					
<b>Quality of Venue and Services Provided</b>		1	2	3	4	5
1.	The breakfast provided met/exceeded my expectations.					
2.	The lunch provided met/exceeded my expectations.					
3.	The venue was easy to find.					
4.	The venue was of acceptable quality.					
5.	The workshop delivery was executed in a professional manner.					
6.	The workshop overall was of high quality.					
<b>Quality of Speakers and Supplemental Resources Provided</b>		1	2	3	4	5
1.	Speaker #1 was of expert quality.					
2.	Speaker #1 presented quality information in an easy-to-understand, attractive format.					
3.	Speaker #2 was of expert quality.					
4.	Speaker #2 presented quality information in an easy-to-understand, attractive format.					
5.	I will contact the speakers for more information in the future.					
6.	The workbook provided was useful and of high quality.					
7.	The supplemental flash drive provided contained high-quality, useful information.					
8.	The hands-on learning exercises were useful and of high quality					
9.	The written learning exercises were useful and of high quality					

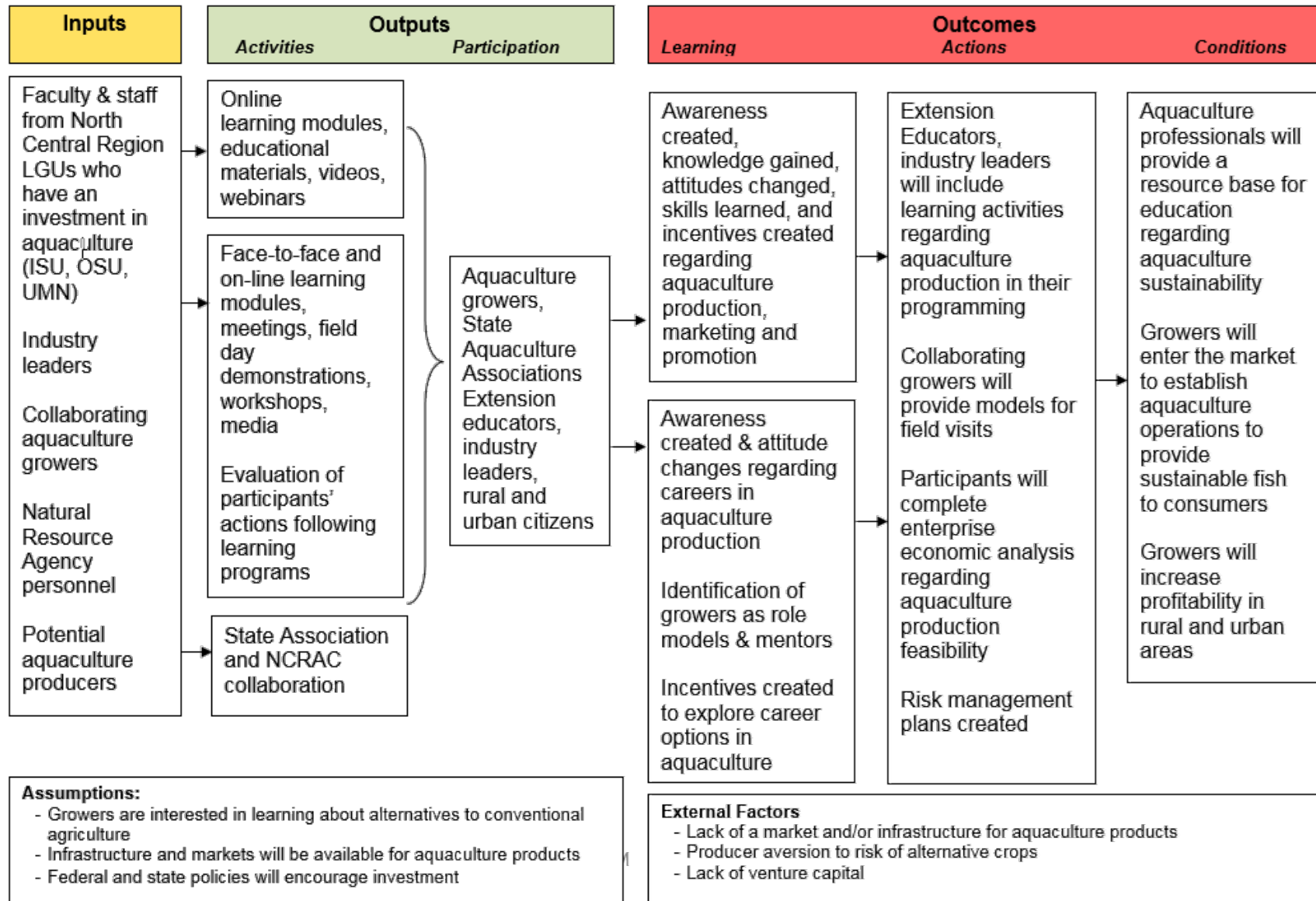
**Table 4. Potential 6-month post-workshop survey questions.**

Aquaculture and Aquaponics System Production Workshop Survey						
Please indicate your response to the following questions in the columns to the right.		True		False		
1.	I currently own/operate an aquaculture operation.					
2.	I currently own/operate an aquaponics operation.					
3.	I am a commercial-scale producer.					
4.	I am a hobby-scale producer.					
5.	I am a current/aspiring private industry producer.					
6.	I am an academic research or extension employee.					
7.	I am a natural resource agency employee.					
8.	I joined a state aquaculture association since the workshop.					
9.	I started a business as a result of the workshop I attended.					
		Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
		1	2	3	4	5
1.	I have pursued aquaculture because of the workshop.					
2.	I have pursued aquaponics because of the workshop.					
3.	I shared the knowledge I gained at the workshop with others.					
4.	My operation is more efficient because of the workshop.					
5.	My business is more profitable because of the workshop.					
6.	I would like to learn more about this aquaculture topic.					
7.	I would like to attend workshops on other aquaculture topics.					

