**July 2017**

**Partnership for Ecosystem Research and Management**

**Annual Report to Board of Advisors**



**A report on projects recently ended, ongoing, and proposed for FY2016 through FY2018**

**Michigan Department of Natural Resources**

**Michigan State University**

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***Purpose of the Document:*** *to annually inform the Board of Advisors on the status and performance of PERM and provide a basis for discussion at the annual review meetings. Secondarily, the document can be used as communication tool for the University and DNR.*

1. **Introduction**

Applied science provides the foundation for management decisions and policy development in natural resource agencies. The Partnership for Ecosystem Research and Management (PERM) between Michigan State University (MSU) and the Michigan Department of Natural Resources (DNR) began in 1995. The program continues as a unique model of a university and state agency partnership that provides cutting-edge research and technology to address challenging natural resource management issues.

The purpose of PERM is to provide for active cooperation in the advancement, organization, and conduct of natural resource research, graduate education, in-service training, technical assistance, public relations, and demonstration programs. PERM fills gaps in advanced expertise not available in the DNR and assists the agencies with fresh insights into natural resources management. Specific objectives of the partnership are to:

* Conduct research into the ecology and conservation of natural resources and to investigate the production, use, management, protection, rehabilitation, and restoration of such resources.
* Provide technical and professional training and continuing education, primarily at the graduate and professional level, in the fields of natural resource management, administration, research, information and education.
* Provide outreach in the form of methods, literature, and new findings discovered through research to land owners, sportsmen and other outdoor recreationists, conservationists, extension workers, teachers, and local, state and Federal officials.
* Provide targeted consultation to the DNR on key natural resources issues.
* Disseminate research findings through the publication of reports, bulletins, circulars, white papers, and journal and magazine articles. These may include scientific, semi-popular, and popular materials at all levels.

The PERM Agreement is a formal document that was revised in 2013 to condense a series of amendments to the original agreement into a single document and to address issues that were identified in a PERM program review conducted by the DNR in 2012. One result of the revision and review was the creation of a PERM Board of Advisors that would meet annually to review funding commitments and workplan progress along with any accomplishments achieved through the partnership. Additionally, at this annual meeting, the Board of Advisors will discuss strategic direction, new initiatives, and any issues that arose during the previous year. This document serves as a basis for discussion at that annual meeting.

1. **Science to Management**

Through the PERM program, the MDNR accomplishes several of its strategic goals to:

1. Protect natural and cultural resources
2. Ensure sustainable recreation use and enjoyment
3. Enable strong natural resource-based economies
4. Improve and build strong relationships and partnerships
5. Foster effective business practices and good governance

Division specific strategic plans support the overall goals of the Department. Investments in research and assessment through PERM must tie closely to the Division and Department Strategic Plans. Future reporting should incorporate individual project outcomes with Division and Department strategic objectives.

The partnership also provides a valuable mechanism for delivering on the outreach and engagement mission of MSU. PERM faculty and their graduate students regularly interact with agency personnel to provide scientific and technical input into the development of resource management policy and tactics. Frequently this engagement also involves non-government stakeholders. The MDNR has a responsibility to engage stakeholders, and regularly meets with organized stakeholder groups to both gather input and share important information. These interactions provide opportunities to MSU experts (such as PERM faculty) to access and share their expertise with these groups in an organized and focused setting. A large portion of the collective outreach activities of the Department of Fisheries and Wildlife is explicitly connected to our PERM partnerships, both with the MDNR and the Great Lakes Fishery Commission.

Many PERM-related outreach efforts led by MSU academic staff were accomplished during this reporting period. The following are some examples and see complete list of presentations detailed in Appendix C:

* James Bence provided key technical guidance to Fisheries Division on fish stock assessment and allocation decisions, both directly to staff on specific fisheries problems and more generally to the Tribal Coordination Unit as they continued to refine and improve fisheries population models used for decision support in the Tribal Consent Decrees.
* Dan Hayes provided leadership and technical guidance throughout the year to Fisheries Division’s Lake Sturgeon Committee as a key member of this committee.
* Kim Scribner assisted Fisheries Division biologists in interpreting complex genetics information that is being collected on Lake Herring populations in the Great Lakes region, guided the Fish Production System in the proper management of broodstocks, and provide new information to assist in the rehabilitation of Michigan’s Lake Sturgeon and Lake Herring populations.
* Mary Bremigan assisted Fisheries Division in reviewing and critiquing the science in Research Division reports that are being prepared for publication.
* Dana Infante guided Fisheries Division staff in the use of landscape scale fisheries data to greatly improve the aquatic section of the State Wildlife Action Plan that was approved in 2016 and completed the 2nd National Fish Habitat Assessment.
* Frank Lupi continued to provide Fisheries Division detailed information on the demographics and behavior of our trout anglers, key information as DNR develops a new statewide fisheriesmanagement plans.
* Brian Roth is beginning his PERM journey and is building needed relationships with Fisheries Division staff.
* For the second year in a row, PERM faculty and the Department Chair attended the annual Wildlife Division In-service meeting in August 2016. The faculty hosted a social mixer with Wildlife Division staff as well as providing numerous presentations about on-going research. The goal of this outreach is to continue to integrate PERM faculty into Wildlife Division efforts while maintaining an understanding of the role of research in wildlife management. Plans are already underway to incorporate PERM Faculty in the January 2018 Joint Wildlife Division/Forest Resources Division In-service.
1. **Budget Overview**

Faculty in PERM are funded primarily through “Umbrella Projects” that are designed to cover the full range of expectations for the PERM faculty member in their area of expertise. Umbrella projects are designed to be reviewed annually to address any new directions that may be necessary as well as provide specific deliverables to the DNR for the coming year. Fisheries and wildlife faculty whose salaries are 100% covered by the DNR are expected to teach one graduate course every other year to allow for a significant focus on meeting the DNR’s needs in their area of expertise. Other fisheries and wildlife faculty, with appointments varying from 25% to 85% have teaching commitments commensurate with level of MSU expectations for those appointments (Table 1). For FY2017, the total DNR amount for Faculty Salary Support and Operations is $3,635,160 (Table 2). The amounts for FY2017 are projected to be higher.

Table 1. Proportion of faculty appointment to PERM for period from FY2016 to 2018.

|  |  |  |  |
| --- | --- | --- | --- |
| **Faculty** | **FY2016 Support** | **FY2017 Support** | **FY2018 Proposed** |
| Jim Bence | 100% | 100% | 100% |
| Mary Bremigan1 | 30% | 30% | 30% |
| Jordan Burroughs | 50% | 50% | 50% |
| Dan Hayes | 50% | 50% | 50% |
| Dana Infante | 50% | 50% | 50% |
| Dan Kramer | 40% | 40% | 40% |
| Frank Lupi2 | 48% | 48% | 48% |
| Shawn Riley | 85% | 85% | 85% |
| Gary Roloff | 50% | 50% | 50% |
| Brian Roth1 | 25% | 25% | 25% |
| Kim Scribner | 100% | 100% | 100% |
| Fish Health Faculty (TBD) | -------- | 100% | 100% |

2Dr. Lupi’s support is a combination of 25% from Fisheries and 23% from Wildlife

Table 2. DNR PERM budget for the period from FY2016 to 2018\*.

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **FY2016 Expenditures** | **Expected FY2017\*** | **Preliminary FY2018\*** |
| PERM Faculty | $879,720 | $1,164,946 | $1,223,880 |
| Boone and Crockett Fellowship | $39,275 | $41,104 | $42,878 |
| Other PERM Projects | $0 | $0 | $0 |
| Research Contracts and Services | $1,748,515  | $1,012,373 | $1,084,798 |
| Quantitative Wildlife Center support | $89,606 | $95,776 | $98,933 |
| Quantitative Fisheries Center1 | $108,412 | $109636 | $113,178 |
| **Totals** | **$2,865,528** | **$2,423,835** | **$2,573,667** |

1Quantitative Fisheries Center Support includes the NOAA Interjurisdictional and annual project funding for graduate students and post-docs.

