

NORTH CENTRAL REGIONAL AQUACULTURE CENTER EXTENSION PROJECT

Chairperson: D. Allen Pattillo, Iowa State University

Industry Advisory Council Liaison: Dan Vogler, Harrietta Hills Trout Farm, LLC.

Funding Request: \$50,000

Duration: 2 Years (September 1, 2016 – August 31, 2018)

Objectives:

1. Strengthen linkages between North Central Regional Aquaculture Center (NCRAC) Research and Extension Work Groups.
2. Enhance the NCRAC extension network for aquaculture information transfer.
3. Develop and implement aquaculture educational programs and materials for the North Central Region (NCR).

Deliverables:

1. Revised NCRAC publication library
2. Development of new NCRAC resource(s)

Proposed Budget:

Institution	Principle Investigator	Objectives	Year 1	Year 2	Total
Iowa State University (ISU)	D. Allen Pattillo	1-2	30,000	20,000	50,000
Total			30,000	20,000	50,000

Non-Funded Collaborators:

Institution	Collaborator
University of Nebraska-Lincoln	Dennis E. Bauer
North Dakota State University	Mark E. Clark
University of Wisconsin-Extension	Yet to be named
Southern Illinois University – Carbondale	Paul Hitchens
Michigan State University	Ronald E. Kinnunen
Kansas State University	Charles D. Lee
South Dakota State University	Yet to be named
University of Minnesota	Nicholas B. D. Phelps
Purdue University	Kwamena K. Quagraine
Michigan State University	Christopher Weeks
University of Missouri	Bob Pierce

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SUMMARY OVERVIEW

The 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 NCR creates challenges for dissemination of applied research findings. In a 2014 NCR Aquaculture Needs Survey (Weeks et al. 2014, unpublished), several priorities were identified for species information, extension activities, and needed outreach tools. One way to supplement learning opportunities is to provide high-quality, timely, and relevant publications and other online resources that are open access and readily available to NCRAC clientele. It has been indicated that many of the NCRAC fact sheets have become dated, with an average age of 18 years, and require revision to achieve maximum relevancy for today's aquaculture industry. The current project will complement previous extension information transfer efforts, and enhance learning outcomes for participants by providing a revised and updated NCRAC resource library.

JUSTIFICATION

Aquaculture in the NCR is an emerging industry that has continued into the 21st century, with an estimated farm gate value of \$36.7 million. Although the NCR contains approximately 25% of the U.S. population, the regional aquaculture production accounts for less than 3% of all U.S. aquaculture according to the USDA. The North Central Regional Aquaculture Center (NCRAC) Extension Work Group represents one of the longest established organized programs providing aquaculture resource information and technical assistance to the NCR's commercial aquaculture industry through applied and basic research, education, and outreach. The goal for the Extension Work Group is to focus on delivering more specialized services to the aquaculture industry and broaden the scope of the program in the NCR. Members of the NCRAC Extension Work Group will continue to expand on these efforts by providing information for state, regional, and national applications.

With the growth of the aquaculture industry in the NCR, a new demand and broader market for technical aquaculture services has evolved. Providing technical assistance in all aspects of aquaculture is critical to enhance the positive momentum that the region's aquaculture industry is exhibiting. As novices enter the industry, they seek guidance from knowledgeable and experienced persons, commonly from state and federal agencies but also from private culturists. Experienced culturists need updated information on new research findings on alternative rearing techniques that can maximize production and profits. With this growth of the regional aquaculture industry, the demand for developing more effective strategies to advance the industry must occur. This requires timely responses to critical issues but also the timely transfer of research findings to the aquaculture industry for implementation. The need for more public outreach by NCRAC researchers is increasingly apparent given the limited number of cooperative and Sea Grant extension personnel. Extension work group members can lead these efforts, but a cooperative education strategy is needed for NCR aquaculture to be successful.

Project Relevance - University Extension programs provide an essential linkage between research and stakeholders. The NCRAC extension base project continues to be highly desired by the private industry stakeholders; however, lack of funding and aquaculture extension FTE's in the NCR creates challenges for dissemination of applied research findings. 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. It has been indicated that many of the NCRAC fact sheets have become dated, with an average age of 18 years, and require revision to achieve maximum relevancy for today's aquaculture industry. According to Pat Howard of the Brenton Center at ISU the target cycle for extension materials is 5 years. Although many of the NCRAC resources are still very relevant and valuable, the public perception is that aged information is no longer relevant and valuable. Updates of critical NCRAC fact sheets will be the major focus of this project.

Who will benefit? Where will it be applied? - The NCRAC resource library is used by thousands of people annually in the NCR and even globally. The NCRAC web site (www.ncrac.org) has continued to be a source of many of these requests. The NCRAC website receives an average of 20,000 unique hits per

month. Total hits are in excess of 40,000 with a peak in spring of up to 75,000. Requests come from a range of individuals: from the mildly curious with a limited background in aquaculture, to others with limited knowledge but real physical properties or financial resources, and to experienced aquaculturists with considerable expertise and knowledge who want to apply alternative innovative techniques. The experienced aquaculturists include individuals attempting to improve or change their operations themselves and those who have reached the point where they need outside professional help. Often clients may wish to evaluate the appropriateness of equipment, species, or techniques for use in the region. These interested parties need sound advice concerning the development and operation of aquaculture ventures. The NCRAC Extension Work Group plays a vital role in providing this information. Updated publications will benefit users from private industry, academia, natural resource agencies, and others. The current project will serve to continue and complement previous extension efforts to enhance learning outcomes for participants by providing up-to-date aquaculture information in a digital text format available at NCRAC.org.

Potential collaborations - This project will be a collaboration of aquaculture experts from the 12-state region, private industry, and professional writer(s). Members of the NCRAC Extension Work Group will continue to expand on these efforts by providing information for regional and national applications. Also, the Regional Aquaculture Extension Specialist (RAES) project overlaps with and cooperatively enhances NCRAC extension efforts. Land Grant Universities, private industry producers and natural resource agencies will all contribute in the revision and development of NCRAC resources.

Relevance to NCRAC mission – The North Central Regional Aquaculture Center (NCRAC) Extension Work Group represents one of the longest established organized programs providing aquaculture resource information and technical assistance to the NCR's commercial aquaculture industry through applied and basic research, education, and outreach. The goal for the NCRAC Extension Work Group is to focus on delivering more specialized services to the aquaculture industry and broaden the scope of the program for the NCR. This project is aimed at identifying and organizing aquaculture resource information to meet regional aquaculture industry needs by improving communication and interaction among the state aquaculture industry associations within the 12 NCR states. With the continued shortages in regional aquaculture extension personnel, this network has been critical to the ability of individual extension contacts to respond to information requests from their clients. In fact, many of these contacts often respond on a regular basis to client inquiries outside of their specific state.

With the growth of the aquaculture industry in the NCR, a new demand and broader market for technical information and aquaculture services has evolved. Providing quality technical assistance in all aspects of aquaculture is critical to enhance the positive momentum that the region's aquaculture industry is exhibiting. As novices enter the aquaculture industry, they seek guidance from knowledgeable and experienced persons, commonly from state and federal agencies. Experienced aquaculturists need updated information on new research findings on alternative rearing techniques. The need for more public outreach by NCRAC researchers is increasingly apparent given the limited number of cooperative and sea grant extension personnel. This is one of the primary goals of the NCRAC Extension Work Group.

Since 1989, this program has been a principal source of information, guidance, and technical assistance to the development of the regional aquaculture industry. The NCRAC Extension Work Group works closely with regional vocational agriculture instructors. In addition, several thousand people have attended local and regional aquaculture conferences, workshops, and lectures sponsored/co-sponsored and organized by NCRAC Extension Work Group members. This Work Group has established a network of industry and government aquaculture contacts at the local, state, regional, and national levels. The needs and requirements of novice and practicing aquaculturists are so multifaceted that the response depends on the stage of development in the client's proposed activity. Initial inquiries can usually be suitably answered with prepared pamphlets, bibliographies, guide to available resources (Aquaculture Resource Guide), Web pages posting answers to Frequently Asked Questions (FAQs), and Web-based links to appropriate resource information. These provide general answers and a broader view of the enterprise's possibilities. Follow-up requests and more specialized questions require greater time and advanced materials related to these specialized topics and problems. Critical to fulfilling this type of

request from clients will be the traditional one-on-one approach, with expert assistance to answer specific questions, solve problems through person-to-person or conference telephone calls, or on-site technical assistance when possible.