# LOGIC MODEL for A COMPREHENSIVE OUTREACH AND TRAINING PROGRAM TO EXPAND DEVELOPMENT OF NCR AQUACULTURE

**Goal:** Expand development of North Central Region (NCR) aquaculture in the North Central Region of the U.S.

**Objective:** Develop and provide hands-on learning programs to enhance information transfer for both newcomers to the aquaculture industry and established growers



## FACILITIES

These intensive, multi-day, hands-on workshops (n=3 per year) and training opportunities (n=2 per year) from subject area experts (n=4 per conference) will be held in conjunction with a state (i.e., 2017 or 2018 WI/MI/OH/MO/IA/IN Aquaculture Association Meeting) and/or regional aquaculture conference (i.e. 2018 NCRAC Conference. More in-depth, hands-on workshops may be held at the on-campus research and demonstrations facilities of OSU, UMN, and ISU. All recorded presentations and training videos will be archived on the NCRAC.org website. Evaluation of the events will be completed by project PIs and specialists at ISU.

The Brenton Center at Iowa State University provides practical and cost effective educational delivery services. The Brenton Center's state-of-the-art educational facilities can serve as an on-campus location for conferences, or as the origination site for online education offering. The staff of the Brenton Center deals with the technology concerns, allowing instructors to focus on the content and learning. Specific services listed below include development, production, delivery, and evaluation services.

### Development

- Digitizing visuals
- Still images
- Animated images
- Web materials
- Multi-media CD-ROM / DVD
- Digitizing video

### Production

- Planning and Scripting
- Videotaping on-location and in the Brenton Center
- Audio recording and editing
- Video recording and editing

### Delivery

- Matching technology to the group's educational needs
- Providing technical assistance during your presentation
- Preparing videotaped, CD-ROM, & DVD curriculums
- Wirecast capture and live streaming
- Adobe Connect or Zoom Web Conferencing

### Evaluation

- Survey production and delivery
- Qualtrics web-survey technology
- Video featurettes on program delivery and participant interviews

Institution	Facilities	Procedures
ISU	ISU is a world-renowned institution with a proven research history in fisheries, aquaculture, aquaponics as well as home to the NCRAC and Agriculture Marketing Resource Center. ISU's state-of-the art research facility includes five research laboratories (water chemistry, fresh and saltwater fish husbandry systems, aquaponic research systems, six 1/10 <sup>th</sup> acre ponds). ISU also has a multitude of workshop training spaces and extension support staff such as the Brenton Center to develop training videos and perform program evaluations.	<ol style="list-style-type: none"> <li>1) Advanced Aquaculture Systems Workshop</li> <li>2) Aquaculture Business and Marketing Workshop</li> <li>3) Training Video Production</li> <li>4) Program Evaluation</li> <li>5) Reporting</li> </ol>

OSU	OSU is a world-renowned institution with a proven research history in aquaculture and fisheries. OSU's state-of-the art research facility (i.e. water chemistry lab, fish husbandry systems, aquaponic research systems, and earthen production ponds) that provides excellent demonstration sites for the proposed workshops. Additionally, OSU has multiple meeting locations with the appropriate A/V technology to accommodate a workshop for over 50 participants.	1) Advanced Aquaculture Systems Workshop 2) Water Quality Workshop 3) Training Video Production
UMN	UMN is a world-renowned institution with a proven research history in aquaculture, fisheries and fish health. The UMN has on-campus aquaculture and aquaponics research facilities and an AAVLD-accredited Veterinary Diagnostic Laboratory. UMN routinely hosts large-scale wet lab and lecture style workshops for a variety of animal species.	1) Fish Health Workshop 2) Aquaculture Regulations Workshop 3) Training Video Production

### STATEMENT OF DUPLICATION

The principal investigators searched for duplicative work on the themes proposed in this outline, using the USDA Research, Education, and Economics Information System (REEIS <http://reeis.usda.gov/>) on April 28, 2017. Term searches for previously USDA-funded works on aquaculture extension resulted in the following matches:

- Aquaculture Boot Camp 2012 and 2016 (Ohio State University),
- Northern Aquaculture Demonstration Facility 2006 and 2010 (University of Wisconsin-Extension),
- Red Cliff Tribal Hatchery 2008 and 2009 (University of Wisconsin-Extension), and
- NCRAC-funded projects on extension projects since 1988 when the Center was first developed.

The planned activities planned in this project will build upon these past projects to develop an Extension project for the entire North Central Regions and are not duplication of these earlier projects. In addition, the following NOAA databases were accessed and no previously funded projects similar to this proposed project were identified:

## REFERENCES

- Conlyn, J. and G. Boersen. (2015). NCRAC Needs Assessment Report. Originz, LLC.
- Engle, C. R. and N. M. Stone. (2013). Competitiveness of U.S. aquaculture within the current U.S. regulatory framework. *Aquaculture Economics & Management* 17 (3):251-280.
- Environmental Protection Agency (EPA). (2013). Federal Agency Aquaculture Profile Series. Available: [http://www.nmfs.noaa.gov/aquaculture/docs/policy/agency\\_fact\\_sheets/epa\\_regulatory\\_fact\\_sheet\\_updated.pdf](http://www.nmfs.noaa.gov/aquaculture/docs/policy/agency_fact_sheets/epa_regulatory_fact_sheet_updated.pdf) (October 30, 2015).
- Hildreth, R. J. and W. J. Armbruster. (1981). Extension Program Delivery – Past, Present, and Future: An Overview. *American Journal of Agricultural Economics*, 63 (5):853-858 *In* Proceedings Issue (Dec., 1981).
- Smith-Lever Act. (2016). Clemson Cooperative Extension. Available: <http://www.clemson.edu/extension/100/smith-lever-act-1914.html> (October 1, 2016).
- Weeks, C. R. (2014). 2014 NCRAC Needs Assessment.
- Weeks, C. R. (2013). Sustainable Aquaculture in the North Central Region U.S.—A Review of Perceptions and Recommendations from the Aquaculture Community. *Journal of Extension*. 51 (2). Available: <https://www.joe.org/joe/2013april/comm1.php> (March 23, 2017).

