

**A WHITE PAPER ON THE STATUS
AND NEEDS OF AQUACULTURE
EXTENSION OUTREACH FOR THE
NORTH CENTRAL REGION**

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INTRODUCTION

The North Central Regional Aquaculture Center (NCRAC) is one of five Regional Aquaculture Centers administered by the U.S. Department of Agriculture's Cooperative State Research, Education, and Extension Service (USDA CSREES). These Centers work together within the broader, integrated research/extension aquaculture program of USDA to advance a well developed and sustainable aquaculture industry in the United States. NCRAC relies on leaders in the diverse aquaculture industry for guidance and direction in its programs. An Industry Advisory Council (IAC) identifies program priorities. A Technical Committee (TC) works with the IAC to formulate projects that address industry priorities. Regional programs are coordinated with activities of other Centers to avoid duplication, yet still address regional differences. Teams of researchers and extension aquaculture specialists from North Central Region (NCR) universities, public agencies, and the private sector develop and execute projects to solve priority problems. A Board of Directors oversees administration and management of NCRAC's activities.

NCRAC recently formulated a strategic plan to assist the Center to more effectively identify and implement research and extension programs to enhance benefits to the NCR (NCRAC 1998). NCRAC's mission is to enhance aquaculture through education, research, and technology transfer to support a sustainable profitable industry throughout the NCR. Essential to accomplishing this mission is building a North Central aquaculture community representing a partnership among the industry, universities, and public agencies. NCRAC's mission will be accomplished by:

- Developing transferable technology enabling producers to be profitable,
- Disseminating relevant educational materials to achieve profitable margins of operation,
- Providing demonstrations and regular aquaculture extension programs,
- Engaging in research partnerships among industry, universities, and public agencies, and
- Fostering open dialogue and networking throughout the North Central aquaculture community.

Outreach education, specifically NCRAC Extension, is a core component to the long-term development of an economically and environmentally sound aquaculture industry. Based on the results of the 1998 Census of Aquaculture, states having strong state aquaculture associations have the largest aquaculture industries in the region. Within the NCR Missouri had the highest farm-gate value at \$5,374,000 (17% of the total), followed closely by Wisconsin at \$3,221,000 (11% of the total), and third was Minnesota at \$3,221,000 (11% of the total). The combined farm-gate value of these three states was \$13,821,000 or 46% of the region's total; these states also have strong viable aquaculture associations. Strong university-based aquaculture extension programs have the potential to both enhance established state aquaculture industries as well as serving as the catalyst for more limited state aquaculture industries.

CURRENT STATUS OF AQUACULTURE EXTENSION

The NCRAC Extension Work Group is a sub-committee of the NCRAC Technical committee; hereafter this Work Group will be referred to as NCRAC Extension. The Work Group is designed to assess and meet the informational and educational needs of the various clientele groups through cooperative and coordinated regional educational programming. A network of Sea Grant (SG) and Cooperative Extension Service (CES)-designated contacts has been established to help maximize the efficiency and impact of education programs in the 12-state NCR.

Since NCRAC's inception, NCRAC Extension has been the primary conduit for the dissemination of NCRAC research findings. An outreach education component is usually integrated into each research proposal to assess project results related to the aquaculture industry. In 1992, multiple extension liaisons were appointed to all NCRAC-funded research projects, e.g., economics, hybrid striped bass, walleye, and yellow perch.

The function of the extension liaison is to participate in writing annual progress and termination reports as well as assisting in the implementation of extension objectives in each research project. The increased number of extension liaisons has helped to improve the information transfer from research work groups to the public. Extension liaisons have also assisted with the planning, awareness, promotion, and implementation of the hybrid striped bass, walleye, and yellow perch workshops held throughout the region and have supported the NCRAC Economics and Marketing Work Group's efforts to develop cost of production budgets and expected revenues for selected NCR species.

In addition, NCRAC Extension conducted a variety of needs-based educational programs that are not based on NCRAC research. NCRAC-sponsored workshops, fact sheets, technical bulletins, and videos have served to inform a variety of clients about numerous aquaculture practices for the NCR. In a 1994 survey, NCRAC extension contacts estimated that NCRAC publications were used to address approximately 15,000 client questions annually. These fundamental services were in response to a needs assessment of persons interested in Midwest aquaculture.