There is an ongoing need to develop up-to-date and relevant publications for the region's aquaculture industry. For instance, the new aquaculture practice, aquaponics, is growing in popularity, yet there is little known about the sustainability and economic feasibility for aquaponics in the NCR. Most of the research for aquaponic food production is derived from the University of the Virgin Islands and Hawaii, which have tropical climates and do not represent our region. Aquaponics facilities in urban areas tend to depend on the tourism and social programming aspects of urban farming projects to be profitable. Thus far, niche marketing and integrated farming techniques have allowed aquaponics to be feasible in more rural areas, yet it is unknown if rural aquaponics food production facilities will be profitable long-term. An NCR-specific aquaponics fact sheet was commissioned in 2013 to provide potential producers the knowledge they need to be successful in the NCR.

Extension provides the linkage between federally funded aquaculture research at universities and the general public. The extension base project of the North Central Regional Aquaculture Center (NCRAC) continues to be critical and highly desired by the private industry stakeholders in the North Central Region (NCR) of the United States. As extension specialists, the project investigators are constantly in search of better ways to enhance information transfer to the public. Online technology transfer is one way to address the limited number of Extension FTEs 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 (NAF)." 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. 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 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 2nd largest imported product into the United States and the current annual trade deficit is nearly \$12 billion. Additionally, aquaculture has a 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.

The NCRAC Extension Work Group is designed to assess and meet the information needs of the various clientele groups through cooperative and coordinated regional educational programming. A network of Sea Grant and Cooperative Extension Service-designated contacts has been established to help maximize efficiency of education programs in the 12-state NCR. However, many of these contacts have part-time assignments on aquaculture and need additional resources to meet the growing demands of the aquaculture 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 (i.e. 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.

In 2009-2010 Kinnunen was involved in conducting eight aquaculture biosecurity workshops and two AIS-HACCP workshops at private aquaculture and baitfish operations and state, federal, and tribal facilities in the NCR. He has also been involved with developing AIS-HACCP and biosecurity plans for these operations. Kinnunen is a co-author of the Aquatic Invasive Species-HACCP Training Curriculum, and has been actively involved in aquaculture outreach activities for over two decades. The presence that the NCRAC has had in the AIS regulatory issues is one of the main reasons that production and transport of aquaculture products is still allowed in many states in the NCR.

In light of the ever-increasing influence of the internet as a source of knowledge, the investigators found it prudent to develop an online webinar series that will cover topics of interest in aquaculture and make them available to the public. The use of webinars was identified by Weeks (2014) as being an important extension activity by the NCRAC community. This webinar series was modeled after the successful Aquaculture Boot Camp (ABC) model (<http://southcenters.osu.edu/aquaculture/aquaculture-extension/boot-camp>) developed by Dr. Laura Tiu at The Ohio State University. The ABC model uses researchers, extension specialists and industry mentors to teach such topics as aquaculture production training, business planning, and marketing. The ABC is offered at three levels of interest and commitment – introductory, intermediate, and intensive, with intensive having a hands-on component and intermediate and introductory conducted primarily online.

Effective packaging of information on all aspects of aquaculture appropriate to the NCR will bridge the gap between user groups and the extension informational network. The eXtension.org website is a virtual clearinghouse for extension information and an interface in which any person can find extension publication on any topic area, and also use the “Ask an Expert” function to directly pose a question that will be routed to an area expert by registered members of eXtension. Webinars and voiceover power point presentations are given by extension experts online, and are available for no charge to the general public. The training session (lead by Dr. Vanessa Weldon) on using eXtension.org was intended to give the NCRAC extension work group critical information on using eXtension.org for disseminating aquaculture information. This training session also gave extension personnel different electronic methods for evaluating the outcomes and impacts of extension programs.

The NCRAC extension base project continues to be highly desired by the private industry stakeholders; however, lack of funding and aquaculture extension FTE's in the NCR creates challenges for dissemination of applied research findings. In spite of the limited number of aquaculture full-time equivalent positions in this region, substantial progress on the previously described objectives has been made. Extension liaisons are actively involved in several research projects and they have helped to improve the information transfer from research work groups to the public. Five North Central Regional Aquaculture Conferences have been held. The first was held in March 1991 in Kalamazoo, Michigan, the

second was held in February 1995 in Minneapolis, Minnesota, the third conference was held in Indianapolis, Indiana in February 1997, and the fourth was held in Kansas City, Missouri in February 1999, and the fifth was held in Toledo, OH in 2014. These regional meetings were attended by hundreds of individuals including persons from Canada. The sixth conference is planned for 2016 to be held in Milwaukee, WI.

Many NCRAC extension contacts are involved with their respective state aquaculture associations, and have worked with industry and governmental representatives to produce state aquaculture plans and improve governmental regulations. It is this interaction by extension contacts that the NCRAC Board of Directors wanted to support when they voted to increase funding support for NCRAC extension contacts in 1999, which continues through this proposal. The end result is an increased interaction between NCRAC extension contacts and their respective state aquaculture associations.

Extension liaisons have also assisted with the planning, promotion, and implementation of past baitfish, hybrid striped bass, walleye, and yellow perch workshops held throughout the region. These workshops have included “hands-on” experiences, formal presentations, in addition to forum sessions whereby producers share their experience with other producers as well as extension specialists. Several fact sheets and bulletins have been completed and are available to the public both in hard copy and on the Web. In part, these publications have the following topics: (1) walleye fingerling culture, (2) salt usage, (3) starting an aquaculture operation, (4) overview of aquaculture, (5) aquaculture as a business enterprise, (6) survey of salmonid producers, (7) channel catfish culture, (8) niche marketing, and (9) plankton management for fish culture ponds. The use of these publications has helped to supplement individual states' publications in this region. In 1994 a survey was undertaken to determine the use of NCRAC extension publications in the region. It was estimated that approximately 15,000 client questions are addressed annually by these publications; publications related to basic aquaculture topics were most often used. All of these Culture Manuals are now available in pdf format on the NCRAC Web site. However, it has been indicated that many of the NCRAC fact sheets have become dated, with an average age of 18 years, and require revision to achieve maximum relevancy for today's aquaculture industry. The current project will complement previous extension information transfer efforts, and enhance learning outcomes for participants by providing a revised and updated NCRAC resource library.

ANTICIPATED BENEFITS

Existing aquaculture industry members need relevant and current information on new techniques and technologies in aquaculture, as well as updated information related to changing state and federal regulations. Increasingly, individuals are interested in aquaculture and aquaponics as a means of agriculture diversification or urban development. A healthy aquaculture industry in the NCR will reduce the need to import fish products and help improve the U.S. trade imbalance, a fact increasingly recognized in Washington. The NCRAC Extension Work Group meets these diverse client needs through on-site advice, publications, and specialized workshops. Entrepreneurs and prospective aquaculturists often require an enormous amount of time to educate and can benefit from the availability of the electronic media. Additionally, middle and high school teachers often use extension materials in their classrooms. The project components directed toward pre-service and in-service vocational agriculture teachers will make an investment in the future, and sustain the development of regional aquaculture. Continual updating of outreach information will assist NCRAC advisory service specialists in answering the needs of local communities, small businesses, industry, educational groups, and the general public.

Effective packaging of information on all aspects of aquaculture appropriate to the NCR will bridge the gap between user groups and the extension informational network. The eXtension.org website is a virtual clearinghouse for extension information and an interface in which any person can find extension publication on any topic area, and also use the “Ask an Expert” function to directly pose a question that will be routed to an area expert by registered members of eXtension. Webinars and voiceover power point presentations are given by extension experts online, and are available for no charge to the general public. However, as eXtension.org has evolved, many Land-grant institutions have un-invested their resources. The valuable service that eXtension.org served as a virtual clearing house for aquaculture

information is also a function of the NCRAC website.