### PROJECT LEADERS

State	Name/Institution	Area of Specialization
Iowa	D. Allen Pattillo, Iowa State University, ISU	Aquaculture/Aquaponics Research/Extension
Minnesota	Nicholas B. D. Phelps University of Minnesota, UMN	Extension/Fish Health/ Regulations
Ohio	Matthew A. Smith, The Ohio State University, OSU	Aquaculture Extension

UNITED STATES DEPARTMENT OF AGRICULTURE OMB Approved 0524-0039  
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

ORGANIZATION AND ADDRESS Iowa State University 339 Science Hall 2 Ames, IA 50011				USDA AWARD NO.      Year 1: Objectives 1-4			
PROJECT DIRECTOR(S) D. Allen Pattillo							
	CSREES FUNDED WORK MONTHS						
	Calendar	Academic	Summer				
	3			14,100			
c. ____ Paraprofessionals .....							
d. __ Graduate Students .....							
e. _1_ Prebaccalaureate Students.....				5,200			
f. ____ Secretarial-Clerical .....							
g. ____ Technical, Shop and Other.....							
Total Salaries and Wages ..... <input type="checkbox"/>				19,300			
B. Fringe Benefits (If charged as Direct Costs) 11.4%				4,896			
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ..... <input type="checkbox"/>				24,196			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies				6,670			
F. Travel				9,000			
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.)				4,456			
K. Total Direct Costs (C through I)..... <input type="checkbox"/>				44,322			
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.)							
M. Total Direct and F&A/Indirect Costs (J plus K) ..... <input type="checkbox"/>							
N. Other..... <input type="checkbox"/>							
O. Total Amount of This Request Year 1 <input type="checkbox"/>				44,322			
P. Carryover -- (If Applicable)      Federal Funds: \$      Non-Federal funds: \$      Total \$							
NAME AND TITLE (Type or print)		SIGNATURE (required for revised budget only)				DATE	
Project Director							
Authorized Organizational Representative							
Signature (for optional use)							

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.

## COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

ORGANIZATION AND ADDRESS Iowa State University 339 Science Hall 2 Ames, IA 50011				USDA AWARD NO.      Year 2: Objectives 1-4			
PROJECT DIRECTOR(S) D. Allen Pattillo							
	CSREES FUNDED WORK MONTHS						
	Calendar	Academic	Summer				
	3			14,100			
c. ___ Paraprofessionals .....							
d. ___ Graduate Students .....							
e. _1_ Prebaccalaureate Students.....				5,200			
f. ___ Secretarial-Clerical.....							
g. ___ Technical, Shop and Other.....							
Total Salaries and Wages ..... <input type="checkbox"/>				19,300			
B. Fringe Benefits (If charged as Direct Costs) 12.4%				4,896			
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ..... <input type="checkbox"/>				24,196			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies				2,950			
F. Travel				9,000			
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.)				2,928			
K. Total Direct Costs (C through I) ..... <input type="checkbox"/>				39,074			
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.)							
M. Total Direct and F&A/Indirect Costs (J plus K) ..... <input type="checkbox"/>							
N. Other..... <input type="checkbox"/>							
O. Total Amount of This Request..... <input type="checkbox"/>				39,074			
P. Carryover -- (If Applicable)      Federal Funds: \$      Non-Federal funds: \$      Total \$							
NAME AND TITLE (Type or print)			SIGNATURE (required for revised budget only)			DATE	
Project Director							
Authorized Organizational Representative							
Signature (for optional use)							

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 IOWA STATE UNIVERSITY  
(Pattillo)**

**Objectives 1-4 and Deliverables**

**A. SALARIES AND WAGES: TOTAL = \$38,600**

YEAR 1: = \$19,300

- Salaries are requested for 0.25 FTE (\$14,100) and fringe benefits (34.5%) for Brenton Center personnel for workshop and video development, program support and evaluation.
- Salary (\$5,200) and fringe benefits (0.6%) are requested for one half-time (10 hrs/wk @ \$10/hr) undergraduate student assistant for one full year to assist in workshop planning, development, promotion, execution, and evaluation, demonstration project setup and maintenance, and animal husbandry.

YEAR 2: = \$19,300

- Salaries are requested for 0.25 FTE (\$14,100) and Fringe Benefits (34.5%) for Brenton Center personnel for workshop and video development, program support and evaluation.
- Salary (\$5,200) and fringe benefits (0.6%) are requested for one half-time (10 hrs/wk @ \$10/hr) undergraduate student assistant for one full year to assist in workshop planning, development, promotion, execution, and evaluation, demonstration project setup and maintenance, and animal husbandry.

**B. FRINGE BENEFITS: TOTAL = \$9,792**

YEAR 1: = \$4,896

- Fringe benefits (34.5%) for Brenton Center personnel (\$4,865)
- Fringe benefits (0.6%) are requested for one full time (10 hrs/wk) undergraduate student assistant (\$31)

YEAR 2: = \$4,896

- Fringe benefits (34.5%) for Brenton Center personnel (\$4,865)
- Fringe benefits (0.6%) are requested for half time (10hrs/wk) undergraduate student assistant (\$31)

**E. MATERIALS AND SUPPLIES: TOTAL = \$9,620**

Items	Year 1	Year 2	Total
General workshop supplies including clickers (n=32) and printed materials and flash drives for the lecture component	\$1,290	\$2,950	\$4,240
Hands-on workshop supplies (e.g. fish, feed, laboratory supplies, plumbing, water chemistry supplies)	\$5,380		\$5,380
<b>Total</b>	<b>\$6,670</b>	<b>\$2,950</b>	<b>\$9,620</b>

**F. TRAVEL (DOMESTIC): TOTAL = \$18,000**

YEAR 1: = \$9,000

- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for aquaculture production workshop presenters (n=2). Total = \$1,600
- Transportation (\$600 including baggage fees), lodging (\$200), and meal expenses (\$100) for Brenton Center Staff to attend workshops outside of Iowa (n=2) and record the presentations and video footage for training videos. Total = \$1,800
- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for the PI (Pattillo) to attend the other workshops (n=2) and participate in state and regional aquaculture conferences (n=2). Total = \$3,200
- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for the Extension Liaison (Weeks) to attend workshops and participate in state and regional aquaculture conferences (n=3). Total = \$2,400

YEAR 2: = \$9,000

- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for aquaculture business and marketing workshop presenters (n=2). Total = \$1,600
- Transportation (\$600 including baggage fees), lodging (\$200), and meal expenses (\$100) for Brenton Center Staff to attend workshops outside of Iowa (n=2) and record the presentations and video footage for training videos. Total = \$1,800
- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for the PI (Pattillo) to attend the other workshops (n=2) and participate in state and regional aquaculture conferences (n=2). Total = \$3,200

- Transportation (\$500), lodging (\$200), and meal expenses (\$100) for the Extension Liaison (Weeks) to attend the workshops and participate in state and regional aquaculture conferences (n=3). Total = \$2,400

**J. OTHER DIRECT COSTS: TOTAL = \$7,384**

YEAR 1: = \$4,456

- \$2,556 for meals for workshop attendees (n=30) and \$1,900 for meeting room (2 days) and media rentals.

