Non-Lethal Bird Deterrent Evaluation in the NCR

Detailed Project Outline for the Plan of Work

FOR GRANT #2018-38500-28887

Non-Lethal Bird Deterrent Evaluation in the NCR

Chairperson: Paul B. Brown, Purdue University, FNR
Co-Investigators Robert Rode, Purdue University, FNR
Brian MacGowan, Purdue University, FNR
Jason Garvon, Lake Superior State University

Extension Liaisons: Brian MacGowan, Purdue University
Matthew Smith, The Ohio State University

Industry Liaison: Dan Vogler, Harietta Hills Trout Farm

Duration: 1 year (August 1, 2020 – July 31, 2021)

Objective:

The objective of this project is evaluation of the Sound Blanket system from Wildlife Defense Systems, Inc. as a method of deterring predation of fish by birds in the North Central Region (NCR).

Proposed Budgets:

Institution	Principal Investigator	Objective	Year 1	Total
Purdue University	Paul Brown	1	$34,400	$34,400

Non-Funded Collaborators:

Facility	Collaborator(s)
Michigan Wholesale Walleye, Sault St. Marie, MI	Andrea McDonald
Harietta Hills Trout Farm, Harietta Hills, MI	Dan Vogler
Ozark Fisheries, Stoutland, MO	Larry Cleveland
Fountain Bluff Fish Farm, Gorham, IL	Larry Brown

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List of Principal Investigators..... **Error! Bookmark not defined.**

Project Summary

Predation of fish by birds is a significant economic loss to fish farmers and killing those birds is becoming less acceptable within our society. Estimated economic losses on individual farms range as high as $500,000 in the Northeast to over $25 million annually in the catfish industry. This project seeks to evaluate a new non-lethal method of deterring avian predators that relies on disrupting communications among birds, which in turn makes the local area uninhabitable even when an abundance of food is available. This method is in use in the fruit tree industries throughout the US. In those industries, multiple species of birds are destroying crops. The Sound Blanket system discourages consumption of agricultural crops leaving their more natural food items as the available food supply. This non-lethal deterrent system has not been evaluated in aquaculture where a unique suite of predacious birds exists. Diminishing losses to predacious birds would significantly improve economic viability of aquaculture operations and result in more fish in the US supply chain. Further, using non-lethal means of reducing predation would result in a significant new marketing opportunity (environmentally friendly, food production compatible with ecosystems, etc.) that fits well within the newer definitions of sustainability.

Justification

As in other regions in the U.S. fish loss to bird predation continues to be a problem for fish producers in the North Central Region (NCR). Although there have been a number of bird predation projects in the other regions, e.g., southern states, most of these projects have focused on the channel catfish industry and not on fish species cultured in the NCR. This project seeks to evaluate a new non-lethal method of deterring avian predators that relies on disrupting communications among birds, which in turn makes the local area uninhabitable even when an abundance of food is available. In addition to the different fish species being cultured in the NCR, the predaceous bird community differs in their diversity compared to other regions.

Related Current and Previous Work

Despite the significant economic loss due to bird predation in aquaculture, there is relatively little research underway to minimize their impact, with most of that effort underway in the southern region with a focus on channel catfish (*Ictalurus punctatus*) raised in earthen culture ponds. Based on web searches, colleagues at the Harry K. Dupree Stuttgart National Aquaculture Research Center have an active research effort to document nesting sites and behavior of cormorants throughout their range (MS to WI). Colleagues at the Mississippi State University Animal and Plant Health Inspection Service (APHIS) have active projects focused on “bird foraging patterns, bird population distributions, preferred prey size, and a host of other factors that may influence how much product is lost to bird predators (and) additional studies are looking at the role that birds play in transmission of catfish parasites”. They are also exploring unmanned aerial vehicles as a method of deterring bird predation. An existing project focuses on predation by lesser scaup (*Aythya affinis*) predation on catfish and baitfish in earthen ponds. The proposed effort will be the first to evaluate the sound system as a method of deterring birds in aquaculture and does not duplicate other research efforts.