***\*This table needs to be updated and finalized after BOA meeting.***

In addition to DNR funded activities and actions, PERM faculty have successfully attracted an additional $4,143,751 in grant funding for 22 projects that were active during this reporting period that added to the information for resource management in Michigan.

1. **Project Summaries and status**

*Addressing Fish and Wildlife Health.* Although the university is involved with the Department in many disease studies through the [Diagnostic Center for Population and Animal Health (DCPAH)](http://animalhealth.msu.edu/), four health projects are currently supported through the PERM agreement.

Eastern massasauga conservation: through refined modeling, habitat management, and snake fungal disease detection. Project objectives are to: (1) determine what factors affect species detectability and if certain patterns in variables can be measured to maximize our detection rates; (2) determine a relationship between the HSI values and the probability of occupancy at a site, suggesting that the index could be used to plan and assess the results of management intended to create or improve EMR habitat; (3) conduct habitat management with an emphasis on creating larger EMR habitat complexes around known occupied sites; and (4) detect snake fungal disease associated with *Ophidiomyces ophidiicola* in Michigan populations. This project is ongoing. (Dr. Campa)

Management of Chronic Wasting Disease in Michigan. The goal is to improve the cost-efficiency and effectiveness of finding and removing Chronic Wasting Disease (CWD) and of managing deer populations in the face of CWD emergence in Michigan. Project objectives are to: (1) develop a tool that evaluates the factors influencing disease emergence beyond the CWD Management Zone in Michigan, and that considers the attendant financial and political costs of surveillance; (2) develop a tool that evaluates alternative management actions to reduce the risk of local cases of CWD transitioning from emergent status to established status; and (3) develop recommendations for monitoring management outcomes as measured by population abundance and disease prevalence. This project began in FY 2017 and is ongoing. (Dr. Porter and Dr. Williams)

Assessing drivers of spread and transmission of Chronic Wasting Disease in Michigan deer. As part of a comprehensive approach to research CWD in Michigan, this study is designed to provide critical information needs on the movement and dispersal of deer in and out of the core CWD management zone in south-central Michigan while estimating population parameters and contact rates. Project objectives are to: (1) assess movement and dispersal patterns and their influence on disease spread in and around the 5-county CWD management zone; (2) estimate population parameters and contact rates critical to assessing population dynamics and influences on disease transmission in and around the CWD management zone; and (3) inform localized disease surveillance and management strategies considering movement, behavior, and population density of deer. This project will begin in FY 2018. (Dr. Porter and Dr. William’s)

Development and Implementation of a Fish Health Initiative for Michigan Inland and Great Lakes Fisheries and VHS Testing. Project objectives are to: (1) Develop health guidelines for fish production; (3) Provide consultation, diagnostic and inspection capabilities for state fish hatcheries and wild fish; (3) Assess disease prevalence and pathways in wild fish; (4) Identify emerging diseases; and (5) Provide guidance to DNR regarding vaccination and drug administration. This project is ongoing. (Dr. Faisal and TBA with hiring in 2017)

*Advanced Quantitative and Genetic Analyses and Support.* Seven projects use the advanced quantitative approaches for fisheries and wildlife that are supported through PERM.

Research and biometrics consultation and support to Wildlife Division via the Boone and Crocket Quantitative Wildlife Center at Michigan State University. To provide quantitative analyses capacity to the Wildlife Division to support management decisions, regulation recommendations, and policy development. Project objectives are to (1) identify emerging quantitative needs of DNR-WD research and management staff through regular meetings and (2) provide quantitative expertise and support to DNR-WD through consultation and data analysis facilitated through the MSU-QWC Associate Director. This project is ongoing. (Dr. Porter and Dr. Williams)

Boone and Crocket Graduate Student Fellowship: regional analysis of antlered white-tailed deer buck harvest and trophy deer records. Results from this research will be used to inform managers regarding the influence of habitat conditions, harvest regulations, and hunting traditions on characteristics of harvested deer. Objectives are to (1) compile historic records of age structure of harvested bucks and trophy records of white-tailed deer including Boone and Crockett trophy animals, Commemorative Bucks of Michigan, and similar records in states throughout the Midwest and potentially Northeastern US; (2) explore spatial and temporal patterns in age structure and distribution of trophy animals; and (3) Compile data on spatial and temporal patterns of habitat suitability, harvest regulations, and hunter selectivity. This project is ongoing. (Dr. Porter and Dr. Williams)

Critical evaluation of Michigan's spring waterfowl survey. Project objectives are to: (1) compare fixed-winged and helicopter estimates of abundance for primary waterfowl species from historic data; (2) estimate helicopter-based plot sample sizes (and associated survey costs) required to achieve estimates of precision comparable to estimates from fixed-winged transect surveys; and (3) develop a sampling plan to field test the helicopter plot method. Project will begin in FY 2018 (Dr. Williams)

Using population and community dynamic models and quantitative fisheries analysis to promote improved fisheries management in the Great Lakes. Project objective is develop a research, education, and outreach/service program aimed at improving quantitative fishery stock assessments and analysis of population/community dynamics with a view toward an enhanced understanding of the dynamics of the Great Lakes system. This project is ongoing. (Dr. Bence)

Development and implementation of conservation genetic initiatives for Michigan inland and Great Lakes fisheries and aquatic wildlife species. Project objectives are to: (1) develop and enhance a research, education, and outreach/service program aimed at providing information on historical, current, and projected future levels of genetic diversity for Great Lakes and inland aquatic wildlife species in Michigan waters; and (2) assess the impacts of management and other anthropogenic effects on diversity and sustainability. This project is ongoing with the addition of full technician support funding will focus on genetic quality of Fish Production Program products, invasive species genetics analysis, and the use of genetics information to diagnose landscape impairments on fish populations. (Dr. Scribner)

Quantitative Support for Inter-jurisdictional Fisheries Management in the Great Lakes. Project objectives are to: Work with statistical and modeling experts at the Quantitative Fisheries Center (QFC) at Michigan State University to provide a research, outreach/service, and teaching program to: 1) build greater capacity within fishery management agencies in quantitative methods; 2) improve quantitative methods for assessing fish stocks; 3) assist agencies in the use of model-based approaches in decision making; and 4) develop a better understanding of fish community and population dynamics. This project is ongoing. (Dr. Bence)

Improving Fishery Stock Assessments in the Great Lakes. Project objective is to develop a research, education, and outreach/service program aimed at improving quantitative fishery stock assessments, analysis of population/community dynamics, and use of mathematical and statistical models to inform fishery management. This work will emphasize providing an enhanced understanding of the dynamics of the Great Lakes system, and support for Great Lakes fishery management especially in 1836 treaty waters. In addition assistance will be provided to the Michigan MDNR fisheries division on quantitative issues for non-Great Lakes systems. This project is ongoing. (Dr. Bence)

*Habitat and Population Dynamics.* Ten projects addressing fisheries and wildlife habitat and population dynamics are supported through PERM and address the following objectives:

Elk Responses to Recreational Use and Habitat Potential in Michigan. Project objectives are to: (1) quantify elk habitat potential in the core (with restricted recreational activities) and peripheral (with normal recreation restrictions) regions of the elk range; (2) quantify the number and relative intensity, frequency, and geographic scope of recreational users (horseback riders, mountain bikers) in the core (with restricted recreational activities) and peripheral (with normal recreation restrictions) regions of the elk range in Michigan; (3) quantify temporal elk movement and habitat selection patterns in response to the number and relative intensity and frequency and geographic scope of recreational users (horseback riders, mountain bikers) in the core (restricted recreational activities) and peripheral (normal recreation restrictions) regions of the elk range in Michigan; and (4) quantify the fine scale responses (behavior, spatially, temporally) of radio-collared elk to experimentally applied recreational disturbances (mountain bike and horseback riding). This project is ongoing. (Dr. Campa)