YEAR 2: = \$2,928

- \$1,978 for meals for workshop attendees (n=50) and \$950 for meeting room (1 day) and media rentals.

**Total Year 1: \$44,322**

**Total Year 2: \$39,074**

**TOTAL COST FOR ISU: \$83,396**

**IOWA STATE UNIVERSITY**  
OF SCIENCE AND TECHNOLOGY

Office of Sponsored  
Programs Administration  
1138 Pearson Hall  
505 Morrill Road  
Ames, Iowa 50011-2103  
Phone: 515 294-5225  
Fax: 515 294-8000

October 3, 2016

Dr. Joseph E. Morris, Director  
North Central Regional Aquaculture Center  
Iowa State University  
339 Science II  
Ames, Iowa 50011-3221

**SUBJECT: Comprehensive Outreach and Training Program to Expand  
Development of NCR Aquaculture**

Dear Dr. Morris:

As the Authorized Organizational Representative (AOR) I would like to inform you Iowa State University (ISU) wishes to participate in the above referenced project. Mr David Allen Patillo will serve as the Principal Investigator of the subcontract and he will have access to all of the necessary equipment, laboratory, and office space to successfully undertake this project. I also approve the budget as submitted for Mr. David Allen Pattillo's involvement in this project. Upon issuance of approval to the North Central Regional Aquaculture Center for this project, ISU will enter into a formal agreement with your institution.

Sincerely,



Kirsten Abel  
Pre-Award Administrator

UNITED STATES DEPARTMENT OF AGRICULTURE      OMB Approved 0524-0039  
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

<b>ORGANIZATION AND ADDRESS</b> University of Minnesota 1333 Gortner Ave St. Paul, MN 55108				<b>USDA AWARD NO.      Year 1: Objectives 1-3</b>				
<b>PROJECT DIRECTOR(S)</b> Nicholas B. D. Phelps								
		<b>CSREES FUNDED WORK MONTHS</b>						
		Calendar	Academic					Summer
		1						
c. ____ Paraprofessionals .....								
d. _1_ Graduate Students .....				1,300				
e. ____ Prebaccalaureate Students.....								
f. ____ Secretarial-Clerical.....								
g. ____ Technical, Shop and Other .....								
<b>Total Salaries and Wages</b> ..... <input type="checkbox"/>				5,300				
B. Fringe Benefits (If charged as Direct Costs) 11.4%				1,440				
<b>C. Total Salaries, Wages, and Fringe Benefits (A plus B) .....</b> <input type="checkbox"/>				6,740				
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)								
E. Materials and Supplies				6,750				
F. Travel				4,000				
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.)				4,000				
<b>K. Total Direct Costs (C through I) .....</b> <input type="checkbox"/>				21,490				
<b>L. F&amp;A/Indirect Costs.</b> (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"/>								
<b>N. Other</b> ..... <input type="checkbox"/>								
<b>O. Total Amount of This Request Year 1</b> <input type="checkbox"/>				21,490				
<b>P. Carryover -- (If Applicable)      Federal Funds: \$      Non-Federal funds: \$      Total \$</b>								
<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 for this information collection is 0524-0039.

UNITED STATES DEPARTMENT OF AGRICULTURE      OMB Approved 0524-0039  
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

ORGANIZATION AND ADDRESS	<b>USDA AWARD NO.      Year 2: Objectives 1-3</b>
--------------------------	---

University of Minnesota 1333 Gortner Ave St. Paul, MN 55108				Duration Proposed Months: <u>12</u> <b>Year 2</b> <b>Funds</b> <b>Requested by</b> <b>Proposer</b>	Duration Proposed Months: ____ <b>Funds Approved</b> <b>by CSREES</b> (If different)	Non-Federal Proposed Cost- Sharing/ Matching Funds (If required)	Non-federal Cost- Sharing/ Matching Funds Approved by CSREES (If Different)	
PROJECT DIRECTOR(S) Nicholas B. D. Phelps								
		<b>CSREES FUNDED WORK MONTHS</b>						
		Calendar	Academic					Summer
		1						
c. ____ Paraprofessionals .....								
d. <u>1</u> Graduate Students .....				1,300				
e. ____ Prebaccalaureate Students.....								
f. ____ Secretarial-Clerical.....								
g. ____ Technical, Shop and Other .....								
<b>Total Salaries and Wages</b> .....				5,300				
B. Fringe Benefits (If charged as Direct Costs) 12.4%				1,440				
<b>C. Total Salaries, Wages, and Fringe Benefits (A plus B) .....</b>				6,740				
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)								
E. Materials and Supplies				500				
F. Travel				4,000				
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.)				2,000				
<b>K. Total Direct Costs (C through I) .....</b>				13,240				
<b>L. F&amp;A/Indirect Costs.</b> (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>								
<b>N. Other .....</b>								
<b>O. Total Amount of This Request.....</b>				13,240				
<b>P. Carryover -- (If Applicable)</b> <b>Federal Funds: \$</b> <b>Non-Federal funds: \$</b> <b>Total \$</b>								
NAME AND TITLE (Type or print)		SIGNATURE (required for revised budget only)					DATE	
Project Director								
Authorized Organizational Representative								
Signature (for optional use)								

**BUDGET EXPLANATION FOR UNIVERSITY OF MINNESOTA  
(Phelps)**

**Objectives 1-3 & Deliverables**

**A. SALARIES AND WAGES: TOTAL = \$10,600**

YEAR 1: = \$5,300

- Salaries are requested for one veterinary student (\$1,300) to assist with workshop preparation and presentation.
- Salary is requested for workshop leader (\$4,000).

YEAR 2: = \$5,300

- Salaries are requested for one veterinary student (\$1,300) to assist with workshop preparation and presentation
- Salary is requested for workshop leader (\$4,000).