A demand has increased for information on the improvement of aquaculture rearing and management strategies to reduce and, if possible, eliminate environmental impacts. Fact sheets, technical bulletins, and videos have served to inform a variety of clients about numerous aquaculture practices in the NCR and to present possible solutions to relevant problems. For instance, the 2004 NCRAC publication “Aquaculture Effluents and Waste By-Products” was downloaded more than 300 times per month when it was first posted online in 2006. Species-specific publications on walleye, trout, and catfish, as well as publications on aquaculture businesses and transportation of fish in bags have been used in numerous regional meetings and have been requested by clients throughout the United States. Since new information on aquaculture production in the NCR is generated constantly, and new culture methods are being developed, it is critical, for success in the industry, that the NCRAC extension work group create and update extension publications to reflect current knowledge. The drafted aquaponics fact sheet will give timely, technical information on production potential, economics, and sustainability of aquaponics in the NCR, which will help potential producers be more profitable.

The presence that the NCRAC has had in the AIS regulatory issues is one of the main reasons that production and transport of aquaculture products is still allowed in many states in the NCR. The proposed work will include stakeholder meetings to develop 3rd party certification for AIS-HACCP plans, which will be a huge step forward for the industry. Also, the final stages of the AIS-HACCP DVD are currently underway. This program gives a complete rundown of the AIS-HACCP process, what threats exist in aquaculture facilities, and how AIS issues can be mitigated. Although this DVD will not be able to fully replace the workshop, it is a great resource for aquaculturists and regulatory bodies to understand the process of creating and implementing a HACCP plan. When coupled with the workshop, the industry members will be able to create their own HACCP plan that is tailored to their individual operation.

Project outputs, outcomes, and later impact assessment are now used for extension activities; these metrics are noted per individual Work Group member. However, there continues to be a need for extension professionals to be able to address public inquiries when there may not be an economic impact. For instance, potential aquaculturists are sometimes advised not to pursue specific activities as they may suffer economic losses if not well thought out or proposed efforts simply will not work in their specific circumstances. Such impacts may be hard to document but are nevertheless important to both the individual as well as for development of the aquaculture industry.

Current and potential producers learn through online resources, particularly in the absence of aquaculture extension personnel. These publication updates will provide a knowledge base and resources for beginning and experienced aquaculturists that will help them become more efficient and profitable. Table 1 expresses the anticipated benefits and impacts of this project.

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

Short Term	Goals	Update and improve the NCRAC resource library.
	Outcomes	Improve the quality and relevance of NCRAC-generated knowledge available to NCR aquaculturists.
Mid Term	Goals	Generate an aquaculture information hub containing NCR-specific resources.
	Outcomes	Improve aquaculture information transfer in the NCR.
Long Term	Goals	Foster NCR aquaculture industry development and profitability through the provision of high-quality, timely, & relevant informational resources.
	Impacts	Expand the development of the NCR Aquaculture industry in terms of biomass production and profitability.

OBJECTIVES

This project will focus on objectives 1-3 of the ongoing Extension project.

Objectives:

1. Strengthen linkages between North Central Regional Aquaculture Center (NCRAC) Research and Extension Work Groups.
2. Enhance the NCRAC extension network for aquaculture information transfer.
3. Develop and implement aquaculture educational programs and materials for the North Central Region (NCR).

DELIVERABLES

1. Revised NCRAC publication library
2. Updates to critical NCRAC resource(s)

PROCEDURES

Strengthen Linkages (Objective 1).

At least Extension Work Group member has been assigned to each Research Work Group with the goal of increasing the amount of information coming out of research projects. Extension Liaisons are responsible for interacting with researchers in developing possible extension products based on outcomes of these projects as well as assisting in writing research projects' annual and termination reports.

Enhance Extension Network (Objective 2)

At least one extension contact has been designated by CES for each NCR state. These contacts will attend the annual in-state aquaculture meeting to assist state associations; provide aquaculture extension-related materials produced in their state to NCRAC, provide a link between NCRAC and aquaculturists in their state; identify and update lists of key state contacts to receive NCRAC announcements, newsletters, and other pertinent materials, identify key industry needs in their state and relay to NCRAC for setting priorities and determining projects to be undertaken, and generate an annual report for incorporation into the NCRAC Extension report.

Develop and Implement Aquaculture Education Programs and Materials for the NCR (Objective 3)

NCRAC Extension participants will help support the aquaculture industry. These activities include workshops and education materials that will be distributed within and outside of their states. Any workshop or materials developed and/or hosted by state aquaculture extension contacts will be advertised in surrounding states to take advantage of the NCRAC Extension network and the individual expertise of the Extension Work Group participants.

Iowa State University (ISU) staff will coordinate the NCRAC resource library review and work closely with the content editing specialist (CES) to complete the updating process. The CES will be hired from outside the NCR to alleviate the workload strains caused by the low number of NCR extension FTEs. However, the CES will work with the assigned subject area expert from within the NCR to ensure the quality and relevance of the work produced. ISU will also be responsible for final editing and layout as well as uploading the final product to the NCRAC website.

Project workflow - In year one of the project, a project committee of extension and private industry personnel will be selected as well as a content review specialist to review the NCRAC Resource Library that includes fact sheets, technical bulletins and videos. Figure 1 outlines the work process model for the

project. The review process will occur early in the grant cycle (i.e., October 2016) at a meeting location, likely in Ames, IA. This 2–day meeting will convene the committee, where they will evaluate each publication using a ranking rubric to select which publications to keep as is, update, or delete. The review process decision tree is outlined in Figure 2. Following the decision to update, the projects will be ranked in order of priority based on their score derived from the ranking rubric (Table 2). The ranking rubric will provide a numerical score based on 1) **Relevance** to the current NCRAC priority areas, 2) **Age** of the publication, 3) **Impact Potential** of the updated information in the NCRAC community, 4) **Uniqueness** of the information in the publication, and 5) **Likelihood of Completion** during the grant cycle due to publication length and complexity. Each NCRAC resource will be assigned a subject expert (table 3) to assist in the provision of up-to-date information to the CES for the publication update. The highest scoring publications will be updated first, and updates will continue until the budget is exhausted or the grant ends, whichever is first. All revised NCRAC resources will Manuscripts will be provided to the project PI to oversee peer-review, editing and layout. Following the approval of resource updates, formatting and layout, the finalized publications will be uploaded to the NCRAC website (www.ncrac.org) to replace the previous version.