Population dynamics and movements of mute swans in Michigan. Project objectives are to: (1) estimate age-specific survival, reproductive and recruitment rates of mute swans in Michigan; (2) monitor seasonal movements and identify concentration areas of mute swans that can be targeted for management; (3) examine swan movements and site fidelity in response to management activities; (4) modify existing population models to improve prediction of mute swan population responses to control efforts; and (5) simulate effects of alternative strategies for controlling mute swans and develop management recommendations. This project is ongoing. (Dr. Winterstein)

Population dynamics and management of wild turkeys in Michigan: linking monitoring, assessment, and harvest-policy evaluation. Project objectives are to: (1) identify specific population and harvest objectives for wild turkeys in Michigan and translate these objectives into measureable performance metrics for use in monitoring and regulatory risk assessment; (2) develop improved understanding of population drivers and abundance of wild turkeys in Michigan using existing harvest and monitoring data; (3) evaluate the adequacy of existing harvest and monitoring data for assessing turkey populations and supporting management decision making; (4) illustrate to DNR-WD personnel the benefits of approaches that integrate monitoring, population analysis, and risk assessment to evaluate management decision-making; and (5) evaluate alternative harvest regulatory policies in terms of their effectiveness at meeting management objectives, sustainability, and risks to identified performance metrics. This project will be completed in FY 2017. (Dr. Porter)

Data collection and analysis to generate localized deer abundance estimates and recommended future protocols. Project objectives are to: (1) estimate current local abundance of white-tailed deer in proximity to areas of a major mortality event (EHD outbreak); (2) estimate the time required for local deer populations to recover from a major mortality event; (3) identify a similar area not recently affected by a recent mortality event to replicate monitoring efforts at a similar scale where deer abundance is expected to be representative of regional pre‐outbreak conditions; (4) evaluate the feasibility of using trained volunteers from the local community into a 5-year deer-abundance monitoring plan; and (5) provide recommendations to aid future local population assessment methods, management decisions, and broader public communications regarding the local-scale response of deer populations to die-off events. This project is ongoing. (Dr. Porter)

Conduct research and consult on general wildlife resource issues and wildlife-habitat relationships. Project objectives are to: (1) evaluate approaches to assessing distribution of illegal fur harvest; (2) Coordinate technological, data management, and communication among MI-Mast users; (3) Work on riparian management-beaver-fisheries topic by conducting scoping meetings with Wildlife, Forest Resources, and Fisheries Division Units (tabled from FY 2016); (4) Participate in MDNR work groups, citizen advisory groups, workshops, and serve as forest stewardship certification auditor; (5) Contribute to identification of research needs and planning efforts and (6) inform staff of recent research findings, ongoing or emerging issues, or events of mutual interest. This project is ongoing. (Dr. Roloff)

Burke Lake Banding Station Support. Project objectives are to: (1) evaluate diversity and abundance of migrating landbirds that stopover at the Rose Lake SWRA enroute to their wintering grounds in fall 2017 (15 Aug to 15 October); (2) measure the quantity, diversity, and phenology of fruit available to landbird migrants that stopover on the Rose Lake SWRA during fall migration; and (3) collect fecal samples from frugivorous migrants that stopover at the Rose Lake SWRA and identify the fruit species and/or food type being consumed. This project is ongoing (Dr. Owen)

Factors affecting waterfowl and hunter use of managed waterfowl areas. There is a need to regularly evaluate waterfowl and user use of managed waterfowl areas and to adapt management systems to changing conditions to ensure these areas continue to function as intended.  Status of important Great Lakes waterfowl populations (e.g., mallards [*Anas platyrhynchos*] and Canada geese [*Branta canadensis*]) have improved since the managed areas were created and yet statewide numbers of waterfowl hunters has declined in Michigan and other Great Lakes States. Project objectives are to: (1) identify factors affecting historic and current waterfowl and hunter use of Michigan’s managed waterfowl areas; and (2) develop management and monitoring options to enhance future use of these areas. This project began in FY 2016. (Dr. Winterstein)

Wildlife and recreational value of created and enhanced wetlands in Michigan. Project objectives are to: (1) assess waterbird and other wildlife use of floodings maintained by Wildlife Division; (2) identify factors predictive of waterfowl and hunter use of wildlife floodings. (3) characterize year‐round recreational use and estimate economic values associated with wildlife floodings; and (4) develop tools to aid field staff in decisions about maintenance of existing wildlife floodings and potential benefits of creating additional floodings via wetland mitigation banking. Project will begin in FY 2018. (Dr. Winterstein)

Population Dynamics and Assessment in Michigan’s Nearshsorehore Great Lakes, Inland Lakes and Streams. Project objectives are to: (1) coordinate and collaborate with Fisheries Division to better understand and prioritize issues attendant with the various sampling programs and harvest estimation methods currently implemented; (2) develop methods to better extract information contained within limited fishery surveys; and (3) communicate findings to Fisheries Division staff in a way that is c accessible for their use through workshops, participation in committees, or software development. This project is ongoing. (Drs. Hayes and Roth)

Rehabilitation of lake sturgeon populations in Michigan. Project objectives are to: (1) to insure ongoing, efficient production of lake sturgeon at two important Michigan restoration sites; (2) to examine effects of fish culture practices on egg survival and larval lake sturgeon growth and survival; (3) to quantify environmental covariates (temperature and discharge) and their effects on larval recruitment; (4) to quantify effects of stream habitat and the species composition and abundance of predators and alternative prey on lake sturgeon larval survival; and (5) to quantify stage-specific survival of natural and hatchery age-0 and older juvenile lake sturgeon. This project is ongoing. (Dr. Scribner)

*Integrating Social, Economic, and Human Dimensions Aspects of Fisheries and Wildlife Management.* Demonstrating the current importance of social, economic, and human dimensions in fisheries and wildlife management, 16 projects to integrate these factors are supported through PERM.

An Evaluation of Moving to a Learning Organization in the Wildlife Division: Measuring Collaboration, Trust, Performance, and Effectiveness of Decisions. Project objectives are to: (1) develop a formative evaluation process that explicitly defines metrics for performance measures for priority components of the strategic plan anticipated to have the greatest effect on the overall success of the Division in becoming a learning organization; (2) determine factors affecting trust and credibility of the Division among segments of priority stakeholders and the general public in Michigan; (3) determine limiting factors to achieving increased quality and quantity of collaborative governance regarding wildlife management in Michigan; (4) develop a summative evaluation process to measure progress toward achievement of the desired outcomes of the plan; and (5) determine how sustainable the change processes are that have been described in the strategic plan. This project will be completed in early FY 2018. (Dr. Riley and Dr. Ford)

Monitoring mast occurrence and production using citizen scientists to inform wildlife management in Michigan. Project objectives are to: (1) develop sampling protocol and reporting system for citizen science observers to collect and submit information on mast occurrence and production in Michigan; (2) implement the mast observation and reporting system with volunteers from 20 counties in the northern Lower Peninsula of Michigan; (3) develop a seasonal, ecoregional index of mast abundance in Michigan using data collected by citizen science observers; and (4) prepare a literature review of wildlife-mast relationships with a focus on the Great Lakes Region. This project was completed in early FY 2017. (Dr. Roloff)

