Youth Education in Aquaculture (YEA)

Chairperson: Dr. Barbara I. Evans

Industry Advisory Council Liaison: Mr. Bill West

Extension Liaisons: Dr. Ronald Kinnunen
Ms. Emma Wiermaa

Funding Request: **$**34,950

Duration: 1 year (July 1, 2016 to June 30, 2017)

Objectives:

1) To assess the level of aquaculture curricula/programs in high schools throughout Michigan and Wisconsin

2) Develop a web based platform that:
   a) Allows assessment of the level and distribution of aquaculture curricula throughout the region
   b) Will be accessible by the schools to link the programs and
   c) Is expandable to all states in NCRAC and possibly to other RACs.

3) Develop incentives for the students to solve aquaculture problems such as expansion of the "Aquaculture Challenge". Competitions should be scalable to other states within NCRAC.

Proposed Budget

Institution/Company	Principal Investigators	Objectives	Year 1 (Total)
LSSU	Barbara Evans	1.2.3	$4954
LSSU	Christopher Smith	1,2,3	$3826
LSSU	2 Aquaculture Students	1	$16104
LSSU	1 Computer Student	2	$8053
LSSU	Travel	1	$993
LSSU	Other Direct Costs	1,2,3	$1020

Non-funded Collaborators

Facility	Collaborators
West Shore Community College	Hamdy Helal
University Wisconsin Steven's Point NADF	Emma Wiermaa
Blue Iris Fish Farm LLC	Bill West
Michigan Sea Grant/MSU	Ronald Kinnunen
Iowa State University	D. Allen Pattilo

TABLE OF CONTENTS

PROJECT SUMMARY

Advancement of the aquaculture industry requires a workforce experienced with aquatic farming. Although globally, aquaculture is growing rapidly, the projected workforce in the US is insufficient to meet future demands. This includes food production, baitfish, game fish for stocking, as well as providing eggs and fry for the growers. Our goal is to strengthen career pathways from high school to the aquaculture industry. We propose to develop an online forum for Youth Education in Aquaculture (YEA) that will identify and inter-connect high schools that have aquaculture programs throughout Michigan and Wisconsin. Quantifying the level of aquaculture engagement that currently exists in the high schools throughout the NCRAC region, will allow coordination of effort. Not only will this allow us to see what resources are needed to support current programs, but also where we need to initiate/encourage new activities. In addition, aquaculture involves advanced concepts in math and science. A basic education in aquaculture opens the door to university and potential careers in business, engineering and the life sciences. We propose to engage youth in aquaculture throughout the North Central Regional Aquaculture Center (NCRAC) region and identify career pathways from high school through college and university to the aquaculture industry.

JUSTIFICATION

In the 1970's the US imported 50% of its fish and shellfish. Although 13% of world seafood production was from aquaculture, the US only contributed about 6%. To promote expansion of US aquaculture, congress enacted the "National Aquaculture Act of 1980" (AFA, 1981; US Congress, 1980). Despite this legislation, the US now imports 91% of its seafood contributing to a $14 billion annual seafood trade deficit. Although aquaculture now supplies over 50% of the world's seafood, the US contribution is now only 1% (FAO, 2012). Concern exists not only for the future supply of seafood for the US, but also how this trade imbalance affects the quality of seafood available in the US market; in particular seafood from foreign sources where environmental regulations are less stringent than in the US (FAO, 2012). Global aquaculture is valued at $100 billion, yet US production only accounts for 1% of this market. Currently imports are much cheaper than US domestic seafood, but as world population increases, the global demand for seafood will likely require us to rapidly increase domestic production. There is a need for a Herculean effort to grow the US aquaculture industry in order to meet projected demands for fish. The US has the potential for establishing a thriving aquaculture industry, but there are a number of barriers that need to be overcome. These include: compliance with regulations and legislation, developing successful business plans and establishing an educated workforce. We are also faced with a negative public opinion of aquaculture. Many of these barriers could be removed by increased efforts on educating the public on the benefits of sustainable aquaculture. As the aquaculture industry expands, it will also need a workforce, skilled in the life sciences, water chemistry and systems engineering. The first step in educating the public begins in the schools.