Several key examples of needs-based education programs are:

- “Making Plans for Commercial Aquaculture in the North Central Region” is often used to provide clients with initial information about aquaculture;
- Species-specific publications on walleye, trout, and catfish are used in numerous regional meetings and are requested by clients from throughout the U.S.;
- Publications on organizational structures for aquaculture businesses, transportation of fish in bags, and others are beneficial to both new and established aquaculturists;
- A national video conference for beginning aquaculturists throughout the U.S.;
- In-service training workshops for county CES/SG educators;
- Aquaculture handbooks are critical resources for county CES/SG educators;
- Continuing education classes for prospective and practicing aquaculturists, teachers, and other audiences on: business planning, marketing, species, systems, economics, and other related topics;
- A national aquaculture Web site (AquaNIC) offers a comprehensive resource to the public;
- Aquaculture materials developed for 4-H and other youth groups; and
- Environmental Strategies for Aquaculture Symposium and Proceedings.

CRITICAL FACTORS AND RECOMMENDATIONS

Critical factors identified that impede the development and implementation of educational programs are: lack of aquaculture extension personnel; lack of institutional support for extension; lack of sustained needs-based educational programs; and the under-utilization of distance education program delivery methods. The first two critical factors are operational issues; the remaining two are strategic issues. In this document, suggested recommendations are outlined for both types of issues. Suggested recommendations are presented for each identified critical issue. Underlying all four issues is the diverse nature of the aquaculture industry of this region.

ISSUE 1: LACK OF STATE AQUACULTURE EXTENSION PERSONNEL

In total there are currently less than 3.0 full time equivalents (FTEs in aquaculture extension in the NCR.

Table 1. Estimated extension effort specifically funded for aquaculture outreach activities; activities include all forms of extension including NCRAC and state extension programming.

State	FTE	State	FTE
Illinois ¹	0.0	Missouri	0.1
Indiana ¹	0.0	Nebraska	0.0
Iowa	0.25	North Dakota	0.1
Kansas:	0.0	Ohio	0.75
Michigan	0.25	South Dakota	0.0
Minnesota	0.7	Wisconsin	0.2
Total:	2.35 FTE		

¹It is anticipated that the Indiana-Illinois Sea Grant will hire a new extension specialist in 2001 (1.0 FTE).

Besides the designated NCRAC extension contacts serving with NCRAC Extension, several states have additional personnel involved in aquaculture extension program development. For example, the state of Illinois has two additional FTEs involved in outreach education for aquaculture:

A technology transfer specialist works through the Southern Illinois University-Carbondale Office of Economic and Regional Development
The Illinois Fish Farmer's Cooperative has a Technical Service Manager who will work one-to-one with Illinois fish farmers.

In addition, the state of Indiana anticipates using some of the proceeds from the tobacco settlement funds to create a new extension specialist position to be located at the Southeastern Indiana Agriculture Research and Education Center.

Recommendations

- Provide in-service training programs for county extension educators and state specialists.
- Provide a resource package for new extension specialists containing technical publications, programming recommendations, contacts with area of specialization, Web resources, frequently asked questions, challenges of being an extension specialist in the Midwest, etc.
- Provide NCRAC and NCR state publications to all county CES/SG agriculture educators.
- Develop and provide a training package (electronic and hard copy) to state aquaculture extension specialists or the NCRAC Extension Associate Director containing lesson plans to be used for teaching basic aquaculture to county CES/SG educators.
- Teach leadership skills to representatives of state aquaculture associations to improve the role and efforts of associations in advancing aquaculture as well as interactions with regulatory agencies.

Assist with extension aquaculture job descriptions as needed by university CES/SG administrations.
Increase collaboration and coordination among outreach education educators and programs (e.g., county CES/SG educators, NRCS, state aquaculture coordinators, vocational agriculture teachers, natural resource personnel, and others).

ISSUE 2: LIMITED ACADEMIC AND GOVERNMENTAL UNDERSTANDING OF THE REAL AND POTENTIAL ECONOMIC BENEFITS OF RESEARCH AND EXTENSION PROGRAMS FOR NORTH CENTRAL AQUACULTURE

Aquaculture is relatively new and small compared to other, more traditional agribusinesses in the Midwest. As a result, the financial and infrastructure priorities of land-grant institutions are devoted to these traditional and more established agribusinesses. To be recognized by universities and governments as a viable alternative and supplemental form of agriculture, aquaculture extension programs must work within the framework of state and national associations to develop persuasive evidence for either reprioritization or increased allotment of state and federal agriculture funding for aquaculture research and extension.

Recommendations

Develop 1-page publications outlining the aquaculture industry and opportunities in the NCR.