Facilitating urban-suburban deer management in Michigan: social, spatial, and population considerations. Project objectives are to: (1) assess and model landscape features (within communities and on the surrounding landscape) that distinguish urban-suburban settings experiencing problems from those that do not perceive problems; (2) assess and model the extent to which demographic characteristics of community residents and the frequency and nature of interactions with deer contribute to establishing thresholds of tolerance for deer-human interactions; (3) quantify space used by deer social groups and determine the geographic scale at which genetic relatedness attenuates; (4) recommend procedures to delineate and rank neighborhoods as prospective candidates for deer management based on ecological and sociological considerations; and (5) design a field test of a management program to reduce deer populations at the neighborhood scale. This project was completed in FY 2016. (Dr. Riley)

Exploring causal factors and effects of declining hunter participation in Michigan. Project objectives are to: (1) describe and assess underlying macro, meso, and micro social causes (beyond age cohort effects) of hunter “drop out,” and potential opportunities or barriers to recruitment of new hunters; (2) examine from the perspective of hunters, merits of different types of hunting opportunities for recruitment and retention of hunters; (3) assess characteristics of non-hunters who engage in the varied forms of wildlife-related recreation, and examine their perspectives on different types of experiences as opportunities for recruitment and retention of general outdoor recreationists; (4) evaluate support for wildlife conservation by hunters and other wildlife-related recreationists; and (5) synthesize and disseminate study findings. This project is ongoing. (Dr. Riley)

Improving efficacy of furbearer management in Michigan through assessment of the nature and extent of illegal furharvesting. Project objectives are to: (1) Assess illegal fur harvesting activities (e.g., highgrading, unreliable registration, reporting of trapper survey data) for bobcat, fisher, marten, and river otter; (2) Explore the relationship between regulatory changes (e.g., more or less restrictive take), pelt prices (e.g., increase or decrease), illegal take, and reporting; (3) Parameterize social science and any additional ecological data from Objectives 1 and 2 for integration into future population models and trapper surveys; and (4) Develop a spatially explicit decision-support tool and recommendations for addressing illegal fur harvesting activities at the Peninsula level. This project is ongoing. (Dr. Gore and Dr. Roloff)

Stewardship Motivations and a Collaborative Governance Model for Great Lakes Coastal-Based Wildlife Management Areas for Waterfowl Hunting, Bird Watching, and Community Development. Project objectives are to: (1) compare demographics, attitudes, preferences, and values of waterfowl hunters, bird watchers or other outdoor recreationists, and community leaders for stewardship and management of state wildlife management areas and other areas along Great Lakes coasts, and to document the economic impact of visitor uses of these areas (e.g., social accounting matrix similar to what is used in calculating the economic impacts of charter fishing); (2) determine values of key ecosystem services (e.g., flood water storage, shoreline protection, human-nature connection, etc.) resulting from managed wetland and waterfowl areas and other areas across the along the Great Lakes coastal landscape; (3) analyze community planning processes, needs, and opportunities (e.g., community visioning, master planning, zoning, etc.) relative to interdependence on state wildlife management areas and other managed wetland/waterfowl areas along Great Lakes coasts as a hub for ecological and economic activity; (4) determine possible collective goals across a landscape of public (e.g., state wildlife management areas, local government, etc.) and private (e.g., NGO, private citizen, etc.) lands for wildlife management, and associated coordinated action planning to achieve goals for conservation and community development along Great Lakes coasts; and (5) implement stakeholder engagement in this applied research project that addresses key issues in the conservation, planning, and community economic development aspects of state wildlife management areas along Great Lakes coasts, and evaluate the impact of engagement on collaboration and shared learning. This project is ongoing. (Dr. Triezenberg)

Social and Economic Benefits and Costs of Elk in Michigan. Project objectives are to: (1) measure expenditures by hunters and other outdoor recreationists in the study area; (2) measure economic losses caused by elk through damage to crops and property; (3) assess recreation specifically due to and incidental to elk presence in the study area; (4) examine features of the elk population, landscape characteristics, and infrastructure that influence choices regarding recreational behaviors and expenditures; and (5) synthesize and disseminate study findings. This project began in FY 2017. (Dr. Lupi)

Conduct research, consult on improving quality and sustainability of human environments and natural resources; emphases on wildlife resources, partnerships. Project objectives are to: (1) increase support for scientific wildlife management and acceptance of hunting among the non-hunting public as consistent with an environmentally conscious lifestyle; (2) Identify opportunities for adult hunter recruitment and retention programs; and (3) Inform staff of recent research findings, ongoing or emerging issues, or events of mutual interest. This project is ongoing. (Jordan Burroughs)

Advise and consult on data collection, study design, and application of findings regarding the social, economic, and policy aspects of wildlife management, conservation biology, and changing land use. Project objectives are to: (1) Assist with completion of a manuscript for submission to a peer-reviewed journal regarding correlates of hunter satisfaction among private deer cooperatives in Michigan; (2) Inform staff of recent research findings, ongoing or emerging issues, or events of mutual interes; (3) Continue development of research approach to understanding the success of partnership building through grants programs (e.g. Wildlife Habitat Grants Program) in collaboration with Wildlife Division staff; and (4) develop research questions and approaches for understanding 1) the role of and 2) better outreach efforts to engage local governments in wildlife management and conservation in collaboration with Wildlife Division staff. (Dr. Kramer)

Advise and consult on natural resource economics data collection, study design, and application of findings, which characterize the significance of wildlife to the state’s natural resource-based economy. Project objectives are to: (1) advise Wildlife Division regarding economic expenditure data and provide recommendations regarding future survey efforts; (2) advise Wildlife Division regarding potential means of estimating visitation and economic contributions at State lands such as State Game Areas in southern Michigan; (3) serve on the Human Services Technical Working Group for Tittibawasee River for the Tittibawasee Natural Resource Damage Assessment; (4) contribute to identification of research needs and planning efforts; and (5) inform staff of recent research findings, ongoing or emerging issues, or events of mutual interest. This project is ongoing. (Dr. Lupi)

Conduct research and consult on general wildlife resource issues and the integration of human and environmental dimensions of wildlife management. Project objectives are to: (1) assess and build trust and credibility with stakeholders; (2) operationalize the public trust doctrine; and (3) increase capacity for structured decision-making by state wildlife agency personnel. This project is ongoing. (Dr. Riley)

Improving partnerships for the Michigan DNR Wildlife Division: creation of public value through collaborative governance and partnerships. Project objectives are to: (1) identify, measure, and compare beliefs of WD employees and their respective partners regarding what are antecedents and characteristics of effective partnerships; (2) develop a typology of current WD partnerships with other public agencies and actors in the civil and private sectors, which enables analysis of effectiveness by type of partnership; (3) conduct analysis of WD partnerships to determine which type of partnerships are most effective, as determined by WD employees and partners; and (4) reveal organizational challenges experienced by employees currently engaged in partnerships as well as perceived impediments that may limit participation in or success in partnership

Using Social Network Analysis and Social Media Evaluation to Measure and Assess Relationship Building and Partnerships under the Wildlife Habitat Grants Program (WHGP). To understand the success of the WHGP in building successful direct and indirect relationships and positive perceptions, we will examine three types of relationships associated with the WHGP. Project objectives are to: (1) identify, measure, and evaluate WD’s relationships with grantees to include persons both directly and indirectly involved with WHGP grant administration within the grantee organization; (2) identify, measure, and evaluate the leveraged resources acquired by the grantee organization as a result of the WHGP grant received; (3) identify, measure, and evaluate the effects of the WHGP on relationships with and perceptions of the WD by the grantee organization’s collaborators - individuals or organizations with whom the grantee has relationships; and (4) analyze the extent and success of the WD’s social media outreach and communications related to the WHGP in improving public perceptions of the WD based on grantee and grant characteristics as well as social media type and content. This project will begin in FY 2018. (Dr. Kramer)