The aquaculture industry is also concerned that a bottleneck exists for expanding the industry due to the small number of the younger generation entering the aquaculture workforce. To help remedy this problem, we propose to identify the career pathways from high school through to the aquaculture industry. The first step will be to map out the current landscape of aquaculture training in the high school curricula. We propose to create an online forum to integrate these schools, and create career pathways for aquaculture. The project is relevant, because although many schools in the US do incorporate aquaculture, they are isolated and there is no clear path for interested students to pursue an aquaculture career. By integrating these activities, the schools will be able to interact with peer programs, but this will also allow the industry to see where an interest in aquaculture exists. Resources and training opportunities can then be targeted to these regions. By connecting the aquaculture industry to the high schools, students may be able to gain additional skills by volunteering at fish farms or other aquaculture businesses. Schools clearly need help from the industry if they are going to augment their curricula. Those that have been working with the schools find that there is no directive to achieve goals based on any type of fish production. Even keeping fish alive is not a goal. Most schools do not have access to quality fish, any quality feed, aeration techniques, wastewater treatment processes etc., so there is considerable room for improvement, even in the schools that show interest. By identifying the needs, we will be better able to foster education in aquaculture.

Integration of effort provides benefits on many levels. Interested students may be able to identify a career path in aquaculture and receive guidance on where to obtain skills training. The aquaculture industry will benefit from identification of a future workforce that is still in need of skills training. These students could be employed in the industry as interns, or seasonal workers as they learn the tools of the trade. The applications for this project are

nation wide. We will begin with an intensive survey of Michigan and Wisconsin schools, but plans are already in place to extend this to all 12 states of NCRAC. In the future, this could be extended to the other Regional Aquaculture Centers (RACs).

We have many current and potential collaborators on this project. We are working with extension educators from a number of agencies including Michigan Sea Grant, Michigan State University Extension, University of Wisconsin Steven's Point and Iowa State University. We plan to collaborate with the state departments of education, and school districts to identify high school aquaculture activity. We also hope to collaborate with the US Career and Technical Education program (US CTE) to connect interested students with industry opportunities. For example in Michigan, US CTE offers "Less than class size" (LTCS) educational options if a high school lacks the resources or student numbers to offer training in career pathways such as aquaculture. Once we have identified the aquaculture interest, we also hope to collaborate with community colleges and/or universities to establish programs in aquaculture. Our goal is to increase the numbers of skilled workers trained in aquaculture in line with the NCRAC goal to promote a well developed and sustainable aquaculture industry in the United States.

RELATED CURRENT AND PREVIOUS WORK

Increased exposure to aquaculture has been observed to engage students, and increase their interest in math and science (Wingenbach et al., 1999). Our preliminary work in the K-12 system shows strong interest in aquaculture by students. We recently held a competition called the "Aquaculture Automation Challenge" for our local high schools. Students were given materials to design an aquaculture system, and to program sensors to monitor the environmental parameters. We were amazed at how interested the students were in being involved with the competition, and how motivated and engaged many were with their projects. However, we also found that the teachers mentoring the teams needed more aquaculture training. This was also observed in a survey of high school aquaculture in the mid 1990's in the northeastern US (Wingenbach et al., 2000).

Aquaculture education in the US high schools began as an experimental program back in 1989 (El-Ghamrini, 1996). In a survey of 450 central US schools thought to incorporate aquaculture, success was correlated to the ability of innovation to diffuse through the system. The learning curve can be steep for newcomers to the field, so having access to a support network will increase the probability of success. With incorporation of the web platform to integrate these endeavors, we predict the number of successful high school aquaculture programs will increase. There continues to be a many isolated attempts to engage students in aquaculture. Significant efforts are being made in northern Wisconsin as well as Alabama. In talking with these individuals it is apparent that these efforts are cyclic, dependent on a few dedicated champions, and the inertia of the project rests solely on them. What is needed is an integration of effort so that each of these activities does not occur in isolation and the results can be sustained.

There are significant gaps in our knowledge of the extent of student and teacher interest in aquaculture in the high schools. We need to know what resources they have available, and what are their needs. We need to have curricula and access to training in aquaculture available to the teachers to equip them with the necessary skills. By identifying the presence of aquaculture programs in the high schools, we will be able to target resources to get these students on a career pathway to the aquaculture industry. At the same time, as part of their education, these students can be challenged to solve the problems that are stifling the growth of the industry. These challenges can address manpower issues using automation, disease issues, energy efficiencies, as well as successful business plan models.