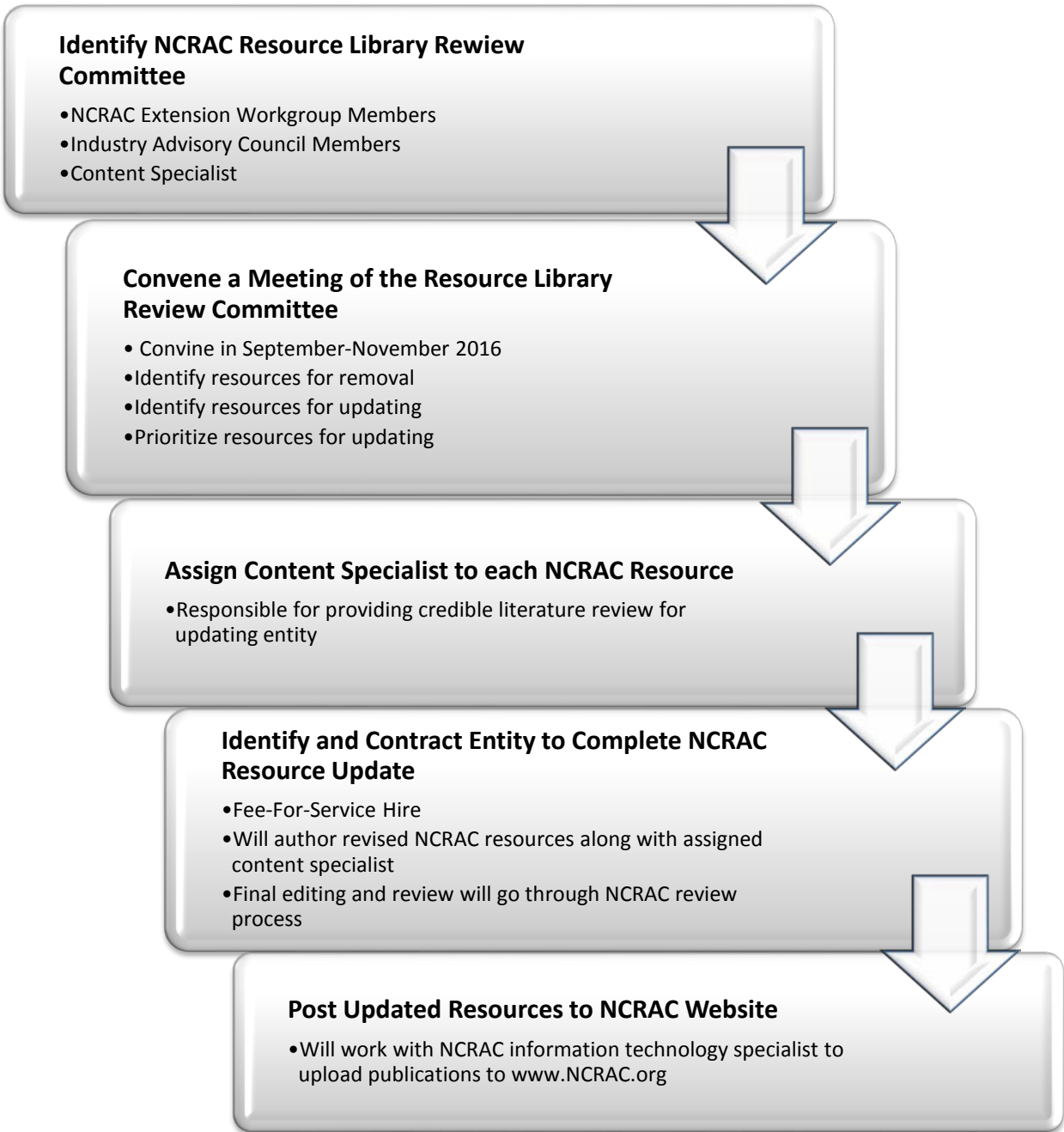


Figure 1. Work process model for NCRAC resource library revision process.

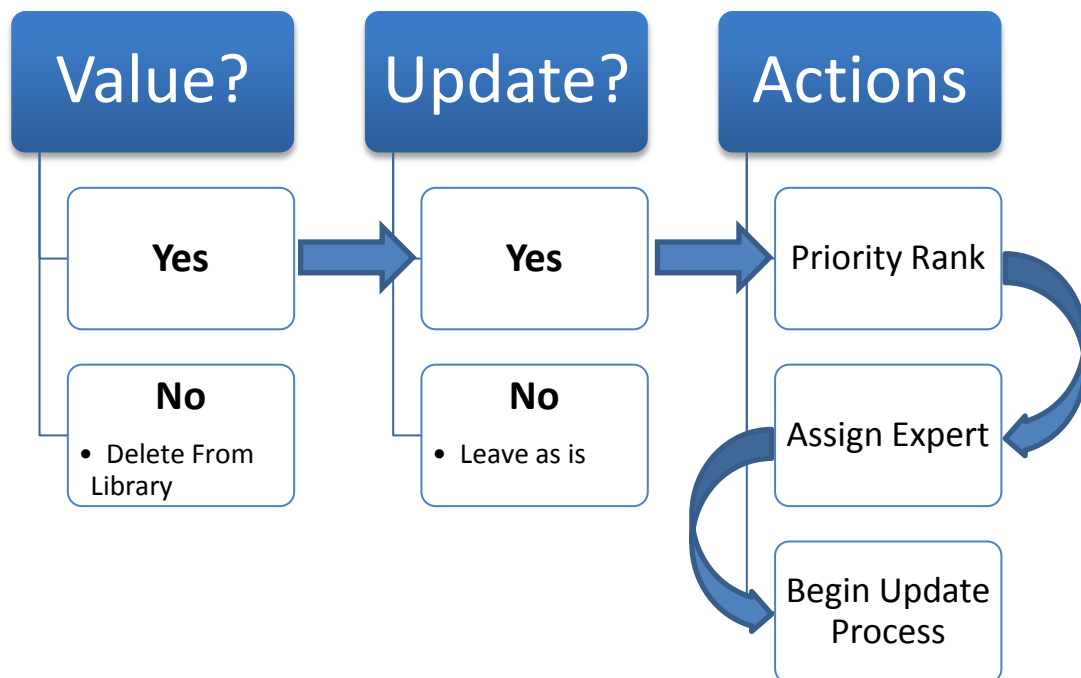


Figure 2. Review process decision tree for NCRAC resource library.

Table 2. Potential NCRAC Resource Library Ranking Rubric.

<i>Category</i>	<i>Potential Score</i>	<i>0</i>	<i>1 (2)</i>	<i>2 (4)</i>	<i>3 (6)</i>	<i>4 (8)</i>	<i>5 (10)</i>
<i>Relevance to NCRAC Priority Areas</i>	0-5	None	Very Poor	Poor	Fair	Good	Excellent
<i>Age (yrs) of Publication</i>	0-5	0-5	6-10	11-15	16-20	21-25	> 25
<i>Impact Potential of Publication Info</i>	0-10	None	Very Poor	Poor	Fair	Good	Excellent
<i>Uniqueness of Information</i>	0-5	Contains only basic, common knowledge	Basic, but contains some useful info for NCR states	Contains some NCR-specific info	Contains all NCR-specific info	Contains rare info and is NCR-specific	Sole source of info
<i>Likelihood of Completion during project period due to complexity and length</i>	0-5	Cannot be completed	Very unlikely	Unlikely	Moderate	Likely	Very Likely

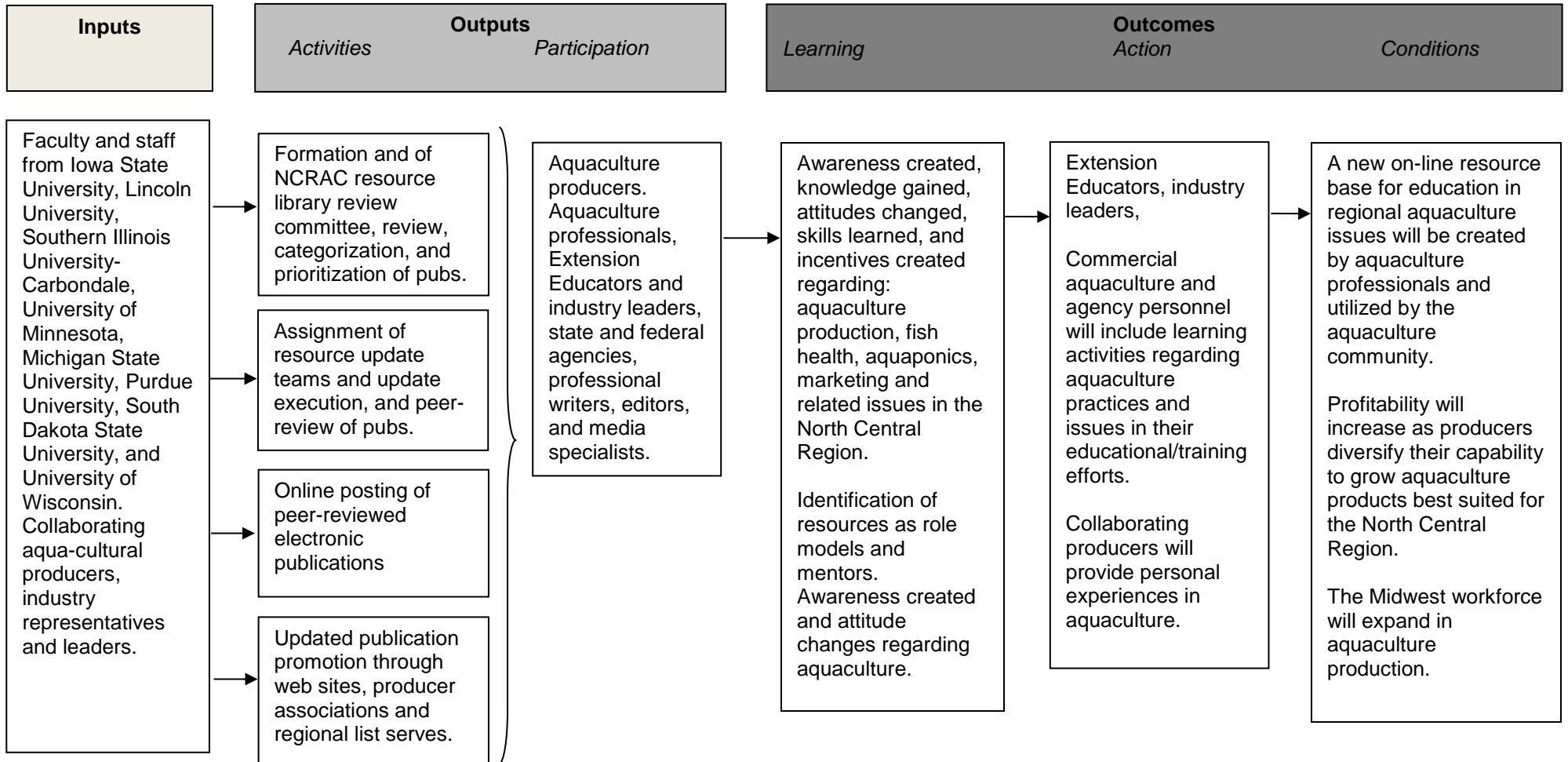
Table 3. Potential subject area experts to be assigned to NCRAC resource library publications for update.