Using economic models and quantitative human dimensions analysis to promote improved fisheries management in the Great Lakes regional ecosystem. Project objective is to develop a research, education, and outreach/service program aimed at improving economic analysis of recreational fisheries with an emphasis on an enhanced understanding of the uses, users, and economic values of recreational fisheries of the Great Lakes regional ecosystem. This project is ongoing. (Dr. Lupi)

Angler Survey for Basin Managers and Great Lake Management Planning. Project objectives are to: (1) develop for each Great Lake a profile of Michigan’s Great Lakes anglers and their resource use; (2) understand attitudes, behaviors, and preferences of Michigan anglers toward Great Lakes management issues; (3) relate these attitudes, behaviors, and preferences to the specific lake being fished; and (4) compare these data for randomly recruited Great Lakes anglers to the data from stakeholder group members and attendees of public meetings. This project is ongoing. (Dr. Lupi)

A statewide survey of Michigan’s licensed anglers. Project objectives are to: (1) determine how often anglers fish, and the general spatial distribution of fishing trips; (2) determine indicators of catch for sport fish species; and (3) to the extent possible, infer important ecological and economic considerations shaping the patterns of angling behavior. This project is ongoing. (Dr. Lupi)

*Landscape and Habitat.* Eleven projects addressing landscape and habitat information needs for fisheries and wildlife are supported through PERM.

Understanding habitat, breeding ecology, and diseases of feral swine in Michigan to inform effective management. Project objectives are to: (1) quantify feral swine hourly, daily, and seasonal movement and habitat use patterns in Michigan with respect to land ownership, land cover type, proximity to domestic swine facilities, and proximity to urban areas; (2) identify the spatial extent of feral swine rooting activities; (3) quantify feral swine dispersal capabilities and routes; (4) develop a resource selection function (i.e., predictive model) that portrays the likelihood of feral swine habitat use; (5) evaluate the efficacy of techniques for controlling feral swine populations; (6) evaluate changes in activity and habitat use patterns as population control activities increase; and (7) identify presence of diseases and parasites in feral swine. This project is ongoing. (Dr. Roloff)

American woodcock reproductive rates in relation to forest structure at local and landscape scales. Project objectives are to: (1) estimate nesting density, nesting success and fledgling survival for woodcock in 2 distinct Michigan landscapes over a 3-year period; (2) identify predators responsible for predation of woodcock nests and young; (3) link woodcock reproductive rates to vegetative and physical characteristics near nest sites and surrounding landscapes; and (4) make recommendations on landscape-dependent habitat management practices that efficiently target improvement in woodcock reproductive rates. This project is ongoing. (Dr. Winterstein)

Silvicultural approaches for promoting diversity and sustainability in Michigan’s northern hardwood forests. The overarching goal is the development of operationally implemented, integrated silvicultural approaches aimed at restoring northern hardwood regeneration stocking and diversity in landscapes that support deer. Project objectives are to: (1) compare the capacity of four silvicultural system options (shelterwood, strip clearcuts, larger group/patch cuts, and the current practice of selection harvest) to produce diverse, well-stocked tree regeneration; (2) evaluate the applicability of the alternative silvicultural systems over broad gradients of deer density, site quality, and geography (western upper Peninsula to northern lower Peninsula); (3) quantify the effectiveness of scarification to create seedling establishment substrates, and of herbicide control of undesirable advanced tree regeneration and competing vegetation within silvicultural system options; (4) quantify how silvicultural system options and localized practices (e.g. tactical placement of tree tops) affect deer behavior and herbivory impacts on northern hardwood regeneration; (5) quantify the efficacy of herbicide control of beech regeneration in combination with natural and planted regeneration on 27 sites in the eastern and central parts of the Upper Peninsula of Michigan for regenerating diverse northern hardwood communities; (6) quantify the impact of variation in regional deer populations and site quality on restoration success; and (7) evaluate local treatments aimed at reducing herbivory impacts on restoration efforts. This project is ongoing. (Dr. Walters and Dr. Roloff)

Increasing the Resilience of Wildlife Habitat Investments by Considering Multiple Plausible Scenarios. We propose to use scenario planning workshops to help managers assess management strategies that more fully consider the uncertainty in the timing and speed of climate impacts. Scenario planning will be used to assist managers to craft adaptive strategies to manage wildlife habitat in early successional jack pine and deer wintering complexes. Project objectives are to: (1) modify management strategies to incorporate climate uncertainties into decisions regarding on-the-ground habitat investments in deer wintering areas in the Upper Peninsula (UP) and jack pine forest in the northern Lower Peninsula (NLP); and (2) quantify improvements to habitat management plans in terms of cost and risk reduction from using scenario planning and complexity theory. This project began in FY 2016. (Dr. Porter)

Integrating information to manage landscapes for featured species. Project objectives are to: (1) compile existing, spatially explicit landscape-level habitat information on featured species (n=41) that can be integrated as map layers into the information system currently used for resource management (Michigan Forest Inventory; MiFI); and (2) incorporate these integrated landscape-level products for each species into MiFI so that large-scale, species-specific information is available to biologists and co-managers for coordinating habitat management activities. This project will begin in FY 2018. (Dr. Roloff)

Developing decision tools for inland lake management through field sampling and statistical models linking lakes to landscape context. Project objective is to develop a research, education, and outreach/service program aimed at improving inland lake management with a view toward an enhanced understanding of how natural landscape features of lakes influence food web interactions and the response of aquatic resources to human stressors. This project is continuing at a reduced level. (Drs. Bremigan and Roth)

Investigation of watershed influences, riparian condition, and habitat dynamics on fish communities. Project objective is to develop a research, education and outreach/service program that will contribute to scientific understanding of the mechanisms by which riparian condition and instream, lake and inshore Great Lakes habitat influence fish assemblages for improved management of Michigan’s fisheries. This project is ongoing. (Drs. Infante and Roth)

Development of spatial information and tools for aquatic life conservation. Project objective is to facilitate and support the conservation, protection, and management of Michigan’s aquatic habitats and Species of Greatest Conservation Need by developing spatial databases, tools, and models in support of Fisheries Division’s implementation of Michigan’s Wildlife Action Plan. This project is ongoing. (Dr. Infante)

Implementation Support for State Wildlife Action Plan. Project objectives are to: (1) continue to identify high priority conservation areas for both inland lakes and rivers; (2) assess environmental conditions of Michigan’s rivers and inland lakes; (3) identify key environmental threats to each water body; (4) develop GIS application tools to meet the other implementation needs of the MWAP programs of Fisheries Division; and (5) assist in implementation of the aquatic portion of the 10-year conservation strategy. This project is ongoing. (Dr. Infante)

The Digital Water Atlas and Resource Guide Support and Analysis. Project objectives are to: (1) provide GIS technical and data support to the statewide river ecological assessment program; (2) provide GIS technical and data support to Fisheries Division as needed for implementation of the Wildlife Action Plan; (3) provide GIS and database support for the study of aquatic habitats at risk to changes in climate and land use; (4) provide GIS and database support for lake classification to support the implementation of the Wildlife Action Plan; and (5) maintain, update, and improve a statewide, long-term, spatial database of all Michigan’s lakes. This project is ongoing. (Drs. Infante and Bremigan)

Effects of flow changes on thermal dynamics of streams: Improving an important link in Michigan’s Water Withdrawal Assessment Tool (WWAT). Project objectives are to determine effects of high capacity groundwater withdrawal on downstream warming trends in streams. (Dr. Hayes)

1. **PERM Program Accomplishments in Scholarship for October 1, 2014 – September 30, 2015 (FY2015 and FY2016)**
	1. PERM faculty produced more than 60 peer reviewed journal articles or book chapters in FY2016 and FY2017 (Appendix B).
	2. Over 127 presentations were given by PERM faculty or their students in FY2016 and 2017 (Appendix C).
2. **PERM and MSU Outreach**

The partnership also provides a valuable mechanism for delivering on the outreach and engagement mission of MSU. PERM faculty and their graduate students regularly interact with agency personnel to provide scientific and technical input into the development of resource management policy and tactics. Frequently this engagement also involves non-government stakeholders. The DNR has a responsibility to engage stakeholders, and regularly meets with organized stakeholder groups to both gather input and share important information. These interactions provide opportunities to MSU experts (such as PERM faculty) to access and share their expertise with these groups in an organized and focused setting. A large portion of the collective outreach activities of the Department of Fisheries and Wildlife is explicitly connected to our PERM partnerships, both with the Michigan DNR and the Great Lakes Fishery Commission.