ANTICIPATED BENEFITS

We anticipate that at the end of this project, the aquaculture industry will benefit from detailed interactive maps of aquaculture in Wisconsin and Michigan. We should also have limited information for the other 10 states of NCRAC. These maps will identify where future skilled workers can be found. The maps will utilize updateable fusion tables, that will give detailed information on a variety of metrics including extent of curricula and what may be lacking for the schools to move their program forward. The web platform will also be accessible by the schools listed on the map. They will be able to locate other programs in their geographic area, as well as link to schools across the state and region. By sharing their struggles and successes, they will be able to advance their education more quickly than by working alone. We also envision this web platform to have the capacity to host a competition such as the

"Aquaculture Challenge", with minimal cost. Each year, teams could be challenged to address a problem facing aquaculture. Teams could pitch their solutions using a video meeting, and judges could evaluate how well they solved the problem. Winning teams could be invited to present at the NCRAC conference, or other aquaculture venues.

Outreach for Objective 1 (Assess the level of aquaculture curricula): An assessment of the level of aquaculture in the K-12 system will benefit industry outreach and extension personnel that are promoting aquaculture in the region. The data generated will allow them to see which areas are pursuing aquaculture and may benefit from additional mentoring and access to educational resources. It will also identify regions that do not have aquaculture curricula, but are interested in development of one. Equipment and teacher training can then be directed to those areas. Results of this project will be shared with NCRAC outreach and extension personnel, and with the state aquaculture associations.

Outreach for Objective 2 (Develop a web based platform): The online aquaculture forum will allow the schools to interact with each other, either by videoconferencing, or through data sharing. Currently many programs are working in isolation, but this will allow them to see what the other programs are doing and learn from their mistakes and successes. We anticipate that this will promote interest in aquaculture at other schools in their area. During the project timeframe, the webmaster will assist the schools in developing their pages. The link to the forum will be shared off the University Wisconsin Steven's Point/Northern Aquaculture Demonstration Facility (UWSP/NADF) webpage, the schools webpages as well as NCRAC webpage. The forum will also be integrated with NCRAC to allow access to aquaculture experts from the industry.

Outreach for Objective 3 (Create incentives for the students to solve aquaculture problems): The long-term goal of this project is to use the information to develop incentives such as an aquaculture competition to keep the interest in aquaculture moving forward. We will also be pursuing additional funding sources for training teachers in aquaculture. Most likely this will involve contacting outreach and extension personnel throughout NCRAC.

Evaluation Plan

The success of the project will be evaluated by the completeness of the data set. We should be able compile a list of all high schools in the two states, and determine what percentage of schools we have been able to contact. Michigan has 550 public school districts with 57 Intermediate School Districts. Wisconsin has @394 school districts. Our goal is to include 80-100% of the schools. We will also assess the ease of use of the web forum, and send surveys to a selection of schools, and to state aquaculture associations to determine if the site is useful and user friendly.

OBJECTIVES

1) To assess the level of aquaculture curricula/programs in high schools throughout Michigan and Wisconsin

2) Develop a web based platform that a) allows assessment of the level and distribution of aquaculture curricula throughout the region; b) will be accessible by the schools to link the programs and c) is expandable to all states in NCRAC and possibly to other RACs.

3) Develop incentives for the students to solve aquaculture problems such as expansion of the "Aquaculture Challenge". Competitions should be scalable to other states within NCRAC.

PROCEDURES

Procedure for Objective 1 (Assess the level of aquaculture curricula): Two LSSU aquaculture outreach students will be responsible for contacting high schools to see whether their curriculum involves aquaculture. One student will focus on Michigan, the other on Wisconsin. The students will work directly with the project PI (Evans) for MI, and with the WI collaborator (Wiermaa). The students will be directed to a variety of resources and contacts within the NCRAC network and the University of Wisconsin-Stevens Point Northern Aquaculture Demonstration Facility (UWSP/NADF), in order to follow up on known aquaculture activities. They will also contact state Departments of Education, and school districts, the US Career and Technical Education program, as well as our collaborators. The

resulting list of schools with an aquaculture curriculum will be compiled for entry into the online database. These schools will be contacted directly and asked for program details, pictures of their program and contact information.