Statement of Duplication of Research

The USDA Current Research Information System (CRIS or REEport) was accessed to review related or relevant research projects and it was found that the proposed work is original research and does not duplicate any previously funded projects in the CRIS. The National Sea Grant Office Funding page and NOAA Office of Aquaculture Funding Opportunities Page were also consulted. **The following NOAA databases of previously funded projects were also accessed to ensure that the proposed work does not duplicate previous research: 1**) National Sea Grant Office Funding Page (http://www.seagrant.noaa.gov/funding/rfp.html); 2) website of state Sea Grant Program (http://www.seagrant.noaa.gov/other/programsdirectors.html); and 3) NOAA Office of Aquaculture Funding Opportunities Page (http://www.nmfs.noaa.gov/aquaculture/funding/funding.html). This project is a unique evaluation and does not duplicate prior research efforts. Key words included sound, blanket, and fish.

Anticipated Benefits

If the Sound Blanket System is successful, fish producers will have a new method of deterring avian predators from production units, resulting in more fish to sell and improved economics of operations. Disease transmission via birds may also be reduced, resulting in healthier fish and a safer food supply for consumers. A marketing opportunity exists if this system is successful. Deterring birds by non-lethal methods might be considered positive by many consumers who may equate that effort as one of the new sustainable approaches for food production/ecosystem interaction. Numerous undergraduate students will have the opportunity to work closely with faculty and staff at 2 universities, as well as fish farms. This hands on, experiential learning opportunity might be a profound component of their education.

Objective

The objective of this project is evaluation of the Sound Blanket system from Wildlife Defense Systems, Inc. as a method of deterring predation of fish by birds in the North Central Region (NCR).

Procedures

Two teams of observers will be developed; one at Purdue (PU) and one at Lake Superior State University (LSSU). Both teams will be comprised of two students who have had courses in avian identification. The Purdue team will be responsible for the southern sites (Fountain Bluff and Ozark) and the LSSU team will be responsible for the two northern sites (Michigan walleye and Harietta Hills). All team members will be trained in identification of birds expected at the sites and all will have the Audubon and Merlin Bird identification apps installed on their personal phones. Basic procedures for each team will be identical.

Prior to deployment of the System, both teams will travel to their target sites for an assessment of bird predation. These assessments will be in the Fall of 2020 and Spring of 2021 during peak migration. Participating farms will alert each team to the timing of this activity. The pre-deployment assessment will last one day. Both team members will be stationed at distinct sites at each farm beginning 30 min prior to sunrise and stay until 30 min after sunset. Total numbers of birds and number of each species will be counted and recorded on waterproof forms developed specifically for this project. Approximately 1-week after the pre-deployment assessment, the System will be moved into place and a second visual assessment will be conducted at all sites. This assessment will have one student near the System and one located away from the effective range of the system (determined by elevation and other physical factors). All team members will be hidden from potential bird predators, either with the use of ground blinds or natural vegetation. The LSSU team has cameras available for this project and they will be used at the two northern sites.

We will use Browning Defender 940 game cameras. They have 80 ft (24 m) range of motion detection and 0.48 sec trigger speed and 0.8 sec recovery time. Cameras will be set with 10-30 second delay between pictures to minimize collecting pictures of the same bird repeatedly. Picture quality is set at 8MP, but can be set up to 20MP if we feel we need better images. Cameras will be set up during the pre-deployment sampling and remain in place through the deployment phase of the evaluation. Cameras are not available for the PU team and purchasing for this project is outside the budgetary range allocated. Visual observation with binoculars will be used for counting and identification.

Data will be analyzed using nonparametric methods using $p<0.05$ as the accepted level of significance. The R statistical program will be used for this phase of the project.

There is a high level of uncertainty involved in this project which, coupled with the use of student labor, dictates development of backup teams at each site. Bird migration patterns will be influenced by weather and it is likely each team will receive little notice prior to deployment. Further, student's schedules must be considered. Both participating institutions are scheduling on-campus classes this Fall, but that situation could change and some of the team members may have exams during sampling periods. Backup teams will be trained and ready at each site to minimize disruptions in sampling.

Facilities

In this project, farms were selected that provided a wide diversity of species and a wide geographic range within the region. Figure 1 depicts the location of the four participating farms. Michigan Wholesale Walleye, Sault St. Marie, MI, produces primarily walleye (*Sander vitreus*) during the warmer months of the year in outdoor ponds. However, their ponds are not classic aquaculture ponds. Their ponds have flooded timber and the ponds are drained each year to remove fish prior to ice formation. They have persistent bird predation challenges during their production cycle and significant bird predation problems when they draw down their ponds and concentrate the fish in a smaller area in September/October of each year. Problem bird species include great blue herons (*Ardea herodias*), mergansers (*Mergus* sp.), double-crested cormorants (*Phalacrocorax auritus*) and bald eagles (*Haliaeetus leucocephalus*).