**B. FRINGE BENEFITS: TOTAL = \$2,880**

YEAR 1: = \$1,440

YEAR 2: = \$1,440

**E. MATERIALS AND SUPPLIES: TOTAL = \$7,250**

Items	Year 1	Year 2	Total
General supplies to host hands on fish health workshop, including fish for necropsy, laboratory tools, disposable supplies (i.e. gloves, slides, etc), and miscellaneous	\$1,750		\$1,750
Microscopes (n=5) for wet lab	\$4,500		\$4,500
Printing of materials for fish health workshop and aquaculture regulation workshop	\$500	\$500	\$1,000
<b>Total</b>	<b>\$6,750</b>	<b>\$500</b>	<b>\$7,250</b>

**F. TRAVEL (DOMESTIC): TOTAL = \$8,000**

YEAR 1: = \$4,000

- Transportation (\$550), lodging (\$300), and meal expenses (\$150) for aquaculture production workshop presenters (n=4). Total = \$4,000

YEAR 2: = \$4,000

- Transportation (\$550), lodging (\$300), and meal expenses (\$150) for aquaculture production workshop presenters (n=4). Total = \$4,000

**J. OTHER DIRECT COSTS: TOTAL = \$6,000**

YEAR 1: = \$4,000

- \$2,000 for meals for workshop attendees and \$2,000 for production of supplemental videos.

YEAR 2: = \$2,000

- \$2,000 for meals for workshop attendees.

**Total Year 1: \$21,490**

**Total Year 2: \$13,240**

**TOTAL COST FOR UMN: \$34,730**

## UNIVERSITY OF MINNESOTA

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*Twin Cities Campus*

*Office of Sponsored Projects Administration*

*450 McNamara Alumni Center*

*200 Oak Street S.E.*

*Minneapolis, MN 55455*

*Office: 612-624-5599*

*Fax: 612-624-4843*

May 24, 2017

Dr. Joseph E. Morris, Director  
North Central Regional Aquaculture Center  
Iowa State University  
339 Science II  
Ames, Iowa 50011-3221

**SUBJECT: Project entitled "Comprehensive outreach and training program to expand development of NCR aquaculture"**

Dear Dr. Morris:

As the Authorized Organizational Representative (AOR) I would like to inform you the University of Minnesota (UMN) wishes to participate in the above referenced project as a subcontractor to Iowa State University.

Dr. Nicholas Phelps will serve as the Principal Investigator of the subcontract and he has access to all of the necessary equipment, laboratory, and office space to successfully undertake this project. I also approve the budget as submitted for Dr. Phelps' involvement in this project. Upon issuance of approval to the North Central Regional Aquaculture Center for this project, Iowa State University and UMN will enter into a formal agreement.

Sincerely,



Andrea Marshall, Principal Grant Administrator  
Sponsored Projects Administration

**Driven to Discover**

UNITED STATES DEPARTMENT OF AGRICULTURE OMB Approved 0524-0039  
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

ORGANIZATION AND ADDRESS The Ohio State University 1864 Shyville Road Piketon, OH 45661				USDA AWARD NO.	Years 1: Objectives 1-4		
PROJECT DIRECTOR(S) Matthew A. Smith							
	CSREES FUNDED WORK MONTHS						
	Calendar	Academic	Summer				
	1.75			\$7,100			
c. ___ Paraprofessionals .....							
d. ___ Graduate Students .....							
e. ___ Prebaccalaureate Students.....							
f. ___ Secretarial-Clerical.....							
g. ___ Technical, Shop and Other.....							
Total Salaries and Wages ..... <input type="checkbox"/>				\$7,100			
B. Fringe Benefits (If charged as Direct Costs)				\$2,513			
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ..... <input type="checkbox"/>				\$9,613			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies				\$4,800			
F. Travel				\$2,888			
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.)				\$3,508			
K. Total Direct Costs (C through I)..... <input type="checkbox"/>				\$20,809			
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.)							
M. Total Direct and F&A/Indirect Costs (J plus K) ..... <input type="checkbox"/>							
N. Other..... <input type="checkbox"/>							
O. Total Amount of This Request..... <input type="checkbox"/>				\$20,809			
P. Carryover -- (If Applicable)      Federal Funds: \$      Non-Federal funds: \$      Total \$							
NAME AND TITLE (Type or print)			SIGNATURE (required for revised budget only)			DATE	
Project Director							
Authorized Organizational Representative							
Signature (for optional use)							
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.							
UNITED STATES DEPARTMENT OF AGRICULTURE    OMB Approved 0524-0039 COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE							
ORGANIZATION AND ADDRESS				USDA AWARD NO.      Years 2: Objectives 1-4			

The Ohio State University 1864 Shyville Road Piketon, OH 45661				Duration Proposed Months: <u>12</u> <b>Total 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)
PROJECT DIRECTOR(S) Matthew A. Smith							
	CSREES FUNDED WORK MONTHS						
	Calendar	Academic	Summer				
	1.75			\$7,241			
c. ____ Paraprofessionals .....							
d. ____ Graduate Students .....							
e. ____ Prebaccalaureate Students .....							
f. ____ Secretarial-Clerical .....							
g. ____ Technical, Shop and Other.....							
Total Salaries and Wages ..... <input type="checkbox"/>				\$7,241			
B. Fringe Benefits (If charged as Direct Costs)				\$2,563			
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ..... <input type="checkbox"/>				\$9,804			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies				\$4,015			
F. Travel				\$2,200			
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.)				\$4,009			
K. Total Direct Costs (C through I)..... <input type="checkbox"/>				\$20,028			
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.)							
M. Total Direct and F&A/Indirect Costs (J plus K) ..... <input type="checkbox"/>							
N. Other..... <input type="checkbox"/>							
O. Total Amount of This Request..... <input type="checkbox"/>				\$20,028			
P. Carryover -- (If Applicable)      Federal Funds: \$      Non-Federal funds: \$      Total \$							
NAME AND TITLE (Type or print)			SIGNATURE (required for revised budget only)				DATE
Project Director							
Authorized Organizational Representative							
Signature (for optional use)							

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 OHIO STATE UNIVERSITY  
(Smith)**

**Objectives 1-4 and Deliverables**

**A. SALARIES AND WAGES:**

YEAR 1: = \$7,100

- *Other Professionals (A&P Staff) PI/PD:* Smith \$7,100 (14.5% effort) requested for 12 months to assist with the development, coordination, and implementation of hands-on workshops, Extension publications, and web-based deliverables for year 1.

YEAR 2: = \$7,241

*Other Professionals (A&P Staff) PI/PD:* Smith \$7,241 (14.4% effort) for 12 months to assist with the development, coordination, and implementation of hands-on workshops, Extension publications, and web-based deliverables for year 2.

**B. FRINGE BENEFITS:**

YEAR 1: = \$2,513

- Fringe rate would be 35.4% (\$2,513) for year 1.

YEAR 2: = \$2,563

- Fringe rate would be 35.4% (\$2,563) for year 2.