DNR staff often rely upon the expertise of the PERM faculty and will reach out for assistance. Through FY2016, PERM faculty provided assistance in the following ways (Appendix D):

* Division, Department or stakeholder meeting attendance and presentations
* Regulations review and analysis
* Stocking review and analysis and production assistance
* Broodstock fish management
* Committee membership and service
* Management assessment, review, evaluation, and planning
* Natural Resources Damage Assessment Input
* Assistance to Law Enforcement Division, and Professional Development
1. Anticipated Program Outcomes and Future Directions for the coming year
* Evaluating the habitat improvements grant program
* Continuing to move the Wildlife Division toward impact management
* Landscape level management decision support tools
* Greater integration of social and economic data into management decisions
* Enhanced in-reach to Department staff on the importance and outcomes of PERM projects
* Work with the Natural Resources Commission on the structure, function, and importance of research to the Department and public trust resource management.
1. **APPENDICES**
	1. **Active Grants**

**Dr. James Bence**

Bence, J. R. (100%), "Improving fishery stock assessments in the Great Lakes," Michigan Department of Natural Resources. Anticipated Award Amount: $426,092, Amount Awarded during report period: $185,062; Amount Awarded to-date: $517,687. (October 1, 2011 - September 30, 2016), APP# 124879.

Bence, J. R. (100%), "Quantitative tools for assessing and managing cisco populations," Great Lakes Fisheries Commission. Anticipated Award Amount: $117,249, Amount Awarded during report period: $78,077; Amount Awarded to-date: $78,077. (January 1, 2016 - December 31, 2018), APP# 143966.

Bence, J. R. (100%), "MDNR Fish Division: PERM Salary & Fringe - Bence," Michigan Department of Natural Resources. Anticipated Award Amount: $158,996, Amount Awarded during report period: $158,996; Amount Awarded to-date: $158,996. (October 1, 2015 - September 30, 2016), APP# 145930.

Bence, J. R. (34%), Jones, M. L. (33%), Brenden, T. O. (33%), "Michigan State University Quantitative Fisheries Center/Great Lakes Fisheries Consulting with Minnesota Department of Natural Resources," MINNESOTA DEPT OF NATURAL RESOURCES, (Prime: NATL OCEANIC & ATMOSPHERIC ADMIN). Anticipated Award Amount: $11,209, Amount Awarded during report period: $112; Amount Awarded to-date: $112. (March 3, 2016 - September 30, 2016), APP# 146743.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $2,500, Amount Awarded during report period: $25,000; Amount Awarded to-date: $27,500. (April 1, 2013 - July 1, 2016), APP# 144555.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $7,500, Amount Awarded during report period: $7,500; Amount Awarded to-date: $7,500. (January 13, 2016 - January 13, 2017), APP# 148009.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $11,209, Amount Awarded during report period: $11,209; Amount Awarded to-date: $11,209. (January 13, 2016 - January 13, 2017), APP# 148010.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Anticipated Award Amount: $7,500, Amount Awarded during report period: $7,500; Amount Awarded to-date: $7,500. (February 17, 2016 - February 17, 2017), APP# 148685.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC SUPPORT FOR QFC," Great Lakes Fisheries Commission. Anticipated Award Amount: $23,253, Amount Awarded during report period: $23,253; Amount Awarded to-date: $23,253. (June 28, 2016 - June 28, 2017), APP# 150798.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for OQF," Great Lakes Fisheries Commission. Anticipated Award Amount: $3,000, Amount Awarded during report period: $3,000; Amount Awarded to-date: $3,000. (July 25, 2016 - July 25, 2017), APP# 151145.

Brenden, T. O. (34%), Jones, M. L. (33%), Bence, J. R. (33%), "Research for Management of Inter-Jurisdictional Fisheries Resources," ILLINOIS DEPT OF NATURAL RESOURCES, (Prime: NATL OCEANIC & ATMOSPHERIC ADMIN). Anticipated Award Amount: $38,711, Amount Awarded during report period: $22,415; Amount Awarded to-date: $38,711. (October 1, 2012 - September 30, 2016), APP# 132568.

Brenden, T. O. (25%), Jones, M. L. (38%), Bence, J. R. (37%), "GREAT LAKES FISHERY COMMISSION SUPPORT FOR THE QUANTITATIVE FISHERIES CENTER," Great Lakes Fisheries Commission. Anticipated Award Amount: $159,585, Amount Awarded during report period: $38,875; Amount Awarded to-date: $114,580. (January 1, 2011 - December 31, 2016), APP# 114227.

Brenden, T. O. (25%), Jones, M. L. (38%), Bence, J. R. (37%), "GREAT LAKES FISHERY COMMISSION SUPPORT FOR THE QUANTITATIVE FISHERIES CENTER," Great Lakes Fisheries Commission. Anticipated Award Amount: $144,395, Amount Awarded during report period: $27,178; Amount Awarded to-date: $27,178. (January 1, 2016 - December 31, 2020), APP# 147302.

Bence, J. R. (100%), "MDNR Fish Division: PERM Salary & Fringe - Bence," Michigan Department of Natural Resources. Total Funds Requested: $162,896, Amount Awarded to-date: $162,896. (October 1, 2015 - September 30, 2017), APP# 152625.

Bence, J. R. (100%), "Quantitative Support for Inter-Jurisdictional Fisheries Management on the Great Lakes," Michigan Department of Natural Resources. Anticipated Award Amount: $97,836, Amount Awarded to-date: $115,877. (October 1, 2010 - September 30, 2016), APP# 115288.

Bence, J. R. (34%), Jones, M. L. (33%), Brenden, T. O. (33%), "Michigan State University Quantitative Fisheries Center/Great Lakes Fisheries Consulting with Minnesota Department of Natural Resources," MINNESOTA DEPT OF NATURAL RESOURCES, (Prime: NATL OCEANIC & ATMOSPHERIC ADMIN). Total Funds Requested: $13,531, Amount Awarded to-date: $24,628. (March 3, 2016 - September 30, 2016), APP# 150021.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $19,206, Amount Awarded to-date: $19,206. (February 23, 2015 - February 23, 2016), APP# 142352.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $12,402, Amount Awarded to-date: $12,402. (July 1, 2015 - July 1, 2016), APP# 144554.

Jones, M. L. (50%), Bence, J. R. (50%), "GLFC support for QFC," Great Lakes Fisheries Commission. Total Funds Requested: $3,000, Amount Awarded to-date: $3,000. (July 1, 2015 - July 1, 2016), APP# 144557.

Jones, M.L., J.R. Bence, and T.O. Brenden. Quantitative Fisheries Center Base Funding. Funding is from consortium of agencies. Ongoing since fiscal 2005. Current annual funding levels from non-Michigan DNR and non-MSU sources (Great Lakes Fisheries Commission, plus Council of Lake Committees member agencies) ~ 70,000 as detailed above with MSU contributing center space and $70,000 in base funding. Given complexity of funding mechanism proposals are submitted to some partners each year.