Figure 1. Locations of the proposed evaluation in the NCR

Harietta Hills Trout Farm, Harietta Hills, MI, is a classic trout raceway operation producing largely rainbow trout (*Oncorhynchus mykiss*). Their most significant challenge is with great blue herons.

Fountain Bluff Fish Farm, Gorham, IL, raises largemouth bass (*Micropterus salmoides*), bluegill (*Lepomis macrochirus*), hybrid bluegill (*L. macrochirus* x *L. cyanellus*) and channel catfish (*Ictalurus punctatus*) in earthen aquaculture ponds. The most susceptible species to bird predation are their bluegill and hybrid bluegill when they are 3-5 inches (7.6-12.7 cm) in length. Primary bird predators are cormorants, herons, cattle egrets (*Bubulcus ibis*), and American white pelican (*Pelecanus erythrorhynchos*).

Ozark Fisheries, Stoutland, MO, raises gold fish (*Carassius auratus*) and koi (*Cyprinus rubrofuscus*) in earthen culture ponds. The primary avian predators are bald eagles, osprey (*Pandion haliaetus*), cormorants and multiple species of ducks during winter months. ***Thus, the evaluation includes multiple species of fish, multiple production systems, multiple bird predators, involves four fish farms in three states, will be conducted in a wide geographic range within the NCR, and includes Great Lakes and NCR residential birds as well as migratory species on both the east and west sides of the Mississippi flyway***.

Deterrent system - Wildlife Defense Systems Inc. (WDS), St. Marys, GA, developed a technology intended to profoundly deter birds and other wildlife out of areas where they are a nuisance. A primary target for this product is agriculture and aquaculture producers that currently lose 20% - 40% of their production to bird and nuisance animal damage. Not only is this a significant economic impact it also presents potential health risks to farm workers and consumers. On the cherry and blueberry farms alone in Michigan, this is estimated to be a problem that exceeds $80,000,000 annually.
Current systems on the market rely on scaring the bird from the fields and orchards. The evolution from scarecrows, to propane cannons and electronic predator bird sounds does not eliminate bird damage to crops. In a very short period of time, the birds become accustomed to the noises and once they realize they are not in danger, they ignore these efforts.

WDS describes their technology as a soundscape that discourages wildlife, such as birds and nuisance animals, from inhabiting the protected area. The soundscape, called the audible "Sound-Blanket™", is broadcast over the area using a portable Sound Deterrent Unit speaker array. The "Sound-Blanket™" does not scare the birds, rather the effect of the sound is to constantly mask the bird's communication and their ability to hear predator sounds, thus making the area naturally uninhabitable. This is like a noisy restraint that deters potential predators and encourages them to eat elsewhere. The "Sound-Blanket™" can be adjusted to deter a variety of bird species simultaneously and can be refined to not impact some species while others are affected. The volume is adjusted based on the distance and area that the sound covers. Two portable Sound Deterrent units are in use at the Bardenhagen orchard, Suttons Bay, MI, a multi-crop orchard (apples, cherries, apricots). The size and scope or the orchard require the volume to be high in close proximity to the system; however, even one row in, the sound was greatly reduced and allows for normal conversation.

Another evaluation is underway in Traverse City, MI, Third Coast Fruit Co., in a cherry orchard. The grower selected a four-acre sweet cherry parcel with an elevation change of 30 feet from the southeast corner to the northwest corner and a 20-foot elevation change from north to south where most of his damage typically occurs. Elevational change is a critical factor in establishing effective deterrent mechanisms as sounds emanate in a cone-shaped fashion and must be oriented to specific locations where birds are likely to land.

Outreach and Evaluation Plan

Before adapting new practices, producers prefer to see it in action. Given the visual and auditory nature of the deterrent systems, having video that can be referenced online and used in virtual field days is critical. Purdue recently purchased two HDR 4K video cameras that we will use to record the set-up and operation of deterrent systems, and behavioral responses of target birds. A Purdue FNR extension intern will edit and render the video clips into final products with project partner co-branding. The edited video will be uploaded to the NCRAC web site and to YouTube.

Evaluation of the project will include all quantitative data collected by fish species and bird predators and their interaction. A Termination Report will be developed for submission to NCRAC. Results from this project will also be developed into a technical/extension document for potential publication in the North American Journal of Aquaculture under the Note or Communication category. The project will be considered successful if birds are deterred from eating fish at the target facilities.