Procedure for Objective 2 (Develop a web based platform): An LSSU computer networking student will be hired to develop an interactive web platform (called NCRAC-YEA for example). Ideally we will identify a student to take on this project for their senior thesis. This student will work with the PI (Smith) to develop the forum. Once the student has completed development of the platform, they will serve as the webmaster for the site. The first step will be to determine the best forum site for this project. There are a number of forum sites available for free, or without advertisement for a small fee (e.g. http://www.lefora.com). The platform will compile information obtained by the aquaculture outreach students, and be able to: i) generate maps with the location of schools with aquaculture. We would encourage the use of cloud based data compilation such as Google Fusion tables that allows web based data exchange for free through Google resources. ii) The data would ideally include schools that currently did not have aquaculture curricula, but are very interested in developing one. iii) the web forum should also support video-conferencing, such as Google "hangouts", to allow schools to interact remotely, to share their challenges and successes, and should be expandable to include additional regions iv) the system should be secure, so that only approved personnel can access each school's information.

Procedure for Objective 3 (Create incentives for the students to solve aquaculture problems): The PI's will work together with collaborators to develop incentives for students to engage in solving some of the problems that create barriers to the advancement of US aquaculture. This will involve brainstorming ideas including but not limited to an aquaculture challenge competition similar to FIRST robotics. The PI's will also pursue funding opportunities for these incentives, as well as for making resources available to schools interested in adopting an aquaculture curriculum (including teacher workshops). They will also pursue funding to maintain the NCRAC-YEA forum site.

Logic Model for Youth Education in Aquaculture (YEA)

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

Objective: Develop and provide hands-on K-12 learning programs to develop an educated workforce available to the aquaculture industry

Inputs	Outputs		Outcomes		
	Activities	*Participation*	*Learning*	*Actions*	*Conditions*
Time: -contact schools, establish links, develop a web platform for K-12 aquaculture training information Resources:- software, Programming skills Travel:-limited, travel to visit facilities at partner institutions, workshop site development visits	Interactive web platform identifying K-12 aquaculture programs in MI and WI and providing opportunity for sharing of knowledge Provide aquaculture training and educational tools to the schools Partner with local school districts to, develop workshops educate teachers, access funding for teachers Create or provide links to educational webinars, partner with US CTE to define career cluster pathways for	K-12 schools (students, student clubs, teachers) and 4H groups Intermediary school districts, Math and science centers, school superintendents Department of education, US Career and Technical Education departments (US CTE) Link US CTE programs to the aquaculture industry through internships or	Assess the level of aquaculture engagement in the K-12 system in the NCRAC region Create a database and online forum to integrate these schools Create workshops to educate teachers in aquaculture Investigate Career and Technical Education (CTE) opportunities for aquaculture	Use this information to design an approach to target resources and mentoring to these schools	Establish a venue to challenge youth to solve problems of aquaculture Train K-12 teachers in aquaculture Create career pathways for aquaculture, from the high schools through skills training, to the aquaculture industry Ultimate impact, increase the workforce trained in aquaculture for the aquaculture industry.

Assumptions:

- Increased exposure to aquaculture a) engages students b) increases their interest in math and science
- More student engagement in aquaculture will move the aquaculture industry forward
- Difficult content subject area, needs education, needs exposure

External Factors:

- Lack of a K-12 aquaculture curriculum
- Lack of awareness about aquaculture by general public
- Lack of integration, networking between active schools
- Lack of youth recruitment to the aquaculture industry

FACILITIES

LSSU facilities: Student research/office space is available in Crawford Hall on the LSSU campus for students working on their senior projects. This space would allow the students to have materials on hand in a safe location. There is wireless internet available throughout campus, such that web development could be conducted at this location. Degree programs in both the Biological Sciences, and in Computer Networking require that students take on an independent capstone project, such as a research or experiential learning project. We are confident we will be able to hire skilled upper class students for this project.

SSMART business accelerator office space adjacent to the LSSU campus: An LSSU campus team Superior AquaSystems LLC, currently leases office space at this site. We will also be utilizing this space for the year of the project at a very low cost. Although space is available on the main campus, some of our student hires may not be doing this work for a senior project, so some dedicated space is needed.

REFERENCES

El-Ghamrini, S.A. 1996. Adoption of aquaculture education by high school agriculture teachers in the central region of the United States. Doctoral dissertation Iowa State University

FAO 2012. The State of World Fisheries and Aquaculture Fisheries and Aquaculture Department
Food And Agriculture Organization Of The United Nations Rome, 2012
http://www.fao.org/docrep/016/i2727e/i2727e00.htm

AFA. 1981. National Agricultural Research, Extension, and Teaching Policy Act of 1977, "Subtitle L-Aquaculture", added by the Agriculture and Food Act of 1981, Public Law 97-98, section 1440(a), 95 Stat. 1316.