Encourage state leaders and university administrators to participate in all NCR aquaculture events. This may be more effective if the message comes, in part, from commercial aquaculturists and state/regional/national aquaculture associations.

ISSUE 3: LACK OF SUSTAINED EDUCATIONAL PROGRAMS FOR PROSPECTIVE AND PRACTICING AQUACULTURISTS

An extension educational program may be defined as a product resulting from all activities in which a professional educator and learner are involved (Seevers et al. 1997). For example, a single activity, e.g., a yellow perch field day to demonstrate results of stocking rates, may not be sufficient to teach farmers how to produce yellow perch. However, a series of activities, e.g., field days, seminars, publications, and one-to-one visitations may be linked together to achieve the intended result of teaching farmers how to maximize yields through improved stocking, feeding, and management practices. All activities must be linked by the educational objective to teach farmers how to make the best decisions about the factors involved in maximizing profits. To conduct an effective educational program there must be a considerable amount of time devoted to the program planning process including planning, design, implementation, and evaluation. Successful educational programs are time-consuming, expensive, and require broad support (Appendix 1). At the same time, NCRAC extension contacts are asked to address other education program needs, e.g., aquatic vegetation control and 4-H programming, or need the assistance of support staff who are already limited at universities, e.g., Web masters and editors. Consequently, current NCR aquaculture extension programs are limited by financial constraints but perhaps more so by the limited amount of support personnel in the region. Compared to the 2.35 FTEs in aquaculture extension in this region, many states in the southern U.S. have extension FTEs in excess of the entire NCR.

The current NCRAC model of integrating multiple extension efforts into accomplishing an educational objective outlined in a research proposal may lead to a disjointed effort and less effective long-term success. A better approach is to use the program-planning model to identify the needs of industry and then develop educational programs designed to address those needs. Results from ongoing and completed research projects may be an important complement to a state educational program.

Recommendations

Use the recommendations from the research white papers to identify goals, objectives, and implementation plans for regional extension education programs.

Develop evaluation guidelines based on regional educational objectives, which will then be used to determine program impacts.

Develop long-term regional extension programs to meet the technology transfer needs of emerging species.

Develop highest priority NCRAC publications tailored to meet the needs of individual states as well as the NCR.

Develop long-term regional applied field sites to demonstrate all research relevant to the NCR aquaculture industry.

ISSUE 4: UNDERUTILIZATION OF EMERGING DISTANCE EDUCATION PROGRAMS

Currently, 407 million people from 150 countries (Nua Ltd. 2000) use the Internet with 158 million Americans having access (Nielsen/NetRatings 2000). The growing use of the Internet will likely help to accommodate the growing number of adults (age 17 and higher) participating in education programs. For example, the National Center for Education Statistics (NCES) reported 59 million Americans took part in adult education programs in 1991, 76 million in 1995, and an estimated 100 million will do so by 2004 (NCES 1998; Weber 1999). Increased use of the Internet and increases in adult education enrollment provide an excellent opportunity for educators to collaborate in addressing the needs of students through curriculum delivery over the Internet.

At the same time, there still exists a need to maintain print materials for extension clients who do not have ready access to the Internet.

Recommendations

Training for specialists on how to conduct distance education programs. Questions regarding when distance education is appropriate, expected costs/returns, and benefits/challenges need to be addressed.

Specialists develop Web sites with lists of experts, their specialties, and contact information. Utilize existing personnel to assist state specialists in developing state specialist Web sites.

Identification of distance education services within each state.

Develop distance education modules based on the educational needs of the region.

PRIORITIZATIONS

As indicated in other NCRAC white papers, prioritizations are largely subjective and it is unlikely that any ordering would reach consensus among either aquaculture producers or extension specialists. The ordering of the list is likely affected by our personal biases but with input from outside reviewers of this document. The list should, therefore, only be viewed as a guide. The highest priority issues are numbers 1 and 3, both equally weighted.

Issue 1: Lack of State Aquaculture Extension personnel.

Issue 3: Lack of Sustained Educational Programs for Prospective and Practicing Aquaculturists.