Logic Model

Logic Model - Non-lethal bird deterrent evaluation in the NCR

Situation: Bird predation on fish raised in aquaculture results in millions of dollars of direct loss to fish farms. This project proposes the first evaluation of a new bird deterrent system that relies on sound to disrupt avian communication.

Inputs	**Outputs**		**Outcomes -- Impact**		
	Activities	*Participants*	*Short*	*Medium*	*Long*
Principal Investigators from Purdue University (PU) and Lake Superior State University (LSSU). *Technical and Extension staff from Purdue University.* *Undergraduate students from PU and LSSU.* *Funding from the USDA North Central Regional Aquaculture Center (NCR).* *Four fish farms in the NCR.*	*Conduct a pre- and post-deployment of the Sound Blanket System at four fish farms.* *Collect video of setup and operation of the System.* *Edit and make available the video.* *Train eight undergraduate students on bird predation on fish.*	*Purdue University and Lake Superior State University.* *Michigan Wholesale Walleye, Sault St. Marie, MI* *Harietta Hills Trout Farm, Harietta Hills, MI* *Ozark Fisheries, Stoutland, MO* *Fountain Bluff Fish Farm, Gorham, IL.* *The Ohio State University* *Millcreek Perch Farm, LLC*	*Quantitative data from use of the System.* *Training undergraduate students at two universities.* *Direct observation of the System at four farms.*	*Decreased predation of fish from four fish farms.* *Increased economic gain from increase in numbers of fish.* *Increased markets for new deterrent system.*	*Decreased loss of fish from fish farms.* *Increased revenue for fish farms.* *Increased supply of fish in US markets.* *Fewer birds killed.* *Increased sustainability marketing opportunities.*

Assumptions
We anticipate the System will move predaceous birds away from aquaculture production units, resulting in more fish for sale. Placing the System on four operating fish farms provides direct evidence for their effectiveness and four spokespersons who can communicate to fellow farmers. Training students increases the number of people entering aquaculture in the US.

External Factors
COVID19 remains the primary external factor that could limit this project. Weather patterns and resulting bird migrations could limit effectiveness of this evaluation.

Project Leaders

Name and State	Institution	Specialization
Paul Brown	Purdue University	Fish Nutrition
Jason Garvon	Lake Superior State University	Wildlife Biology
Brian MacGowan	Purdue University	Wildlife Extension
Robert Rode	Purdue University	Aquaculture Production

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

OMB Approved 0524-0039
Expires 03/31/2004

Budget

ORGANIZATION AND ADDRESS	Purdue University 155 S. Grant Street, West Lafayette, IN 47909	**USDA AWARD NO.**			
PROJECT DIRECTOR(S) Paul Brown		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 1. No. of Senior Personnel	**CSREES FUNDED WORK MONTHS**						
	Calendar	Academic	Summer				
a._____(Co)-PD(s)							
b._____Senior Associates							
2. No. of Other Personnel (Non-Faculty)							
a. ___ ResearchAssociates-Postdoctorates . . .							
b. ___ Other Professionals							
c._____Paraprofessionals							
d._____Graduate Students							
e._____Prebaccalaureate Students							
f._____Secretarial-Clerical							
g._4 Technical, Shop and Other				$1,852			
Total Salaries and Wages ..... D							
B. Fringe Benefits (If charged as Direct Costs)				$148			
C. Total Salaries, Wages, and Fringe Benefits (A plus B) ..... D				$2,000			
D. Nonexpendable Equipment (Attach supporting data. List items and dollar amounts for each item.)							
E. Materials and Supplies				$2,000			
F. Travel				$7,000			
G. Publication Costs/Page Charges							
H. Computer (ADPE) Costs							
I. Student Assistance/Support (Scholarships/fellowships, stipends/tuition, cost of education, etc. Attach list of items and dollar amounts for each item.)							
J. All Other Direct Costs (In budget narrative, list items and dollar amounts and provide supporting data for each item.)				$20,000			
K. Total Direct Costs (C through J) ..... D				$34,400			
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.)				$0			
M. Total Direct and F&A/Indirect Costs (J plus K) ..... D				$31,000			
N. Other ..... D				$3,400			
O. Total Amount of This Request ..... D				$34,400			