<i>Institution</i>	<i>Extension Contact</i>	<i>Subject Area of Expertise</i>
<i>University of Nebraska-Lincoln</i>	Dennis E. Bauer	Pond management
<i>North Dakota State University</i>	Mark E. Clark	Certrtrachids
<i>University of Wisconsin-Extension</i>	➤ <i>Yet to be named</i>	N/A
<i>Southern Illinois University – Carbondale</i>	Paul Hitchens	Production, Hauling & Marketing
<i>Michigan State University</i>	Ronald E. Kinnunen	AIS & Seafood HACCP
<i>Kansas State University</i>	Charles D. Lee	Pond managemetn
<i>South Dakota State University</i>	➤ <i>Yet to be named</i>	N/A
<i>Iowa State University</i>	D. Allen Pattillo	Aquaponics and RAS
<i>University of Minnesota</i>	Nicholas B. D. Phelps	Fish Health and Regulations
<i>Purdue University</i>	Kwamena K. Quagraine	Aquaculture Business and Marketing
<i>Michigan State University</i>	Christopher Weeks	Regulations and Salmonid Culture
<i>University of Missouri</i>	Robert Pierce	Pond management
<i>Ohio State University</i>	➤ <i>Yet to be named</i>	N/A
<i>Louisiana State University</i>	Greg Lutz	Aquaculture Content Editing

Project: North Central Regional Aquaculture Center Extension Project

Goal: Develop an efficient information transfer method of current aquaculture information

Objective: Increase the awareness, knowledge and skills of producers, professionals, students, and general citizenry regarding aquaculture in the North Central Region.



Assumptions:

- Producers are interested in diversifying their revenue streams by learning about aquaculture.
- Infrastructure and markets will develop for regionally produced aquaculture products.

External Factors:

- Limited number of aquaculture extension specialists
- A diverse(species and culture practices) aquaculture industry in the region
- Gaps in information and technical support for the industry

FACILITIES

Institution	Facilities	Procedures
ISU	ISU has a multitude of meeting spaces and lodging accommodations, as well as extension support staff such as the Brenton Center to develop publications and perform editing and layout functions. Subject Area Expert	<ol style="list-style-type: none"> 1) Coordinating review committee meeting 2) Contracting with updating entities 3) Posting publications to NCRAC website 4) Reporting
KSU	Subject Area Expert	Provide resources and expertise to CES
LSU	Content Editing Specialist	<ol style="list-style-type: none"> 1) Connect with Subject Area Experts 2) Review, edit, and update NCRAC resources
MSU	Subject Area Expert	Provide resources and expertise to CES
NDSU	Subject Area Expert	Provide resources and expertise to CES
OSU	Subject Area Expert	Provide resources and expertise to CES
PU	Subject Area Expert	Provide resources and expertise to CES
SDSU	Subject Area Expert	Provide resources and expertise to CES
SIU-C	Subject Area Expert	Provide resources and expertise to CES
UMO	Subject Area Expert	Provide resources and expertise to CES
UMN	Subject Area Expert	Provide resources and expertise to CES
UNE-L	Subject Area Expert	Provide resources and expertise to CES
UWI	Subject Area Expert	Provide resources and expertise to CES

REFERENCES

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- Food and Agriculture Organization of the United Nations (FAO). 2012. The state of world fisheries and aquaculture 2012. FAO Fisheries Department, Food and Agriculture Organization of the United Nations, Rome, Italy.
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PROJECT LEADERS

<u>State</u>	<u>Name</u>	<u>Institution</u>	<u>Area of Specialization</u>
Iowa	D. Allen Pattillo	Iowa State University	Extension/Fish Culture
Indiana	Kwamena Quagrainie	Purdue University	Extension/Business & Marketing
Louisiana	Greg Lutz	Louisiana State University	Extension/Content Editing
Michigan	Chris Weeks	Michigan State University	Extension/Regulations & Salmonids
Michigan	Ron Kinnunen	Michigan State University	Extension/Seafood & AIS HACCP
Minnesota	Nick Phelps	University of Minnesota	Extension/Fish Health

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS

University of Nebraska-Lincoln
Dennis E. Bauer

North Dakota State University
Mark E. Clark

Purdue University
Kwamena K. Quagraine

University of Minnesota-Duluth
Todd Phelps

University of Wisconsin-Extension
Unnamed

University of Missouri
Robert Pierce

Michigan State University
Ronald E. Kinnunen

Kansas State University
Charles D. Lee

Iowa State University
D. Allen Pattillo

South Dakota State University
Unnamed

Purdue University
Kwamena K. Quagraine

Ohio State University
Unnamed

UNITED STATES DEPARTMENT OF AGRICULTURE
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

OMB Approved 0524-0039

ORGANIZATION AND ADDRESS Iowa State University 339 Science Hall 2 Ames, IA 50014			USDA AWARD NO.				Years 1: Objectives 1-2					
			Duration Proposed Months: <u>12</u> Total Funds Requested by Proposer		Duration Proposed Months: _____ Funds Approved by CSREES (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) D. Allen Pattillo												
A. Salaries and Wages			CSREES FUNDED WORK MONTHS									
1. No. of Senior Personnel			Calendar	Academic	Summer							
a. ___ (Co)-PD(s)												
b. ___ Senior Associates												
2. No. of Other Personnel (Non-Faculty)												
a. ___ Research Associates-Postdoctorates . . .												
b. <u>1</u> Other Professionals						15000						
c. ___ Paraprofessionals												
d. ___ Graduate Students.....												
e. ___ Prebaccalaureate Students.....												
f. ___ Secretarial-Clerical.....												
g. ___ Technical, Shop and Other												
Total Salaries and Wages <input type="checkbox"/>						15000						
B. Fringe Benefits (If charged as Direct Costs)						0						
C. Total Salaries, Wages, and Fringe Benefits (A plus B) <input type="checkbox"/>						15000						
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)												
E. Materials and Supplies												
F. Travel						12000						
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.)						3000						
K. Total Direct Costs (C through I) <input type="checkbox"/>						30000						
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"/>						30000						
P. Carryover -- (If Applicable) Federal Funds: \$			Non-Federal funds: \$			Total \$						
Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)												
Cash (both Applicant and Third Party)			<input type="checkbox"/>									
Non-Cash Contributions (both Applicant and Third Party) <input type="checkbox"/>												
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.
Form CSREES-2004 (12/2000)

UNITED STATES DEPARTMENT OF AGRICULTURE
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

OMB Approved 0524-0039

ORGANIZATION AND ADDRESS Iowa State University 339 Science Hall 2 Ames, IA 50014 PROJECT DIRECTOR(S) D. Allen Pattillo			USDA AWARD NO. Years 2: Objectives 1-2			
			Duration Proposed Months: <u>12</u> Total Funds Requested by Proposer	Duration Proposed Months: _____ Funds Approved by CSREES (If different)	Non-Federal Proposed Cost- Sharing/ Matching Funds (If required)	Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different)
A. Salaries and Wages			CSREES FUNDED WORK MONTHS			
1. No. of Senior Personnel			Calendar	Academic	Summer	
a. ___ (Co)-PD(s)						
b. ___ Senior Associates						
2. No. of Other Personnel (Non-Faculty)						
a. ___ Research Associates-Postdoctorates . . .						
b. <u>1</u> Other Professionals						15000
c. ___ Paraprofessionals						
d. ___ Graduate Students						
e. ___ Prebaccalaureate Students						
f. ___ Secretarial-Clerical						
g. ___ Technical, Shop and Other						
Total Salaries and Wages <input type="checkbox"/>						15000
B. Fringe Benefits (If charged as Direct Costs)						0
C. Total Salaries, Wages, and Fringe Benefits (A plus B) <input type="checkbox"/>						15000
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)						
E. Materials and Supplies						
F. Travel						5000
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.)						
K. Total Direct Costs (C through I) <input type="checkbox"/>						20000
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"/>						20000
P. Carryover -- (If Applicable) Federal Funds: \$			Non-Federal funds: \$		Total \$	
Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)						
Cash (both Applicant and Third Party) <input type="checkbox"/>						
Non-Cash Contributions (both Applicant and Third Party) <input type="checkbox"/>						
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. Form CSREES-2004 (12/2000)