US Congress. 1980.National Aquaculture Act of 1980 https://nifa.usda.gov/sites/default/files/resource/naa80.pdf

Wingenbach, G.J., S.A. Garten and L.D. Lawrence. 1999. Students' perception of aquaculture education in the Northeast Region. Journal of Agricultural Education 40: 14-22.

Wingenbach, G.J., S.A. Garten and L.D. Lawrence. 2000. Assessing the aquaculture curricula in the Northeast Region. Journal of Agricultural Education 41: 2-10.

PROJECT LEADERS

State	Name, Institution	Specialization
Michigan	Dr. Barbara I. Evans, Lake Superior State University	Aquaculture Education
Michigan	Dr. Christopher Smith, Lake Superior State University	Computer Networking
Wisconsin	Emma Wiermaa, University Wisconsin Steven's Point	Aquaculture Extension
Michigan	Dr. Hamdy Helal, West Shores Community College	Aquaculture Education
Wisconsin	Bill West, Blue Iris Fish Farm LLC	Aquaculture Education
Michigan	Dr. Ronald Kinnunen, Michigan Sea Grant, MSU	Aquaculture Extension
Iowa	D. Allen Pattilo, Iowa State University	Aquaculture Extension

ORGANIZATION AND ADDRESS Lake Superior Stat Univ., 650 Easterday Ave., Sault Ste Marie MI 49783				**USDA AWARD NO.**	Year 1 : Objectives 1, 2, 3		
PROJECT DIRECTOR(S) Dr. Barbara I. Evans				Duration Proposed Months: _12_ **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) 1			.6	4602			
b. ___ Senior Associates							
2. No. of Other Personnel (Non-Faculty)							
a. ___ Research Associates-Postdoctorates . . .							
b. ___ Other Professionals							
c. ___ Paraprofessionals							
d. ___ Graduate Students							
e. ___ Prebaccalaureate Students 2				14960			
f. ___ Secretarial-Clerical							
g. ___ Technical, Shop and Other							
Total Salaries and Wages				19562			
B. Fringe Benefits (If charged as Direct Costs)				1496			
C. Total Salaries, Wages, and Fringe Benefits (A plus B)				21058			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies							
F. Travel				993			
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.)				420			
K. Total Direct Costs (C through I)				22471			
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)				22471			
N. Other							
O. Total Amount of This Request				22471			

P. Carryover -- (If Applicable) . . . . . **Federal Funds: $** **Non-Federal funds: $** **Total $**

Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)	Leave Blank	
Cash (both Applicant and Third Party)		
Non-Cash Contributions (both Applicant and Third Party)		

NAME AND TITLE (Type or print)	**SIGNATURE** (required for revised budget only)	**DATE**
Project Director Dr. Barbara I. Evans		
Authorized Organizational Representative Dr. David Finley, Provost		
Signature (for optional use)		

ORGANIZATION AND ADDRESS Lake Superior Stat Univ., 650 Easterday Ave., Sault Ste Marie MI 49783				**USDA AWARD NO.** Year 1 : Objectives 1, 2, 3			
PROJECT DIRECTOR(S) Dr. Christopher Smith				Duration Proposed Months: _12_ **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) 1			.5	3554			
b. ___ Senior Associates							
2. No. of Other Personnel (Non-Faculty)							
a. ___ Research Associates-Postdoctorates . . .							
b. ___ Other Professionals							
c. ___ Paraprofessionals							
d. __ Graduate Students							
e. ___ Prebaccalaureate Students 1				7480			
f. ___ Secretarial-Clerical							
g. ___ Technical, Shop and Other							
Total Salaries and Wages				11034			
B. Fringe Benefits (If charged as Direct Costs)				845			
C. Total Salaries, Wages, and Fringe Benefits (A plus B)				11879			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies							
F. Travel							
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.)				600			
K. Total Direct Costs (C through I)				12479			
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)				12479			
N. Other							
O. Total Amount of This Request				12479			
P. Carryover -- (If Applicable) . . . . . **Federal Funds: $**				**Non-Federal funds: $**		**Total $**	
Q. Cost Sharing/Matching (Breakdown of total amounts shown in line O)						Leave Blank	
Cash (both Applicant and Third Party)							
Non-Cash Contributions (both Applicant and Third Party)							

NAME AND TITLE (Type or print)	**SIGNATURE** (required for revised budget only)	**DATE**
Project Director Dr. Barbara I. Evans		
Authorized Organizational Representative Dr. David Finley, Provost		
Signature (for optional use)		

BUDGET EXPLANATION FOR LAKE SUPERIOR STATE UNIVERSITY

(B. I. Evans)

A. Summer salary ($4954): Evans is on a 9 month hard money appointment. Evans requests one month summer salary at 60% effort ($4602), plus FICA (7.65%). Evans will oversee the project, and the aquaculture outreach students. This time will be divided to allow two weeks at the beginning of the project and two weeks at the end. Additional time spent will be contributed in kind.