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) ..... D		
Non-Cash Contributions (both Applicant and Third Party) ..... D		

NAME AND TITLE (Type or print)	**SIGNATURE** (required for revised budget only)	**DATE**
Project Director	Paul Brown	7/31/20
Authorized Organizational Representative	Jenny Siemers	7/31/20
Signature (for optional use)	Jenny Siemers	7/31/2020

Budget Justification for Purdue
(Brown)

Objective: 1
Year 1:

A. Salaries, Wages and Fringe Benefits Salary funds are requested for 4 undergraduate students at each institution (2 primary team members and 2 backups; $10/hr, 20 hr/week, 9 weeks total employment). Students will be trained on specific bird identification expected at the target sites using field guides and downloadable apps and stationed at each site for both a pre-deployment and deployment assessment. Funds are also requested ($1,000; 10/hr, 20 hr/week, 5 weeks) for the Extension intern at Purdue to edit and finalize the video of the system. Fringe benefit rate for undergraduate technicians is 8%. $2,000 total.

E. Materials and Supplies – Supply funds are requested for purchase of binoculars (four Leupold McKenzie, $200 each) and ground blinds (four BlackOut X83, $220 each). Funds will also be used to develop and print waterproof data recording sheets and waterproof folders for field observation ($320). $2,000 total.

F. Travel – NCRAC funds are requested to travel to all four sites (five trips per two sites/institution) for data collections. Travel funds will also be used to visit sites and coordinate activities between PIs and participating farms. Round trip distances from West Lafayette to Sault St. Marie, 1,018 miles; 634 miles to Harietta Hills; 680 miles to Gorham, IL; and, 926 miles to Stoutland, MO. Accommodation charges $120/night, per diem $45/day. Total number of days travelling will be a function of weather and timing of bird activity. Round trip distances from LSSU to Wholesale Walleye, 10 miles; Harietta Hills, 210 miles. Mileage and per diem will be determined by federal standards. $7,000 total.

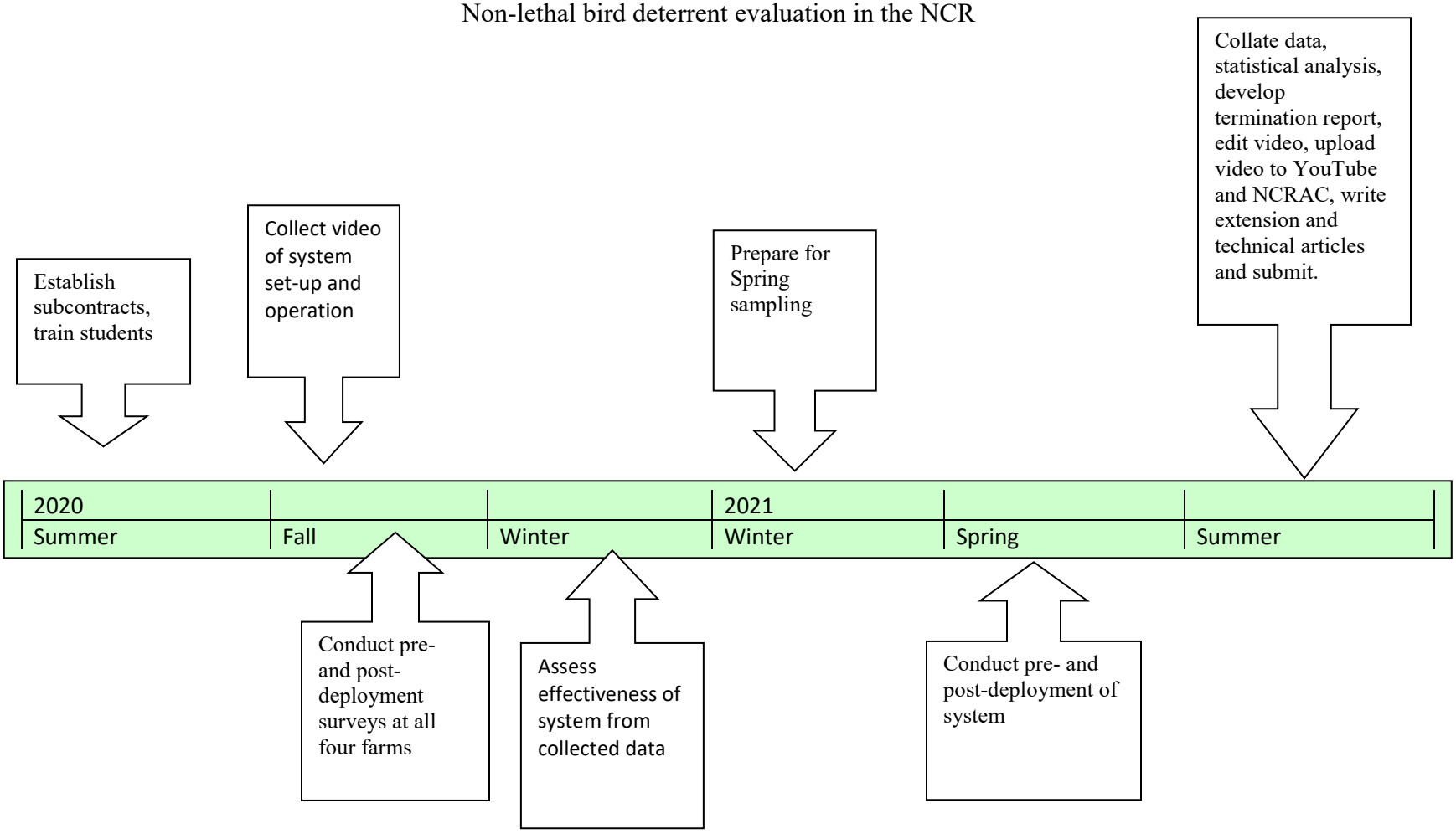
J. Other Direct Costs – WDS requests $5,000/System for use of their System, which includes transportation of units to each site and return to Georgia. $20,000 total.