Bence, J., S. Truesdell, R. Clark, J. Myers, D.L. Yule. Quantitative tools for assessing and managing cisco populations. Great Lakes Fishery Commission. Funded Period January 2016 - December 2018. $117,249.

Porter, W. , M. Jones, J. Bence. Population Dynamics and management of wild turkeys in Michigan: linking monitoring, assessment, and harvest-policy evaluation. Michigan DNR Wildlife Division. Funded period January 2015 - September 30, 2017. $131,500.

Bence, J.R., T. Brenden, and C. Krueger. Estimating survival of acoustic telemetered walleyes in the Great Lakes and comparison of survival rates between Lake Huron and Lake Erie spawning populations. Great Lakes Fishery Commission. Funded period: August 1, 2014 - July 31, 2019. $149,384.

Irwin, B., T. Wagner, and J. Bence. Characterization of spatial and temporal variability in fishers in response to climate change. USGS NE Climate Center. All funds through University of Georgia. Funded period - September 1, 2012 - August 31, 2017. $181,238.

Brenden, T. O., Bence, J. R. "Finding appropriate harvest policies for admixed fisheries to ensure long-term population sustainability of native Great Lake fishes", Great Lakes Fishery Trust. Funded period: January 1, 2013-December 31, 2016. $161,239.

Clark, R. D., Bence, J. R., Brenden, T. O. Determining the Fisheries Management Significance of Chinook Salmon Movement Between Lakes Michigan and Huron, Great Lakes Fishery Trust. Funded period: January 1, 2013-December 31, 2016. $291,268.

Brenden, T. O., and Bence, J. R., "Finding Appropriate Harvest Policies for Admixed Fisheries to Ensure Long-Term Population Sustainability of Native Great Lake Fishes", Great Lakes Fishery Commission. Funded period: January 1, 2013-December 31, 2016. $140,909.

Pending

Bence, J. R. (51%), Peacor, S. D. (49%), "Collaborative Research: Meta-analysis -- evaluation and improvement of an important synthetic tool," National Science Foundation. Amount Requested: $664,368. Focus: Research & Creative Activities; (Proposed Project Period: August 16, 2017 - August 15, 2021), Date Submitted: 2016-08-01, APP# 150954.

Bence, J. R. (100%), "Midwest Climate Science Center," PURDUE UNIV, (Prime: US GEOLOGICAL SURVEY). Amount Requested: $409,951. Focus: Research & Creative Activities; (Proposed Project Period: April 15, 2017 - April 14, 2022), Date Submitted: 2016-07-05, APP# 150819.

**Dr. Mary Bremigan**

None this period

**Jordan Burroughs**

Gourmet Gone Wild and Learn to Hunt. Cabela’s Outdoor Fund $147,500.

**Dr. Dana Infante**

Infante, D.M. et al. U.S. Geological Survey, Aquatic GAP Analysis Program. 2017-2020. Aquatic GAPAnalysis Program: Enhancing data and approaches of the Nation’s inland and coastal aquatic ecosystems. $499,999 pending (Dana M. Infante, lead).

Infante, D. M. (100%), "NATIONAL ASSESSMENT OF THE STATUS OF FISH HABITATS," United States Fish and Wildlife Service. Anticipated Award Amount: $156,000, Amount Awarded during report period: $0; Amount Awarded to-date: $156,000 pending.

Infante, D. M. (100%), "Infante PERM salary and fringe," Michigan Department of Natural Resources. Total Funds Requested: $381,272, Amount Awarded during report period: $29,930; Amount Awarded to-date: $294,294. (October 1, 2009 - September 30, 2017).

Infante, D. M. (100%), "Support for revision of State Wildlife Action Plan," Michigan Department of Natural Resources. Anticipated Award Amount: $156,446, Amount Awarded during report period:156,446; Amount Awarded to-date: $156,446. (October 1, 2015 - September 30, 2017).

Infante, D. M. (100%), "Implementation of the USGS National Climate Change and Wildlife Science CenterScience to Action Fellowship," US GEOLOGICAL SURVEY. Anticipated Award Amount: $47,000, Amount Awarded during report period: $23,500; Amount Awarded to-date: $23,500. (April 15, 2015 - April 14, 2016).

Infante, D. M. (100%), "Aquatic Gap Analysis Program: Enhancing A National View of Conservation Needs of Fishes and Their Habitats," US GEOLOGICAL SURVEY. Anticipated Award Amount: $99,000, Amount Awarded during report period: $99,000; Amount Awarded to-date: $99,000. (October 1, 2016 - September 30, 2017).

Infante, D. M. (100%), "Development of Lake Spatial Information and Tools for Aquatic Life Conservation," Michigan Department of Natural Resources. Anticipated Award Amount: $68,935, Amount Awarded during report period: $68,935; Amount Awarded to-date: $68,935. (October 1, 2016 - September 30, 2017).

Infante, D. M. (75%), Daniel, W. M. (25%), "Strategic coordination of Quadrula spp. research and conservation," WILDLIFE MANAGEMENT INST, (Prime: United States Fish and Wildlife Service). Anticipated Award Amount: $59,915, Amount Awarded during report period: $59,915; Amount Awarded to-date: $59,915. (May 1, 2015 - April 30, 2016).

Infante, D. M. (75%), Taylor, W. W. (25%), "Updated Assessment for the Nation's Inland Aquatic Systems," United States Fish and Wildlife Service. Anticipated Award Amount: $156,000, Amount Awarded during report period: $156,000; Amount Awarded to-date: $156,000. (August 15, 2013 - August 14, 2018).

Jones, M. L. (80%), Infante, D. M. (20%), "EVALUATING TRADE-OFFS FOR SEA LAMPREY MANAGEMENT USING AN OPERATING MODEL OF THE CONTROL PROGRAM," Great Lakes Fisheries Commission. Anticipated Award Amount: $141,077, Amount Awarded during report period: $141,077; Amount Awarded to-date: $141,077. (January 1, 2015 - February 28, 2017).

Infante, D. M. (100%), "Developing a decision support process to aid in conservation of aquatic habitats throughout the main Hawaiian
islands ," ASSOC OF FISH & WILDLIFE AGENCIES, (Prime: United States Fish and Wildlife Service). Anticipated Award Amount: $30,000, Amount Awarded during report period: $30,000; Amount Awarded to-date: $30,000. (January 1, 2016 - December 31, 2017).

Infante, D. M. (100%), "Developing a decision support process to aid in conservation of aquatic habitats throughout the main Hawaiian islands ," ASSOC OF FISH & WILDLIFE AGENCIES, (Prime: United States Fish and Wildlife Service). Anticipated Award Amount: $30,000, Amount Awarded during report period: $30,000; Amount Awarded to-date: $30,000. (January 1, 2015 - December 31, 2016).

**Dr. Daniel Hayes**

Hayes, D.B (100%), “Early invasive dynamics of New Zealand Mudsnails in Michigan”, Michigan Department of Natural Resources. Anticipated Award Amount: $182,000, Amount Awarded during report period: $182,000; Amount Awarded to-date: $182,000. (February 1, 2017 - September 30, 2019).

Roth, B. M. (50%), Jones, M. L. (25%), Hayes, D. B. (25%), "Distribution of invasive crayfish in Michigan and an assessment of risks they pose to ecosystem health," Michigan Department of Natural Resources. Anticipated Award Amount: $20,000, Amount Awarded during report period: $20,000; Amount Awarded to-date: $20,000. (May 26, 2014 - April 30, 2016).