UNITED STATES DEPARTMENT OF AGRICULTURE
COOPERATIVE STATE RESEARCH, EDUCATION, AND EXTENSION SERVICE

OMB Approved 0524-0039

ORGANIZATION AND ADDRESS Iowa State University 339 Science Hall 2 Ames, IA 50014 PROJECT DIRECTOR(S) D. Allen Pattillo			USDA AWARD NO. Years 1&2: Objectives 1-2			
			Duration Proposed Months: <u>24</u> Total Funds Requested by Proposer	Duration Proposed Months: _____ Funds Approved by CSREES (If different)	Non-Federal Proposed Cost- Sharing/ Matching Funds (If required)	Non-federal Cost-Sharing/ Matching Funds Approved by CSREES (If Different)
A. Salaries and Wages			CSREES FUNDED WORK MONTHS			
1. No. of Senior Personnel			Calendar	Academic	Summer	
a. ___ (Co)-PD(s)						
b. ___ Senior Associates						
2. No. of Other Personnel (Non-Faculty)						
a. ___ Research Associates-Postdoctorates . . .						
b. <u>1</u> Other Professionals						30000
c. ___ Paraprofessionals						
d. ___ Graduate Students						
e. ___ Prebaccalaureate Students						
f. ___ Secretarial-Clerical						
g. ___ Technical, Shop and Other						
Total Salaries and Wages <input type="checkbox"/>						30000
B. Fringe Benefits (If charged as Direct Costs)						0
C.Total Salaries, Wages, and Fringe Benefits (A plus B) <input type="checkbox"/>						30000
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)						
E. Materials and Supplies						
F. Travel						17000
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.)						3000
K.Total Direct Costs (C through I) <input type="checkbox"/>						50000
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"/>						50000
P. Carryover -- (If Applicable) Federal Funds: \$			Non-Federal funds: \$		Total \$	
Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)						
Cash (both Applicant and Third Party) <input type="checkbox"/>						
Non-Cash Contributions (both Applicant and Third Party) <input type="checkbox"/>						
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. Form CSREES-2004 (12/2000)

Budget Explanation for Iowa State University

(Pattillo)

Objective 1-4 & Deliverables

- A. Salaries and Wages:** Year 1: Salaries are requested for hiring a content editing specialist (Greg Lutz, LSU) for an approximate value of \$1,500 per publication. Year 1: \$15,000 Year 2: \$15,000
- B. Fringe Benefits:** None
- C. Nonexpendable Equipment:** None.
- D. Materials and Supplies:** None
- E. Travel:** Travel and lodging will be provided for the participants of the NCRAC resource library review committee (approximately 8 persons). Year 1: \$12,000. Travel to different aquaculture facilities for collection of media resources (pictures, video, information, etc.) Year 2: \$5,000.
- F. Publication Costs/Page Charges:** None
- I. All Other Direct Costs:** Meeting room and AV rental fees (\$500), catering (\$2,000) and supply (\$500) costs for the NCRAC resource library review committee 2-day meeting. Year 1: \$3,000.
- J. Total Direct Costs:** \$50,000
- K. Other:** None.

BUDGET SUMMARY FOR EACH YEAR FOR EACH PARTICIPATING INSTITUTION

Year 1												
UNL	NDSU	UMN	UW	LU	MSU	KSU	ISU	SDSU	PU	OSU	TOTALS	
Salaries and Wages												
Fringe Benefits												
Total Salaries, Wages, and Fringe Benefits							\$15,000				\$15,000	
Nonexpendable Equipment												
Materials and Supplies												
Travel							\$12,000				\$12,000	
All Other Direct Costs							\$3,000				\$3,000	
TOTAL PROJECT COSTS							\$30,000				\$30,000	
Year 2												
UNL	NDSU	UMN	UW	LU	MSU	KSU	ISU	SDSU	PU	OSU	TOTALS	
Salaries and Wages												
Fringe Benefits												
Total Salaries, Wages, and Fringe Benefits							\$15,000				\$20,000	
Nonexpendable Equipment												
Materials and Supplies												
Travel							\$5,000					
All Other Direct Costs												
TOTAL PROJECT COSTS							\$20,000				\$20,000	

SCHEDULE FOR COMPLETION OF OBJECTIVES

Start Date: September 1, 2016

End Date: August 31, 2018

Objectives, Tasks, and Deliverables		Year 1						Year 2						
		S	N	J	M	M	J	S	N	J	M	M	J	
		O	D	F	A	J	A	O	D	F	A	J	A	
Tasks	Identify NCRAC resource library review committee													
	Convene a meeting of the review committee													
	Prioritize and assign content specialists to NCRAC resources													
	Identify entities to update NCRAC resources													
	Edit and update NCRAC resources													
	Peer-review of updated NCRAC resources													
	Layout and publishing of updated NCRAC resources													
	Post updated resources to NCRAC website													
	Reporting													

LIST OF PRINCIPLE INVESTIGATORS

Participating Institutions

University of Nebraska-Lincoln	Dennis E. Bauer
North Dakota State University	Mark E. Clark
University of Wisconsin-Extension	Yet to be named
Southern Illinois University – Carbondale	Paul Hitchens
Michigan State University	Ronald Kinnunen
Kansas State University	Charles D. Lee
Louisiana State University	Greg C. Lutz
South Dakota State University	Yet to be named
Iowa State University	D. Allen Pattillo
University of Minnesota	Nicholas B. D. Phelps
Purdue University	Kwamena K. Quagrainie
Michigan State University	Christopher Weeks
University of Missouri	Robert Pierce
Ohio State University	Yet to be named

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FAX: (402) 397-2065
Email: dbauer1@unl.edu

EDUCATION

B.S.	University of Nebraska-Lincoln	1975	Wildlife and Natural Resources
M.S.	University of Nebraska-Lincoln	1978	Range Science

POSITIONS

1978-Present University of Nebraska – Extension Extension Educator

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

Society for Range Management
Nebraska Cooperative Extension Association

VITA

Mark E. Clark
Department of Biological Sciences
North Dakota State University
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Fax: (701) 231-7149
E-mail: m.e.clark@ndsu.edu

EDUCATION

B.A. Mathematics	1987	University of Tennessee
M.S. Mathematics	1989	University of Tennessee
Ph.D. Ecology	1996	University of Tennessee

POSITIONS

2010-Present	North Dakota State University	Assistant Professor
2002-2009	North Dakota State University	Assistant Professor
2000-2002	University of Montana	Postdoctoral Fellow
1997-2000	Iowa State University	Postdoctoral Fellow
1996-1997	Oak Ridge National Laboratory	Postdoctoral Fellow

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society
Ecological Society of America
Society of Integrative & Comparative Biology

SELECTED PUBLICATIONS

- Clark, M.E., K.A. Rose, J.A. Chandler, T.J. Richter, D.J. Orth, and W. Van Winkle. 2008. Water level fluctuation effects on centrarchid reproductive success in reservoirs: a modeling analysis. *North American Journal of Fisheries Management* 28:1138-1156.
- Clark, M.E., and T.E. Martin. 2007. Modeling tradeoffs in avian life history traits and consequences for population growth. *Ecological Modeling* 209:110-120.
- Clark, M.E., B.J. Danielson, M.V. Santelmann, J.I. Nassauer, D. White, and K.E. Freemark. 2007. Impacts on mammal communities: a spatially explicit model. Pages 115-138 in J.I. Nassauer, M.V. Santelmann, and D. Scavia, editors. *From the corn belt to the Gulf: societal and environmental implications of alternative agricultural futures*. RFF Press, Washington, D.C. 223 pages.
- Reed, W.L., M.E. Clark, P.G. Parker, S.A. Raouf, N. Arguedas, D.S. Monk, E. Snajdr, V. Nolan Jr., and E.D. Ketterson. 2006. Physiological effects on demography: a long term experimental study of testosterone's effects on fitness. *The American Naturalist* 167:667-683.
- Santelmann, M.V., D. White, K. Freemark, J.I. Nassauer, J.M. Eilers, K.B. Vache, B.J. Danielson, R.C. Corry, M.E. Clark, S. Polasky, R.M. Cruse, J. Sifneos, H. Rustigian, C. Coiner, J. Wang, and D. Debinski. 2004. Assessing alternative futures for agriculture in Iowa, U.S.A. *Landscape Ecology* 19:357-374.
- Bronikowski, A.M., M.E. Clark, H. Rodd, and D.N. Reznick. 2002. Population-dynamic consequences of predator-induced life-history variation in the guppy (*Poecilia reticulata*). *Ecology* 83:2194-2204.