N. Other — Subcontract to Lake Superior State University (LSSU). Students at LSSU will be responsible for assessing camera images post-deployment and verifying visual data collected on site ($10/hr, 20 hr/week, 4.5 weeks). $900 total; supply funds are requested for purchase of binoculars and ground blinds. Funds will also be used to develop and print waterproof data recording sheets and waterproof folders for field observation (see Budget Justification for Purdue, lead institution for specifics). $1,500 total; NCRAC funds are requested to travel to two sites (four trips per site) for data collections. Travel funds will also be used to visit sites and coordinate activities between PIs and participating farms (mileage and other travel costs listed under Purdue Budget Justification). $1,000 total. $3,400 total for the subcontract.

Schedule for Objective Completion

Timeline

Non-lethal bird deterrent evaluation in the NCR



List of Principal Investigators

Purdue University
- Paul Brown
- Brian MacGowan
- Robert Rode

Lake Superior State University
- Jason Garvon

VITA

Paul B. Brown
Purdue University
715 West State Street
West Lafayette, IN 47907-2061

Phone: (765) 494-4968
Fax: (765) 496-2422
E-mail: pb@purdue.edu

Education

B.S.	University of Tennessee, 1980, Wildlife and Fisheries Sciences
M.S.	University of Tennessee, 1983, Aquatic Animal Nutrition
Ph.D.	Texas A&M University, 1987, Aquatic Animal Nutrition

Positions

Professor (1997-), Associate Professor (1993-1997), Assistant Professor (1989-1993), Aquaculture Nutrition, Purdue University, Department of Forestry and Natural Resources

Scientific and Professional Organizations

American Society of Nutritional Sciences
World Aquaculture Society

Selected Publications

Estruch, G., S. Martinez-Llorens, A. Tomas-Vidal, R. Monge-Oetiz, M. Jover-Cerda, P.B. Brown, and D. S. Penaranda. 2020. Impact of high dietary plant protein with or without marine ingredients in gut mucosa proteome of gilthead seabream (*Sparus aurata*, L.). Journal of Proteomics 216:103672.

Minh, Hoang Le and P.B. Brown. 2016. Effects of time after hormonal stimulation on milt properties in Waigieu seaperch *Psammoperca waigiensis*. Israeli Journal of Aquaculture-Bamidegeh 68:1326-1335.

Liu, B., Z. Zhou, P.B. Brown, H. Cui, J. Xie, H.M Tsion, and X. Ge. 2016. Effects of graded levels of dietary vitamin A on the growth performance, blood composition and disease resistance in juvenile Wuchang bream (*Megalobrama amblycephala*). Aquaculture 450:23-30.

Hart, S.D., A.S. Bharadwaj and P.B. Brown. 2010. Soybean lectins and trypsin inhibitors, but not oligosaccharides or the interactions of factors, impact weight gain of rainbow trout (*Oncorhynchus mykiss*). Aquaculture 306:310-314.