**E. MATERIALS AND SUPPLIES:**

Items	Year 1	Year 2	Total
General workshop supplies including printed materials for the lecture component	\$1,190	\$1,190	\$2,380
Hands-on workshop materials including fish, feed, laboratory tools, plumbing, water chemistry supplies, disposable supplies (i.e. gloves, paper towels, etc.), and miscellaneous	\$3,610	\$2,825	\$6,435
<b>Total</b>	<b>\$4,800</b>	<b>\$4,015</b>	<b>\$8,815</b>

**F. TRAVEL (DOMESTIC):**

YEAR 1: = \$2,888

- Transportation to and from airport, airport parking, per diem, car rental including insurance and gas, hotel, and flight to the University of Minnesota for hands-on workshop (\$1,444).
- Transportation to and from airport, airport parking, per diem, car rental including insurance and gas, hotel, and flight to the Iowa State University for hands-on workshop (\$1,444).

YEAR 2: = \$ 2,200

- Transportation to and from airport, airport parking, per diem, car rental including insurance and gas, hotel, and flight to the University of Minnesota for hands-on workshop (\$1,100).
- Transportation to and from airport, airport parking, per diem, car rental including insurance and gas, hotel, and flight to the Iowa State University for hands-on workshop (\$1,100).

**J. OTHER DIRECT COSTS:**

Year 1: = \$3,508

- \$1,500 is requested for meals for workshop attendees and \$2,008 for invited speakers.

Year 2: = \$4,009

- \$2,001 is requested for meals for workshop attendees and \$2,008 for invited speakers.

**Total Year 1:** \$20,809

**Total Year 2:** \$20,028

**TOTAL COST FOR OSU (Year 1&2): \$40,837**



**THE OHIO STATE UNIVERSITY**

Office of Sponsored Programs  
1960 Kenny Road  
Columbus, OH 43210

October 3, 2016

Dr. Joseph E. Morris, Director  
North Central Regional Aquaculture Center  
Iowa State University  
339 Science II  
Ames, Iowa 50011-3221

SUBJECT: Project entitled: "Comprehensive outreach and training program to expand development of NCR aquaculture"

Dear Dr. Morris:

As the Authorized Organizational Representative (AOR), I would like to inform you that The Ohio State University wishes to participate in the above referenced project as a subcontractor to Iowa State University. Mr. Matthew Smith will serve as our Principal Investigator and will have access to all the necessary equipment, laboratory and office space to successfully undertake this project. I also approve the budget as submitted for Mr. Smith's involvement.

We understand that, upon issuance of approval to the North Central Regional Aquaculture Center for this project, Iowa State University and The Ohio State University will enter into a formal agreement.

The Office of Sponsored Programs is the legal entity authorized to administer grants awarded to faculty and staff at The Ohio State University. Appropriate administrative personnel are aware of this submission and are prepared to manage this grant, if awarded. Any resulting award should be issued to The Ohio State University, Tax I.D. # 31-6025986; DUNS # 832127323.

If you need any additional information, please contact me as administrative contact, Traci Aquara, Sponsored Program Officer. I may be reached at 614-688-1765 or [aquara.1@osu.edu](mailto:aquara.1@osu.edu).

Sincerely,

Traci Aquara  
Sponsored Program Officer  
Office of Sponsored Programs  
The Ohio State University

## BUDGET SUMMARY

### YEAR 1 (2017-18)

	NCRAC Funds				
	Objective #	ISU (Pattillo)	OSU (Smith)	UMN (Phelps)	Project Total
Salaries and Wages	1,2,3,&4	\$19,300	\$7,100	\$5,300	\$31,700
Fringe Benefits		\$4,896	\$2,513	\$1,440	\$8,818
Total Salaries, Wages, and Fringe Benefits		\$24,196	\$9,613	\$6,740	\$40,518
Nonexpendable Equipment		\$0	\$0	\$0	\$0
Materials and Supplies	1,2,3,&4	\$6,670	\$4,800	\$6,750	\$18,220
Travel	1,2,3,&4	\$9,000	\$2,888	\$4,000	\$15,888
All Other Direct Costs	1,2,3,&4	\$4,456	\$3,508	\$4,000	\$11,964
Total		\$44,322	\$20,809	\$21,490	\$86,621

### YEAR 2 (2018-19)

	NCRAC Funds				
	Objective #	ISU (Pattillo)	OSU (Smith)	UMN (Phelps)	Project Total
Salaries and Wages	1,2,3,&4	\$19,300	\$7,241	\$5,300	\$31,841
Fringe Benefits		\$4,896	\$2,563	\$1,440	\$8,899
Total Salaries, Wages, and Fringe Benefits		\$24,169	\$9,804	\$6,740	\$40,709
Nonexpendable Equipment		\$0	\$0	\$0	\$0
Materials and Supplies	1,2,3,&4	\$2,950	\$4,015	\$500	\$7,465
Travel	1,2,3,&4	\$9,000	\$2,200	\$4,000	\$15,200
All Other Direct Costs	1,2,3,&4	\$2,928	\$4,009	\$2,000	\$8,937
Total		\$39,074	\$20,028	\$13,240	\$72,342

## SCHEDULE FOR COMPLETION OF OBJECTIVES

Start date: September 1, 2017

Completion date: August 31, 2019

Objectives, Tasks, and Deliverables		Year 1						Year 2					
		S O	N D	J F	M A	M J	J A	S O	N D	J F	M A	M J	J A
Objective 1: Develop a comprehensive training program that addresses subject priorities critical to the advancement of NCR aquaculture													
	Water Quality workshop and video development												
	Aquaculture Systems and video development												
	Fish Health workshop and video development												
	Aquaculture Regulations workshop and video development												
	Advanced Aquaculture Systems workshop and video development												
	Aquaculture Business and Marketing workshop and video development												
Objective 2: Identify a core team of subject experts who can develop and deliver high quality presentations and demonstrations throughout the NCR.													
Objective 3: In cooperation with NCR states, deliver workshops and training region-wide.													
	Water Quality Management workshop												
	Advanced Aquaculture Systems workshop												
	Fish Health workshop												
	Aquaculture Regulations workshop												
	Aquaculture Systems workshop												
	Aquaculture Business and Marketing workshop												
Deliverables	Archived presentations and related extension materials associated with the workshops												
Objective 4: Develop a comprehensive evaluation plan to assess the adoption/integration of information to the target audience.													
	Develop												
	Implement												
	Analyze												
	Report												