VITA

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E-mail: hitchens@siu.edu

EDUCATION

Bachelor of Science-Environmental Biology, Eastern Illinois University, 1981

RESEARCH AND PROFESSIONAL EXPERIENCE

2005-Present Aquaculture Specialist/Researcher II, Illinois Aquaculture TechSERV; Fisheries and Illinois Aquaculture Center-Southern Illinois University; Carbondale, IL
2003-2005 Technical Service Agent, Illinois Fish Farmers Co-op; Pinckneyville, IL
2003 Independent Private Consultant, Inter Sea Farms De Venezuela C. A.; Maracaibo, Venezuela
1990-2003 Technical Manager, Larfico S.A., Penaeid Shrimp Laboratory, Ayangue, Ecuador
1984-1990 Technical Manager, Langomorro Cia., Ltd.; affiliate of Larfico S.A., Guayaquil, Ecuador
1982-1984 Pond/Hatchery Biologist, Inducam S.A., Guayaquil, Ecuador
1982 Technical Assistant II, Texas A&M University / National Marine Fisheries, Galveston, TX
1982 Independent Private Consultant, Market Facts, Inc., Chicago, IL
1981 Staff Biologist, King James Shrimp, Inc., Park Forest South, IL

PUBLICATIONS

Laramore, R., S. Allen, P. Hitchens, A. Romero, and A. Schuur. 2000. Artificial induction of active accommodation for White Spot Syndrome Virus (WSSV) in Penaeid vannamei with tolerine products. Proceedings of the World Aquaculture Society, Latin American Conference. Panama City, Panama.
Blogoslawski, W.J., C. Perez, and P. Hitchens. 1992. Ozone treatment of seawater to control vibriosis in mariculture of penaeid shrimp, *Penaeus vannamei*. Pages 131-141. Proceedings of the Third International Symposium on the use of Ozone in Aquatic Systems. International Ozone Association, Pan American Group. Stamford, Connecticut, USA.

VITA

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EDUCATION

B.S.	Michigan State University	1976	Fisheries Biology and Management
M.S.	Michigan State University	1979	Fisheries Biology and Management
Ph.D.	Michigan Technological University	1997	Biological Sciences

POSITIONS

1982-Present	Michigan State University	Michigan Sea Grant Extension Agent
1981	Rangen Research Laboratory	Fisheries Pathologist
1979-1980	U.S. Fish and Wildlife Service	Fisheries Biologist

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Fisheries Society, Fish Health Section, Salmonid Section
International Association for Great Lakes Research

SELECTED PUBLICATIONS

- Summerfelt, R.C., R.D. Clayton, J.A. Johnson, R.E. Kinnunen. 2010. Production of walleye as potential food fish. North Central Regional Aquaculture Center Fact Sheet #116. NCRAC Publications Office, Iowa State University, Ames, Iowa.
- Muir, A.M., T.M. Sutton, M.T. Arts, R.M. Claramunt, M.P. Ebener, J.D. Fitzsimons, T.B. Johnson, R.E. Kinnunen, M.A. Koops, and M.M. Sepulveda. 2010. Does condition of lake whitefish spawners affect physiological condition of juveniles? *Journal of Great Lakes Research* 36:92-99.
- Kinnunen, R.E., M.C. Gould, and P. Cambier. 2005. Composting commercial fish processing waste from fish caught in the Michigan waters of the Great Lakes. *Michigan State University Technical Bulletin*, East Lansing, Michigan.
- Hinshaw, J.M., G. Fornshell, R.E. Kinnunen. 2004. A profile of the aquaculture of trout in the United States. Report for USDA Risk Management Agency, Federal Crop Insurance Corporation, through Mississippi State University, East Lansing, Michigan.
- Kinnunen, R.E., editor. 2002. Environmental Strategies for Aquaculture Symposium Proceedings (December 2000). 62nd Midwest Fish and Wildlife Conference, Minneapolis, MN. NCRAC CD Series #101, NCRAC Publications Office, Iowa State University, Ames, Iowa.
- Gunderson, J.L. and R.E. Kinnunen. 2001. Aquatic nuisance species-Hazard analysis and critical control point training curriculum. Michigan Sea Grant Publication No. MSG-00-400, East Lansing, Michigan.
- Kinnunen, R.E. 2000. A white paper on the status and needs of salmonid aquaculture in the North Central Region. North Central Regional Aquaculture Center. Michigan State University, East Lansing, Michigan.

VITA

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EDUCATION

B.S.	Kansas State University	1975	Fisheries and Wildlife Biology
M.S.	Kansas State University	1988	Animal Sciences and Industry

POSITIONS

1995-Present	Kansas State University	Extension Specialist-Wildlife
1989-1995	Kansas Dept. of Wildlife and Parks	Agricultural Liaison Biologist
1986-1989	Kansas State University	Extension Assistant

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

Kansas Chapter of the Society for Range Management
Kansas Chapter of the Wildlife Society
Society for Range Management
The Wildlife Society

SELECTED PUBLICATIONS

Lee, C. D., and Z. B. Eddy. In review. Black-tailed prairie dog immigration to extirpated colonies in Northwest Kansas. *Rangeland Ecology and Management*.

Deppenbusch, B. E., J. S. Drouillard and C. D. Lee. 2011. Feed predation by European starlings in a Kansas feedlot. *Human and Wildlife Interactions* 5(1):58-65.

Lee, C. D., and J. LeFlore. 2007. Efficacy of three in-burrow treatments to control black-tailed prairie dogs. Twelfth Wildlife Damage Management Conference. Corpus Christi, Texas.

Lee, C. D. 1998. Deer damage control options. Kansas State University and Cooperative Extension Service Publication No. C-728, Manhattan, Kansas.

Lee, C. D., and R. J. Johnson. 1997. Wildlife habitat evaluation handbook-participant's manual. Kansas State University Cooperative Extension Service Publication No. MF 2266, Manhattan, Kansas.

Hall, D., R. J. Johnson, and C. D. Lee 1997. Wildlife habitat evaluation handbook-leader's guide, Kansas State University Cooperative Extension Service Publication No. MF 2265, Manhattan, Kansas.

Weins, J. R., C. S. Guy, and C. D. Lee. 1997. Streambank revetment. Kansas State University Agricultural Experiment Station and Cooperative Extension Service Publication No. MF 2294, Manhattan, Kansas.

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EDUCATION

B.A. Earlham College 1979 Biology & Spanish
M.S. Louisiana State University 1983 Fisheries (Aquaculture specialization)
Ph.D. Louisiana State University 1987 Wildlife and Fisheries Science (Aquaculture specialization)

POSITIONS

2013 – Present Editor in Chief, Aquaculture Magazine.
1991 – Present Specialist and Professor (Aquaculture) Louisiana State University Agricultural Center.
1991 Fisheries Biologist Programs Manager – Biometrician, Louisiana Department of Wildlife and Fisheries, Research Division.
1987 – 1991 Director of Research and Operations, Aquaculture Technologies Ltd., Lafayette, Louisiana and Lebeau, Louisiana.