Bharadwaj, A.S., S.D. Hart, B.J. Brown, Y. Li, B.A. Watkins and P.B. Brown. 2010. Dietary source of stearidonic acid promotes increased muscle DHA concentrations in hybrid striped bass. Lipids 45:21-27. doi 10.1007/s11745-009-3372-9.

Hart, S.D., B.J. Brown, N.L. Gould, M.L. Robar, E.M. Witt and P.B. Brown. 2010. Predicting optimal dietary essential amino acid profile for growth of juvenile yellow perch with whole body amino acid concentrations. Aquaculture Nutrition 16:248-253.

Gonzales, J.G. and P.B. Brown. 2007. Nutrient retention capabilities of Nile tilapia (*Oreochromis niloticus*) fed bio-regenerative life support system (BLSS) waste residue. Advances in Space Research 40:1725-1734.

Kasper, C.S., B.A. Watkins and P.B. Brown. 2007. Evaluation of two soybean meals fed to yellow perch (*Perca flavescens*). Aquaculture Nutrition 13:431-438.

Gonzales, J.M., A.H. Hutson, M.E. Rosinski, P.B. Brown, Y.V. Wu and T.F. Powless. 2007. Evaluation of fish meal-free diets for first feeding Nile tilapia, *Oreochromis niloticus*. Journal of Applied Aquaculture 19:89-99.

VITA

Robert Rode
Purdue University
5675 West 600 North
West Lafayette, IN 47907-2061

Phone: (765) 496-7910
Fax: (765) 583-2490
E-mail: rrode@purdue.edu

Education

B.S. University of Maine at Orono, 1981, Wildlife Management
M.S. Auburn University, 1991, Aquaculture

Positions

Lab Manager/Aquaculture Specialist, Purdue University, 2006-Present
Production Biologist, Great Bay Aquaculture, 2002-2005

Scientific and Professional Organizations

Indiana Aquaculture Association
World Aquaculture Society and U.S. Chapter

Selected Publications

Rode, R. and A. Heber. 2020. Buildings for aquaculture operations. NCRAC Fact Sheet Series #128.
Ray, A and R. Rode. In Press. Small-scale, year-round shrimp farming in temperate climates. NCRAC Fact Sheet Series #124.
Rode, R. 2014. Marine shrimp biofloc systems: Basic management practices. Purdue Extension Publication FNR-495-W.

Research Involvement

Near commercial-scale production studies – Bluegill diets in ponds, cage culture of hybrid striped bass and largemouth bass
Larval marine shrimp production

Extension Involvement

State Specialist working with a diversified Aquaculture Industry - Recreational pond stockers, foodfish, aquaponics and marine shrimp producers
Demonstration Projects in Ponds, RAS and Aquaponics

VITA

Jason M. Garvon
Lake Superior State University
650 W. Easterday Ave
Sault Ste. Marie, MI 49783

Phone (906) 635-2471
Fax: (906) 635-2266
E-mail: jgarvon@lssu.edu

Education

B.S.	Northern Michigan University, 1998, Ecology
M.S.	Northern Michigan University, 2001, Biology
Ph.D.	Texas A&M University-Kingsville & Texas A&M University, 2005, Wildlife Science

Positions

Professor (2019-), Associate Professor (2012-2018), Assistant Professor (2005-2011), Biology, Lake Superior State University, School of Biological Sciences

Scientific and Professional Organizations

American Association for the Advancement of Science

Selected Publications

Garvon, J.M., J.B. Mott, S.S. Jacobs, and A.M. Fedynich. 2016. Blood parasites of Blue-winged Teal (*Anas discors*) from two migratory corridors, in the southern USA. Journal of Wildlife Diseases. 52(3): 725-729.

Garvon, J.M., Fedynich, A.M., Peterson, M.J., and D.B. Pence. 2011. Helminth community dynamics in populations of blue-winged teal (*Anas discors*) using two distinct migratory corridors. Journal for Parasitology Research. Volume 2011, Article ID 306257, 9 pages. doi:10.1155/2011/306257

Dubey, J.P., M.V. Reichard, L. Torretti, J. M. Garvon, N. Sundar, and M.E. Grigg. Two new species of *Sarcocystis*, *S. kalvikus* and *S. kitikmeotensis* infecting the wolvering (*Gulo gulo*) from Nunavut, Canada. Journal of Parasitology. 96(5): 972-976.