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Appendix 1

Distance and Live Delivery Matrices

Distance Matrix

	Audience Size	Pros	Cons	Inter-Activity ¹	Selection and Utilization Guidelines	Prep. Time	Delivery Time	Equipment Needs	Facilities	Cost ²
World Wide Web	Small to Very Large (1-1,000's)	<ul style="list-style-type: none"> versatile means of delivery may contain a variety of media provides timely information access to software downloads convenient means of delivery allows user interaction consistency of information 	<ul style="list-style-type: none"> lack of access to the Web difficult to find information in the maze of sources slow telecommunication speeds 	Active	Used for: <ul style="list-style-type: none"> delivering course materials interactive media training access resources promotion teaching 	Hours to Days	Minutes to Hours	<ul style="list-style-type: none"> client computer Internet service provider modem phone line server browser 	<ul style="list-style-type: none"> desk chair electricity room 	very expensive
Intranet	Small to Very Large (1-1,000's)	<ul style="list-style-type: none"> consistency of information self paced learning interactivity centralization of information simple to create and maintain 	<ul style="list-style-type: none"> slow telecommunication speeds unreliable Internet links unreliable Internet service providers 	Active	Used for: <ul style="list-style-type: none"> training access resources courses 	Hours to Days	Minutes to Hours	<ul style="list-style-type: none"> client computer Internet service provider modem phone line server browser 	<ul style="list-style-type: none"> desk chair electricity room 	very expensive
Electronic Mail Courses	Small to Very Large (1-1,000's)	<ul style="list-style-type: none"> accessible by physically challenged serves as a storage database easy access to instructors inexpensive once infrastructure is established 	<ul style="list-style-type: none"> self directed learning requires instructors to lose control student isolation lack of personalization technical difficulties infrastructure expensive 	Passive	Used for: <ul style="list-style-type: none"> training personal correspondence teaching needs assessment 	Minutes to Hours	Minutes to Hours	<ul style="list-style-type: none"> client computer Internet service provider modem phone line server email software printer 	<ul style="list-style-type: none"> room desk chair electricity 	expensive
Broadcast Radio	Small to Very Large (1-1,000's)	<ul style="list-style-type: none"> portable simple to use helps listening skills timely 	<ul style="list-style-type: none"> one way communication no visual stimulus no individualized instruction technical failure 	Passive	Used for: <ul style="list-style-type: none"> gain perspective when cost is an issue teaching, reading books 	Minutes to Hours	Minutes to Hours	<ul style="list-style-type: none"> radio studio transmitter microphone, antenna 	<ul style="list-style-type: none"> no special facilities required 	moderate
Interactive Television	Small to Large (1-100's)	<ul style="list-style-type: none"> provides remote access interactive time independent 	<ul style="list-style-type: none"> may not involve all students easier to become distracted with long questions by other students technical failure 	Active	Used for: <ul style="list-style-type: none"> tutorials, short courses delivery of lectures seminars and conferences curriculum support 	Days to Weeks	Hours to Days	<ul style="list-style-type: none"> computers and interface, lighting cameras, monitors sound system document presenter 	<ul style="list-style-type: none"> studio room lighting 	very expensive

	Audience Size	Pros	Cons	Inter-Activity¹	Selection and Utilization Guidelines	Prep. Time	Delivery Time	Equipment Needs	Facilities	Cost²
Telecourse	Small to Large (1-100's)	<ul style="list-style-type: none"> timely multiple teaching methods interactive widely available 	<ul style="list-style-type: none"> high costs equipment needs lack of peer acceptance requires motivated students high preparation time 	Active	Used for: <ul style="list-style-type: none"> training personal correspondence teaching needs assessment 	Days to Weeks	Hours to Days	<ul style="list-style-type: none"> computers and interface, lighting cameras, monitors sound system document presenter 	<ul style="list-style-type: none"> studio room lighting 	very expensive to extremely expensive
Conferences	Small to Large (1-100's)	<ul style="list-style-type: none"> element of control by presenter networking social versatile delivery 	<ul style="list-style-type: none"> cost inconsistent lack of control 	Passive	Used for: <ul style="list-style-type: none"> skill building improving teamwork teaching, training 	Days to Weeks	Hours to Days	<ul style="list-style-type: none"> AV equipment food 	<ul style="list-style-type: none"> housing conference rooms 	very expensive to extremely expensive
Computer-Mediated Communication	Small to Large (1-100's)	<ul style="list-style-type: none"> reduces travel flexible schedule 24 hr access 	<ul style="list-style-type: none"> information overload requires computer access technical difficulties 	Active	Used for: <ul style="list-style-type: none"> courses discussion/interest groups 	Days to Weeks	Hours to Days	<ul style="list-style-type: none"> telecommunications computers 	<ul style="list-style-type: none"> rooms computer access 	extremely expensive

¹ Interactivity does not take into account questions asked by audience.