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

World Aquaculture Society
United States Aquaculture Society
Latin American and Caribbean Aquaculture Society
National Aquaculture Association

SELECTED PUBLICATIONS

Lutz, C.G. and W.R. Wolters. 1989. Estimation of heritabilities for growth, body size, and processing traits in red swamp crawfish (*Procambarus clarkii* (Girard)). *Aquaculture* 78:21-33.
Lutz, C.G. and K.J. Roberts. 1998. Investment and management aspects of owner-operator scale greenhouse tilapia systems. In: G.S. Libey (Editor), *Proceedings of the Second International Symposium on Recirculating Aquaculture*. Virginia Polytechnic Institute and State Univ. Blacksburg, VA, pp. 98-105.
Lutz, C.G. and W.R. Wolters. 1999. Mixed model estimation of genetic and environmental correlations in red swamp crawfish *Procambarus clarkii* (Girard). *Aquaculture Research* 30:153-163.
Lutz, C.G. 2000. Production economics and potential competitive dynamics of commercial tilapia culture in the Americas. Pages 119-132 in B.A. Costa-Pierce and J.E. Rackocy, editors. *Tilapia Aquaculture in the Americas*, Vol. 2. World Aquaculture Society, Baton Rouge.
Lutz, C.G. 2001. *Practical Genetics for Aquaculture*. Blackwell Science, Oxford, U.K.
Lutz, C.G. 2005. Viewing urban aquaculture as an agro-industry. Pages 15 – 24 in B.A. Costa-Pierce, P. Edwards, D. Baker and A. Desbonnet, editors. *Urban Aquaculture*. CABI Publishing (UK),
Lutz, C.G., Armas-Rosales, A.M. and Saxton, A.M. 2010. Genetic effects influencing salinity tolerance in six varieties of tilapia (*Oreochromis*) and their reciprocal crosses. *Aquaculture Research* 44(11):e770-e780.
Lutz, C.G., and M. Richard. 2012. Impacts of secondary and tertiary recruitment on overall production and yield of *Procambarus clarkii* (Girard) under simulated commercial conditions. *Freshwater Crayfish* 19(1).

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EDUCATION

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

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EDUCATION

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

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.

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EDUCATION

B.S.	Southern Arkansas University, Magnolia, AR 71753	1977	Biology-Agriculture
M.S.	Mississippi State University, Starkville, MS	1981	Wildlife Ecology
Ph.D.	University of Missouri, Columbia, MO 65203		Forestry

POSITIONS

2013 to present: State Extension Fisheries and Wildlife Specialist and Extension Associate Professor, University of Missouri
2001-2013 Extension Assistant Professor and State Extension Fish and Wildlife Specialist, University of Missouri
1989-2001 Extension Instructor and State Extension Fish and Wildlife Specialist University of Missouri
1982-89 County Extension Agent – Agriculture (Lincoln County) and Staff Chairman (Dallas County), University of Arkansas Cooperative Extension Service

SELECTED PUBLICATIONS

Hicks, C.E. and R.A. Pierce II. 2014. Managing ponds and lakes for aquaculture and fisheries in Missouri: Pond construction and management considerations. MU Extension Guide G9474. 6pp.
Hicks, C.E. and R.A. Pierce II. 2014. Managing ponds and lakes for aquaculture and fisheries in Missouri: Fish selection and stocking for sport fishing. MU Extension Guide G9475. 4pp.
Hicks, C.E. and R.A. Pierce II. 2014. Managing ponds and lakes for aquaculture and fisheries in Missouri: Pond dynamics and water quality considerations. MU Extension Guide G9476. 6pp.
Hicks, C.E. and R.A. Pierce II. 2014. Managing ponds and lakes for aquaculture and fisheries in Missouri: Establishing hybrid sunfish in ponds for recreation. MU Extension Guide G9477. 2pp.
Hicks, C.E., R.A. Pierce II and K. W. Bradley. 2014. Managing ponds and lakes for aquaculture and fisheries in Missouri: Controlling nuisance aquatic vegetation. MU Extension Guide G9478. 7pp.
Hicks, C.E. and R.A. Pierce II. 2011. Freshwater prawn production in Missouri. MU Extension Guide G9471. 6pp.
Pierce, R.A. II, J. Parcell, C. Boessen, R. Hayward and C. Hicks. 2007. Paddlefish Production: opportunities for Missouri pond and lake owners. MU Extension Guide G9470. 4pp.

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EDUCATION

B.S.	Agriculture	University of Science and Technology, Ghana
M.S.	Agricultural Economics	University of Alberta, Edmonton, Canada
Ph.D.	Agricultural Economics	2000 University of Alberta, Edmonton, Canada

POSITIONS

2005-Present	Purdue University	Aquaculture Marketing Specialist
2001-2005	University of Arkansas at Pine Bluff	Assistant Professor-Aquaculture Marketing

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

American Agricultural Economics Association
International Association of Aquaculture Economics and Management
World Aquaculture Society

SELECTED PUBLICATIONS

Quagraine, K.K., K.G. Hughes and A. Xing. 2011. Delineating shoppers of live seafood in the Midwestern United States. *Aquaculture Economics & Management* 15 (3): 155-165.

Quagraine, K.K., A. Xing, and K.G. Hughes. 2011. Factors influencing the purchase of live seafood in the North Central Region of the United States. *Marine Resource Economics* 26 (1): 59-74.

Quagraine, K.K., C.C. Ngugi, and S. Amisah. 2010. Analysis of the use of credit facilities by small-scale fish farmers in Kenya. *Aquaculture International* 18 (3): 393-402.

Quagraine, K.K., S. Amisah, and C.C. Ngugi. 2009. Aquaculture information sources for small-scale fish farmers: the base of Ghana. *Aquaculture Research* Vol. 40: 1516-1522.

Amisah, S., D. Adjei-Boateng, K. A. Obirikorang and K.K. Quagraine. 2009. Effects of clam size on heavy metal accumulation in whole soft tissues of *Galatea paradoxa* (born, 1778) from the Volta estuary, Ghana. *International Journal of Fisheries and Aquaculture* 1(2): 014-021.

Amisah, S. A.B. Gyampoh, P. Sarfo-Mensah, and K.K. Quagraine. 2009. Livelihood trends in response to climate change in forest fringe communities of the Offin Basin in Ghana. *J. Appl. Sci. Environ. Manage* 13(2): 5 – 15.

Adjei-Boateng, D., S. Amisah, and K.K. Quagraine. 2009. Bacteriological contamination of the freshwater clam (*Galatea paradoxa*/born 1778) from the Volta estuary, Ghana. *African Journal of Microbiology Research* 3(7): 396-399.

Kumar, G., Quagraine, K.K., and Engle, C. 2008. Factors that influence frequency of purchase of catfish by U.S. households in selected cities. *Aquaculture Economics and Management* 12(4): 252-267.

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EDUCATION

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

POSITIONS

2014-Present	Michigan State University	Extension Specialist
2008-Present	North Central Regional Aquaculture Center	Regional Aquaculture Extension Specialist
2012	University of Alaska	Adjunct Professor
2007-2008	Michigan State University	Research Associate / Specialist
1996-2009	Aquaculture Bioengineering Corp.	Consultant
2003-2007	Michigan State University	Aquatic Animal Health Lab Manager
2002-2007	Michigan State University	Graduate Assistant
2000 – 2001	Stoney Creek Fisheries	Aquaculture Facility Manager
1998 – 2000	Great Black Creek Fish Co.	Hatchery Manager
1989 – 1993	Cade Industries	Engineer
1986 – 1989	McDonnell Douglas	Engineer

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

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

SELECTED PUBLICATIONS

Weeks C.T. 2013. Sustainable Aquaculture in the North Central Region US - A Review of perceptions and recommendations from the aquaculture community. *Journal of Extension* v51 no.2 - 2COM1.

Weeks C.T. 2011. Incorporating Deliverables into the NCRAC Project Development Process. North Central Regional Aquaculture Center Report. North Central Regional Aquaculture Center, December 2011.

Weeks C.T. 2011. NCR Aquaculture Critical Needs Assessment Report. North Central Regional Aquaculture Center Report, October 2011.

Weeks C.T., R. Kim, M. Wolgamod, G. Whelan and M. Faisal. 2011. Experimental infection studies demonstrate the high susceptibility of the salmonid, lake herring (*Coregonus artedii*), to the Great Lakes strain of viral hemorrhagic septicemia virus (Genotype IVb). *Journal of Fish Disease* 34(11): 887-891