Reichard, M.V., L. Torretti, J.M. Garvon, and J.P. Dubey. 2008. Prevalence of antibodies to *Toxoplasma gondii* in wolverines from Nunavut, Canada. Journal of Parasitology. 94(3): 764-765.

Reichard, M.V., L. Torretti, T. Snider, J. Garvon, G. Marucci, and E. Pozio. 2008. *Trichinella T6* and *Trichinella nativa* in Wolverines (*Gulo gulo*) from Nunavut, Canada. Parasitological Research. DOI 10.1007/s00436-008-1028-y.

Fedynich, A.M., B.M. Ballard, T.J. McBride, J.A. Estrella, J.M. Garvon, and M.J. Hooper. 2007. Arsenic, Cadmium, Copper, Lead, and Selenium in Migrating Blue-Winged Teal (*Anas discors* L.). Archives of Environmental Contaminants and Toxicology. 53(4): 662-666.

Fedynich, A.M., R.S. Finger, B.M. Ballard, J.M. Garvon, and M.J. Mayfield. 2005. Helminths of Ross' and greater white-fronted geese wintering in South Texas, U.S.A. Comparative Parasitology. 72(1): 33-38.

VITA

Brian J. MacGowan

Purdue University

715 West State Street

West Lafayette, Indiana 47907

macgowan@purdue.edu

Phone: (765) 647-3538

Fax: (765) 647-4150

Email:

Education

B.S. Ohio State University, 1995, Natural Resources

M.S. Purdue University 1998, Wildlife Science

Positions

Extension Coordinator (2015-), Extension Co-Coordinator (2007-2015), Extension Wildlife Specialist (1999-), Graduate Teaching Assistant (1996-1998), Purdue University, Department of Forestry and Natural Resources

Scientific and Professional Organizations

The Wildlife Society

International Association for Society and Natural Resources

Purdue University Cooperative Extension Specialists Association

Selected Publications

MacGowan, B. J., A. S. Singh, B. Overstreet, M. O'Donnell, H. Klotz, and L. S. Prokopy. 2018. Designing Demonstration Events – Producer's Opinions and Preferences. Journal of Extension, 16269RIB.

Singh, A. S., B. J. MacGowan, J. D. Ulrich-Schad, M. Dunn, M. O'Donnell, H. Klotz, B. Overstreet, and L. S. Prokopy. 2018. The influence of demonstration sites and field days on adoption of conservation practices. Journal of Soil and Water Conservation, 73(3):276-283.

V. Hale, B. J. MacGowan, L. Corriveau, D. Huse, A.F.T. Currylow, and S. Thompson. 2017. Radio Transmitter Application in the Wild Timber Rattlesnake, *Crotalus horridus*. Journal of Wildlife Diseases 53(3):591-595.

MacGowan, B.J., Currylow, A.F.T., and MacNeil, J.E. 2017. Short-term responses of Timber Rattlesnakes (*Crotalus horridus*) to even-aged timber harvests in Indiana. Forest Ecology and Management 387(1):30-36. https://doi.org/10.1016/j.foreco.2016.05.026

Olson, Z.H., B.J. MacGowan, M.T. Hamilton, A.F.T. Currylow, and R.N. Williams. 2015. Survival of timber rattlesnakes: Investigating individual, environmental, and ecological effects. Herpetologica 71:274-279.

Carlton, J.S., Angel, J.R., Fei, S., Huber, M., Koontz, T., MacGowan, B.J., Mullendore, N.D., Babin, N., and L.S. Prokopy. 2014. State service foresters' attitudes toward using climate and weather information when advising forest landowners. Journal of Forestry 112(1):9-14.

LaGrange, S., Kimble, S.J, MacGowan, B.J. and Williams, R.N. 2014. Seasonal variance in hematology and blood plasma chemistry values of the timber rattlesnake (*Crotalus horridus*). Journal of Wildlife Diseases 50(4):990-993.

Currylow, A.F., B.J. MacGowan, and R.N. Williams. 2012. Hibernal thermal ecology of eastern box turtles within a managed forest landscape. Journal of Wildlife Management 77(2):326-335.

Currylow, A.F., B.J. MacGowan, and R.N. Williams. 2012. Short-term forest management effects on a long-lived ectotherm. PLoS ONE 7(7):e40473.