Prebaccalaureate Students ($16104)
Aquaculture Outreach Students ($16104): Support is requested for two students, one to contact the schools throughout each state. This would be full time 3.5 for months in the summer, and 10 hours per week during the academic year ($8.50/hr plus FICA (7.65%))

F. Travel ($993): Funds are requested for student travel between Sault Ste. MI and Bayfield WI. Mileage of 725 miles round trip at $.54/mile. We have included per diem for 1 day at $40 and 1 night's lodging at @$65 each.

J. Other Direct Costs ($420):
Office Rental: We request $420 to lease student office space for the period of the grant. We will be using space leased by Superior AquaSystems, an LSSU aquaculture team that rents space from the local business accelerator (SSMART). For $35 a month, they will have a secure private office with telephone, internet, conference room use, as well as the option to have the web page hosted on their server. We would be taking over their space intensively for the year, so would need to cover the monthly rent.

(C. Smith)

A. Summer Salary ($3826): Smith is on a 9 month hard money appointment. Smith requests one month summer salary at 50% effort ($3554) plus FICA (7.65%). Smith will oversee the computer networking student, and this time will be divided to allow two weeks at the beginning of the project and two weeks at the end. Additional time spent will be contributed in kind.

Prebaccalaureate Students ($8053)
Computer Networking Student ($8053): Support is requested for one student to develop the web platform and act as the webmaster. This would be full time for 3.5 months in the summer, and 10 hours per week during the academic year ($8.50/hr plus FICA (7.65%))

J. Other Direct Costs ($600):
Web Host Cost: We request $600 to cover the web host fee. There may be cheaper options, as we have identified one that costs $250/year, but we want to be sure we can afford the one that best suits our needs.

BUDGET SUMMARY, YEAR 1, BY INSTITUTION

Year #1

	Lake Superior State University
Salaries and Wages	30596
Fringe Benefits	2341
Total Salaries, Wages and Fringe Benefits	32937
Nonexpendable Equipment	0
Materials and Supplies	0
Travel	993
All Other Direct Costs	1020
Totals	34950

SCHEDULE FOR COMPLETION OF OBJECTIVES

Date	Objective	Activities
July 1, 2016	1	Hire aquaculture outreach students -outline procedure for contacting school districts -contact extension liaison for each state -identify information to access from schools
July 1, 2016	2	Hire computer networking student and begin work on web platform -investigate options for hosting site -outline desired structure of platform
July 1, 2016	3	Begin discussion of aquaculture challenge-type incentives
Aug. 15, 2016	2	Launch web platform -begin filling in data from contacted schools
Sept. 30, 2016	1, 2	Continue data gathering -encourage schools to begin trouble shooting the data base
Sept. 30, 2016	3	Assess school interest in concept of aquaculture challenge
Dec. 15, 2016	1, 2, 3	Interim Report -generate interactive maps of aquaculture activity -send surveys to high schools for feedback on web forum -survey state aquaculture associations (value of web forum) -continue to access and enter data
March 2017	1, 2, 3	Present progress to date at NCRAC meeting -continue to access and enter data
May 30, 2017	1, 2, 3	Final Report

PARTICIPATING INSTITUTIONS AND PRINCIPAL INVESTIGATORS

Lake Superior State University

Evans, Barbara I.
Smith, Christopher

VITA

Barbara I. Evans, Ph.D. Phone: (906) 635-2164
Professor, School of Biological Sciences LSSU e-mail**:** bevans@lssu.edu
Sault Sainte Marie MI 49783

EDUCATION

B.S. University of Ottawa, Canada, 1980, Biology (cum laude)
Ph.D. University of Kansas, Lawrence KS, 1986, Biology (Systematics and Ecology)