## **PARTICIPATING INSTITUTIONS AND CO-PRINCIPAL INVESTIGATORS**

### **Iowa State University**

D. Allen Pattillo

### **The Ohio State University**

Matthew A. Smith

### **University of Minnesota**

Nicholas B. D. Phelps

## VITA

D. Allen Pattillo  
Department of Natural Resource Ecology and Management  
Iowa State University  
339 Science Hall II  
Ames, IA 50011-3221

Phone: (515) 294-8616  
Fax: (515) 294-2995  
E-mail: [Pattillo@iastate.edu](mailto:Pattillo@iastate.edu)

## EDUCATION

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

## POSITIONS

2011-present Aquaculture Extension Specialist III, Department of Natural Resource Ecology and Management,  
Iowa State University  
2008-2010 Graduate Research Assistant, Department of Fisheries and Allied Aquacultures,  
Auburn University

## SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society  
World Aquaculture Society  
United States Aquaculture Society

## SELECTED PUBLICATIONS

- Pattillo, D. A. (2014). Fish Health Considerations for Recirculation Aquaculture. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Fish-Health-Considerations-for-Recirculating-Aquaculture>. (June 2015).
- Pattillo, D. A. (2014). Standard Operating Procedures - Fish Health Management for Recirculating Aquaculture. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Standard-Operating-Procedures-Fish-Health-Management-for-Recirculating-Aquaculture>. (June 2015)
- Pattillo, D. A. (2014). Feeding Practices for Recirculating Aquaculture. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Feeding-Practices-for-Recirculating-Aquaculture>. (June 2015)
- Pattillo, D. A. (2014). Standard Operating Procedures – Feeding Practices and Feed Management. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Standard-Operating-Procedures-Feeding-Practices-for-Recirculating-Aquaculture>. (June 2015)
- Pattillo, D. A. (2014). Water Quality Management for Recirculating Aquaculture. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Water-Quality-Management-for-Recirculating-Aquaculture>. (June 2015)
- Pattillo, D. A. (2014). Standard Operating Procedures - Water Quality Management for Recirculating Aquaculture. Iowa State University Extension. Accessible: <https://store.extension.iastate.edu/Product/Standard-Operating-Procedures-Water-Quality-Management-for-Recirculating-Aquaculture>. (June 2015)
- Burden, D and D. A. Pattillo. (2013). Agricultural Marketing Resource Center. Australian Redclaw Crayfish. Accessible: [http://www.agmrc.org/commodities\\_\\_products/aquaculture/aquaculture-non-fish-species](http://www.agmrc.org/commodities__products/aquaculture/aquaculture-non-fish-species). (June 2015)
- Burden, D. and D.A. Pattillo. (2013). Aquaponics. Agricultural Marketing Resource Center. Accessible: [http://www.agmrc.org/commodities\\_\\_products/aquaponics/](http://www.agmrc.org/commodities__products/aquaponics/) (June 2015)

## VITA

Nicholas B. D. Phelps  
College of Veterinary Medicine, Veterinary Population Medicine Dept  
University of Minnesota  
1333 Gortner Ave  
St. Paul, MN 55108

Phone: (612) 624-7450  
Fax: (612) 624-8707  
E-mail: phelp083@umn.edu

## EDUCATION

Ph.D. University of Minnesota, 2012, Veterinary Medicine  
M.S. University of Arkansas at Pine Bluff, 2007, Aquaculture/Fisheries  
B.S. Bemidji State University, 2005, Aquatic Biology

## POSITIONS

2013-present	Assistant Professor, Dept Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota
2009-2013	Instructor, Dept Veterinary Population Medicine, College of Veterinary Medicine, University of Minnesota
2009-present	Aquaculture Specialist, Extension, U of Minnesota
2009-present	Head, Fisheries Diagnostic Service, Veterinary Diagnostic Laboratory, College of Veterinary Medicine, University of Minnesota
2008-2009	Scientist, Veterinary Diagnostic Laboratory, College of Veterinary Medicine, University of Minnesota
2007-2008	Scientist, Veterinary Diagnostic Laboratory, College of Veterinary Medicine, University of Minnesota
2005-2007	Research Assistant, Fish Disease Laboratory, University of Arkansas at Pine Bluff

## SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society, Sections: Fish Health, Fish Culture  
United States Animal Health Association  
American Association of Veterinary Laboratory Diagnosticians

## SELECTED PUBLICATIONS

Phelps, N. B. D., S. K. Mor, A. Armien, K. Pelican, S. M. Goyal. 2015. Description of the microsporidian parasite, *Heterosporis sutherlandae* n. sp., infecting fish in the Great Lakes region, USA. PLOS One 10(8):e0132027.

Papenfuss, J., N. Phelps, D. Fullton, P. Venturelli. 2015. Smartphones reveal angler behavior: A case-study of a popular mobile fishing application in Alberta, Canada. Fisheries 40:318-327.

Mor, S. K., N. B. D. Phelps, M. Barbknecht, M. A. Hoffman, S. M. Goyal. 2015. A multiplex RT-PCR for the detection of fish picornaviruses. Journal of Virological Methods 211:131-134.

Knowels, S. K., S. Massarani, N. B. D. Phelps. 2015. Minnesota fish kill investigation manual.

Rodger, H. D., N. B. D. Phelps. 2015. Percid fish health and disease. In: Kestemont and K. Dabrowski (eds) Biology and Culture of Percid Fishes – Principles and Practices. Springer.

Phelps, N.B., Pelican, K., Goyal, S., Craft, M., and D. Travis. 2014. Risk-based management of viral hemorrhagic septicemia virus (VHSV-IVb) in Minnesota. North American Journal of Fisheries Management 34:373-379.

## VITA

Matthew A. Smith  
1864 Shyville Road  
Piketon, OH 45661

Phone: 740-289-2071  
FAX: 740-289-4591  
E-mail: [smith.11460@osu.edu](mailto:smith.11460@osu.edu)

## EDUCATION

M.S. University of Arkansas, Pine Bluff, 2015, Aquaculture/Fisheries, Aquaculture  
B.S. Auburn University, 2012, Fisheries/Allied Aquaculture, Fish Mgt.