² Inexpensive (<\$100), moderate (\$100-500), expensive (\$500-1500), very expensive (\$1,500-5,000), and extremely expensive (\$5,000>)

Live Delivery Matrix

	Audience Size	Pros	Cons	Inter-Activity ¹	Selection and Utilization Guidelines	Prep. Time	Delivery Time	Equipment Needs	Facilities	Cost
Power Point	Small to Large (1-100's)	<ul style="list-style-type: none"> • Re-useable • Portable 	<ul style="list-style-type: none"> • Hardware and facility requirements • Software learning curve 	Passive	<ul style="list-style-type: none"> • Use with lecture 	Hours	Minutes to Hours	<ul style="list-style-type: none"> • Computer • Projector screen 	<ul style="list-style-type: none"> • Room • Special lighting 	Moderate \$300-350
Role Play	Small (25 w/ sub-groups)	<ul style="list-style-type: none"> • Close to real life • Less risk than real life • Applies knowledge 	<ul style="list-style-type: none"> • Lack of participation • Stress on learner • Skill of facilitator 	Active	<ul style="list-style-type: none"> • Ensure situation can be role played • Ensure problem solving setting 	Hours to Days	Minutes to Hours	<ul style="list-style-type: none"> • Moderator • Props 	<ul style="list-style-type: none"> • Role play dependent 	Inexpensive
Case Study	Small (5-7)	<ul style="list-style-type: none"> • Immediate feedback • Independent learning • Applies knowledge • Few materials 	<ul style="list-style-type: none"> • Inefficient • Difficult to teach 	Active	<ul style="list-style-type: none"> • Mesh with curriculum • Must be believable 	Hours	Minutes to Hours	<ul style="list-style-type: none"> • Facilitator • Case studies 	<ul style="list-style-type: none"> • No special facilities needed. A room would be useful 	Inexpensive to Moderate
Workshop	Medium (<50)	<ul style="list-style-type: none"> • Uses multiple teaching methods • Participative • Social 	<ul style="list-style-type: none"> • Limited time • Limited number of participants • Lots of Preparation time 	Active	<ul style="list-style-type: none"> • Skill building • Conflict resolution 	Days	Hours to Days	<ul style="list-style-type: none"> • AV • Rooms 	<ul style="list-style-type: none"> • Rooms • Chairs • Tables 	Expensive
Game	Small (<50)	<ul style="list-style-type: none"> • Learner interaction • Increase knowledge retention 	<ul style="list-style-type: none"> • Stress on learner • Inefficient 	Active	<ul style="list-style-type: none"> • Ice breaker • Session closer 	Hours	Minutes to Hours	<ul style="list-style-type: none"> • Game • Facilitator 	<ul style="list-style-type: none"> • Game dependent 	Inexpensive
Simulation	Small (<50)	<ul style="list-style-type: none"> • High level of comprehension • Less risk than real life • Motivational • Applies knowledge • Skill Builder 	<ul style="list-style-type: none"> • Time-consuming • Lack of participation • Material requirements 	Active	<ul style="list-style-type: none"> • Set state for simulation 	Hours to Days	Minutes to Hours	<ul style="list-style-type: none"> • Simulation • Facilitator 	<ul style="list-style-type: none"> • Simulation dependent 	Inexpensive to Expensive
Demo	Small to Large (1-100)	<ul style="list-style-type: none"> • Stimulates audience interest • Experiential learning 	<ul style="list-style-type: none"> • Demo may fail • Lack of participation • Material requirements 	Passive	<ul style="list-style-type: none"> • Compliments lecture 	Hours	Minutes	<ul style="list-style-type: none"> • Demo. • Moderator 	<ul style="list-style-type: none"> • Demo dependent 	Inexpensive to Moderate
Panel	Small to Large (10-100)	<ul style="list-style-type: none"> • Provides experts • Few materials • Distance delivery 	<ul style="list-style-type: none"> • Lack of participation • Panelist selection • Time management • Audience management 	Passive	<ul style="list-style-type: none"> • Use less than 10 panelists • Panelists addresses audience • Panelists interact with panelists 	Hours	Hours	<ul style="list-style-type: none"> • Speakers • Moderator 	<ul style="list-style-type: none"> • Room • AV • Tables • Chairs 	Inexpensive to Expensive
Seminar	Large (100>)	<ul style="list-style-type: none"> • Large audiences • Versatile 	<ul style="list-style-type: none"> • Limited skill building • Expensive 	Passive		Days	Hours	<ul style="list-style-type: none"> • Speakers • Moderator 	<ul style="list-style-type: none"> • Room • AV • Refreshments 	Expensive

¹ Interactivity does not take into account questions asked by audience