POSITIONS

1994 – pres.	Professor of Biological Sciences, Lake Superior State University (LSSU)
2005-2006	Acting Co-director Aquatic Research Laboratory, LSSU
1996- 2000	Department Chair, Department of Biology, LSSU
1991-1993	Postdoctoral Scholar (NRSA/NIH) Stanford University, Neurosciences Program
1987-1991	Post-doctoral Fellow (NSERC) University of Oregon, Neuroscience Institute
1990-1991	Guest Investigator, Woods Hole Oceanographic Inst. Environmental Systems Lab
1988	Visiting Assistant Professor of Biology, University of Oregon

SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

Technical Committee /Research Subcommittee of NCRAC through Dec 31, 2017
American Fisheries Society (2001-present) Early Life History Section, Fish Health Section, Fish Culture Section

SELECTED PUBLICATIONS (*undergraduate and **graduate student co-authors)

Caroffino*, D., A. Mwai* and B.I. Evans. 2011. Population genetics of Walleye and Yellow Perch in the St. Marys River. Journal of Great Lakes Research 37(supplement 2):28-34.

Turschak*, B., A. Moerke, and B.I. Evans. 2011. Spatial and seasonal changes in the zooplankton community of the St. Marys River. Journal of Great Lakes Research 37(supplement 2):21-27.

Kirkpatrick, N.S., D. Everitt* and B.I. Evans. 2007. Asymmetric Hybridization of Pink (*Oncorhynchus gorbuscha*) and Chinook (*O. tshawytscha*) Salmon in the St. Marys River, Michigan. J. of Great Lakes Research 33:358-365.

Hoke,** K. L., B. I. Evans and R. D. Fernald. 2006. Remodeling of the Cone Photoreceptor Mosaic during Metamorphosis of Flounder (P*seudopleuronectes americanus*) Brain Behav. & Evol. 68:241–254.

Evans, B.I. 2004. A Fish's Eye View of Habitat Change. Pages 1-30 *I*n: von der Emde G., Mogdans J., Kapoor B.G. (eds) The Senses of Fish. Adaptations for the reception of natural stimuli. Narosa Publishing House, New Delhi, pp 1-30.

Evans, B.I. and H.I. Browman. 2004. Variation in the Development of the Fish Retina. Pages 145-166 *In*: The Development of Form and Function in Fishes and the Question of Larval Adaptati*on* (Ed. J. J. Govoni) AFS Sympos. 40: 145-166.

VITA

Dr. Christopher E. Smith, Email: csmith16@lssu.edu
Assistant Professor, School of Mathematics and Computer Science Phone: 906 635-2612
Lake Superior State University,
Sault Sainte Marie MI, 49783

EDUCATION

B.S. Lake Superior State College, 1984, Computer and Mathematical Sciences
M.S. University of Michigan, 1987, Computer Science and Engineering
Ph.D. University of Minnesota, 1996, Computer Science with a minor in Cognitive Science

POSITIONS

2012 - Present Assist. Professor, School of Mathematics & Computer Science, Lake Superior State University
2006 - 2012 Assoc. Professor, Department of Computer Science, Gonzaga University, Spokane, WA.
2000 – 2006 Assist. Professor, Depart. of Electrical and Computer Engineering, Univ. of New Mexico,

SELECTED PUBLICATIONS

Smith, C. 2014. Anisotropic fractal snakes. Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics.

Gilfeather-Crowley, P., C. Smith, and S. Youtsey, 2011. Connecting visually-impaired people to friends through wireless sensor networks, Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics.

Min, H.J., N. Papanikolopoulos, C. Smith and V. Morellas. 2011. Feature-based covariance matching for a moving target in multi-robot Tomkins, R., T. Jones, R. Nertey, C. Smith, and P. Gilfeather-Crowley, "Reconfiguration and management in wireless sensor networks," Proceedings of the IEEE Sensor Applications Symposium.

Smith, C. 2010. Segmentation and tracking of natural patterns using fractal snakes. Proceedings of the IEEE International Conference on Systems, Man, and Cybernetics.

Abd-Almageed, W., A. El-Osery, and C. Smith. 2006. SLA-based non-parametric expectation maximization. Soft Computing Journal, 10(11):1007-1020, September 2006.

Smith C. and H. Schaub. 2011. Efficient polygonal intersection determination with applications to robotics and vision. Proceedings of the IEEE/RSJ International Conference on Intelligent Robot and Systems, 2005. Following. Proceedings of the Mediterranean Conference on Control and Automation.