## POSITIONS

2016 – Present Extension Aquaculture Specialist, Ohio State University, South Centers  
2015 – 2016 Extension Fish Health Associate, University of Arkansas at Pine Bluff,  
Lonoke Fish Disease Diagnostics Laboratory  
2013 – 2015 Graduate Researcher, University of Arkansas at Pine Bluff  
2012 Graduate Researcher assistant, Auburn University, Ireland Center

## SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

Ohio Aquaculture Association  
World Aquaculture Society  
U.S. Aquaculture Society  
National Aquaculture Association  
Catfish Farmers of Arkansas  
Arkansas Bait and Ornamental Fish Growers Association

## EXTENSION PUBLICATIONS

Smith M.A. 2016. Testing your water quality and maintaining good records. Buckeye Aquafarming. 1(1): in press.  
Smith M.A. 2016. Growing largemouth bass for foodfish? A general overview for Ohio fish farmers. OSU Extension Ohioline Fact Sheet. in press.  
Smith M.A. and Stone N.M. 2016. Winter Golden Shiner production in a split-pond system. Arkansas Aquafarming 33(1): 1-2.  
Roy L.A., Kearby M., Kelly A.M., Smith M.A., and Hoy M. 2016. Lesser scaup predation on Arkansas sportfish farms. Arkansas Aquafarming 33(2): in press.

## PUBLISHED ABSTRACTS

Smith M.A., Roy L.A., Kelly A.M., Quintero H., and Park J. 2016. Feeding regimes for Largemouth Bass at high summer temperatures. Aquaculture America, Annual Meeting of the U.S. Aquaculture Society. Las Vegas, NV. February 22-26, 2016.  
Kelly A.M., Jacobs J., Roy L.A., and Smith M.A. 2016. Update on the use of *Paracoccus pantotrophus* to reduce hydrogen sulfide concentrations in commercial Golden Shiner *Notemigonus crysoleucas* ponds in Arkansas. Lonoke Aquaculture Workshop. Lonoke, AR. February 11, 2016.  
Roy LA, Smith MA, Kearby M, Kelly AM, and Hoy M. 2016. Predation by Lesser Scaup, *Athya affinis*, on commercial sportfish farms in Arkansas. Aquaculture America, Annual Meeting of the U.S. Aquaculture Society. Las Vegas, NV. February 22-26, 2016.  
Roy L.A., Smith M.A., Kearby M., Kelly A.M., and Hoy M. 2016. Winter fish loss study #1: Predation by lesser scaup on commercial sportfish farms in Arkansas. Lonoke Aquaculture Workshop. Lonoke, AR. February 11, 2016.

## VITA

Christopher Weeks

Phone: (517) 745-1562

PhD, Michigan State University  
Department of Fisheries and Wildlife  
East Lansing, Michigan 48824

E-mail: weekschr@msu.edu

### EDUCATION

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

### POSITIONS

2008 – Present	Regional Aquaculture Extension Specialist, North Central Regional Aquaculture Center
2012	Adjunct Professor, University of Alaska
2007 – 2008	Research Associate / Specialist, Michigan State University Dept. of Fisheries and Wildlife
1996 – 2009	Consultant, Aquaculture Bioengineering Corp., Rives Junction, Michigan
2003 – 2007	Lab Manager, Michigan State University Aquatic Animal Health Lab
2002 – 2007	Graduate Assistant, Michigan State University
2000 – 2001	Aquaculture Facility Manager, Stoney Creek Fisheries, Harrietta, Michigan
1998 – 2000	Hatchery Manager, Great Black Creek Fish Co., Black Creek, Wisconsin
1989 – 1993	Cade Industries, Engineer, San Diego, California; Lansing, Michigan
1986 – 1989	McDonnell Douglas, Engineer, Long Beach, California

### SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

World Aquaculture Society, National Aquaculture Association, Aquaculture Engineering Society (past)  
Michigan Aquaculture Association, President 2003 – 2008.

### PUBLICATIONS /TECHNICAL REPORTS

Weeks, C., N. Phelps, and R. Kinnunen. 2016. Feasibility Study, Voluntary Aquatic Invasive Species Prevention Verification for Aquaculture and Baitfish Sectors in the Great Lakes (Submitted to State of Michigan).

Colyn, J., G. Boersen, B. Knudsen and C. Weeks. 2014. A strategic plan for a thriving and sustainable Michigan aquaculture; Michigan Sea Grant Integrated Assessment Final Report. Michigan Sea Grant, Ann Arbor, MI.

Weeks C. 2013. Sustainable aquaculture in the north central region US - review of perceptions and recommendations from the aquaculture community. Journal of Extension 51 (2) - 2COM1.

Weeks C. 2011. Incorporating deliverables into the NCRAC project development process. North Central Regional Aquaculture Center Report. North Central Regional Aquaculture Center, December 2011.

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## EDUCATION

M.S. University of Florida, 1986, Agriculture/Sales and Marketing  
B.S. Florida Institute of Technology, 1977, Biology/Marine Biology

## POSITIONS

2014 to Present	Development Director, National Aquaculture Association.
2012-2014	Environmental Administrator, Florida Dept of Agriculture and Consumer Services
1999-2012	Biological Administrator, FDACS
1987-1999	Development Representative, FDACS
1978-1986	Manager, The Bait Box
1969-1976	Field Biologist, Caretta Research, Inc.

## SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society  
Florida Aquaculture Association  
North American Sturgeon and Paddlefish Society  
U.S. Aquaculture Society  
World Aquaculture Society

## SELECTED PUBLICATIONS

- Zajicek, P., A.E. Goodwin and T. Weier. (2011). Triploid grass carp: triploid induction, sterility, reversion, and certification. *North American Journal of Fisheries Management* 31(4): 614-618.
- Zajicek, P., S. Hardin, and C. Watson. (2009). A Florida marine ornamental pathway risk analysis. *Reviews In Fisheries Science* 17(2): 156-169.
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- Boyd, C.E., P.W. Zajicek, J.A. Hargreaves and G.L. Jensen. (2008). Development, implementation, and verification of best management practices for aquaculture *In* C.S. Tucker and J.A. Hargreaves (ed) *Environmental Best Management Practices for Aquaculture*. Blackwell Publishing, Oxford UK.
- Jensen, G.L. and P.W. Zajicek. (2008). Best management practice programs and initiatives in the United States *In* C.S. Tucker and J.A. Hargreaves (ed) *Environmental Best Management Practices for Aquaculture*. Blackwell Publishing, Oxford UK.
- Hill, J.E. and P. Zajicek. (2007). National aquatic species risk analysis: a call for improved implementation. *Fisheries* 32(11): 530-538.