Hayes, D. B. (100%), "Production of wild potadromous salmonids in tributaries to the Manistee River," Michigan Department of Natural Resources. Total Funds Requested: $139,770, Amount Awarded during report period: $139,770; Amount Awarded to-date: $139,770. (January 1, 2015 - September 30, 2018).

Hayes, D. B. (100%), "Effects of flow reduction on thermal dynamics of streams: improving an important link in Michigan's Water Withdrawal Assessment Tool (WWAT)," Michigan Department of Natural Resources. Amount Awarded during report period: $105,859; Amount Awarded to-date: $105,859. (May 1, 2015 - September 30, 2016).

Hayes, D. B. (100%), "MDNR Fish Division: PERM Salary & Fringe - Hayes," Michigan Department of Natural Resources. Anticipated Award Amount: $85,127, Amount Awarded during report period: $85,127; Amount Awarded to-date: $85,127. (October 1, 2015 - September 30, 2016).

Hayes, D. B. (100%), "Impact of fish habitat structures on fluvial geomorphology, fish habitat and trout populations in the North Branch of the Au Sable River," Michigan Department of Natural Resources. Anticipated Award Amount: $136,607, Amount Awarded during report period: $0; Amount Awarded to-date: $136,607. (May 1, 2014 - December 31, 2018).

**Dr. Dan Kramer**

Examining human/carnivore conflict in Tanzania. We are using social network analysis to understand whether peer influence helps us understand household boma construction techniques which protects livestock from predation at night. We received very good reviews for a NSF Geosciences proposal submitted fall 2016 and will submit again in September 2017.

Using social network analysis to understand farmer adaptations to the effects of dam construction in the lower Mekong river watershed in Thailand, Cambodia, and Vietnam. An MSU team received funding from NASA under their IDS program this spring and were invited to submit a full proposal which includes the social network component on 1 June 2017 to their LCLUC program. The second proposal is under review.

Dr. Frank Lupi

Garnache, C., F. Lupi, J. Herriges, J. Stevenson, D. Hynman and B. Basso, *Linking Agricultural Nutrient Pollution To The Value Of Freshwater Ecosystem Services*, USDA NIFA, Oct 2016-Sept 2019, $500,000.

Garnache, C., F. Lupi, J. Herriges and B. Basso, *Behavioral economics of phosphorus use*, USDA NIFA, Oct 2016-Sept 2018, $250,000.

Steiner, et al., *Enhancing sustainability in coastal communities threatened by harmful algal blooms by advancing and integrating environmental and socio-economic modeling*, National Science Foundation, 2016-2019, Lupi’s MSU portion $311,326.

Herriges, J., F. Lupi, J. Stevenson. *An Integrated Valuation Model Linking Nutrient Reductions to Changing Ecosystem Services in Freshwater Systems*, USEPA STAR Grant. 2016-2019, $800,000.

Lupi, F., *Economic consequences of Asian carp establishment in the Great Lakes Basin*, US ACOE; Sept 2016-September 2017, $108,000.

Lupi, F. et al. Forecasting biological and economic impacts of aquatic invasive species in Lake Michigan. Supporting Agency: Great Lakes Fishery Trust. Overall Funding Level: $249,000 ($77,122 is Lupi economics portion). Duration: 9/16/2015 - 9/15/2017

Lupi, F. et al. Integrating Indicators of Ecological Condition and Services into a Policy Framework. Supporting Agency: EPA. Overall Funding Level: $1,410,000 (with 250,000 as Lupi economics portion). Duration: 5/1/2010- 2/28/2016

Lupi, F. et al. Where People Meet the Muck: An Integrated Assessment of Beach Muck and Public Perception. Supporting Agency: Michigan Sea Grant, NOAA. Overall Funding Level: $38,000 (Lupi economics portion). Duration: Sept 2014-August 2016

**Dr. Shawn Riley**

No active grants.

**Dr. Gary Roloff**

The Nature Conservancy, G. J. Roloff, Data analysis and reporting in support of the Two Hearted Watersheds Silviculture Project. $6,270.

**Dr. Brian Roth**

Foster, E. (PI), J. Lucas, K. Millenbah, B.M. Roth, and L. Weatherspoon. Careers in Food, Energy, and the Environment - an Interdisciplinary Approach. National Science Foundation. Awarded 11/2016. $1,000,000.

Roth, Brian M. (PI). Assessment of Progress Indicator Data Integration. International Joint Commission. Awarded 1/2015. $89,000

**Dr. Kim Scribner**

Scribner, K. Genetic estimation of the number of spawning lake sturgeon contributing to larvae in the St. Clair and Detroit Rivers, MI. U.S. Geological Survey. $191,101 (2016-2018)

Scribner, K. Burbot genetics. Little River Band Ottawa Indians. $30,000 (2016)

Scribner, K. and G. Luikart. Identification of adaptive GENEs associated with lake trout survival and recruitment in different and changing Great Lakes environments. Great Lakes Fishery Commission. $253,304 (2016-2019)

Scribner, K.T. and E. Baker. Development of science-based resources to facilitate implementation of Michigan’s lake sturgeon restoration plan. Michigan Department of Natural Resources. $564,093(2016-2019)

Scribner, K.T. and E. Baker. Behavior of juvenile lake sturgeon stocked above a hydropower dam. Great Lakes Fishery Trust. $285,993 (2016-2018)

Scribner, K. T. and S. Herbst. An integrated approach for aquatic invasive species early detection and monitoring. Michigan Department of Natural Resources. $264,600 (2016-2018)

cribner, K.T. Wintering Ecology of Canada Geese in the Greater Chicago Metropolitan Area. Southern Illinois University. $50,000 (2016-2017)

Internal Michigan State University Water Sciences Center and ESPP program Water Sciences Ice Cube - (2015-2017) $60,000

Fisheries Division PERM Tech support for genotyping services associated with Steelhead broodstock assessment, lake herring rehabilitation, and brown trout creel compositional estimates - $110,000 (2016-2018)

Law Division - Fish and Wildlife DNA forensics - $60,000 (2016-2018)

1. **Publications**

**Dr. James Bence**

He, J.X., J.R. Bence, M.P. Ebener. Submitted. Catch per unit of effort in a rehabilitation process and rapidly changing ecosystem, lake trout spring gillnetting surveys in the main basin of Lake Huron. Canadian Journal of Fisheries and Aquatic Sciences. Submitted January 13, 2017.

Brenden, T.O., I, Tsehaye, J.R. Bence, J. Kanefsky, K. Scribner. In review. Indexing recruitment for populations contributing to mixtures by including age in genetic stock identification models. Canadian Journal of Fisheries and Aquatic Sciences. Submitted December 13, 2016. In revision based on first round reviews.

Vidal, T.E., B.J. Irwin, T. Wagner, L.G. Rudstam, J.R. Bence, and J.R. Jackson. Accepted. Using variance structure of fish catches to quantify responses to perturbation. Transactions of the American Fisheries Socitey. Submitted July 26, 2016. Revised version submitted February 23, 2017. Accepted February 2017.

Vincent, M.T., T.O. Brenden, and J.R. Bence. In press. Simulation testing the robustness of a multi-region tag-integrated assessment model that exhibits natal homing and estimates natural mortality and reporting rate. Canadian Journal of Fisheries and Aquatic Sciences. Accepted February 13, 2017. Submitted July 1, 2016. Revision submitted October 21, 2016. Second revision submitted January 13, 2017. Third revision submitted January 30, 2017. Accepted 13 Feb. 2017.

Stevens, B.S., J.R. Bence, W.F. Porter and C.J. Parent. In press. Structural uncertainty limits generality of fall harvest strategies for wild turkeys. The Journal of Wildlife Management. Accepted November 23, 2016.

Truesdell, S. B., Bence, J. R., Syslo, J. M., & Ebener, M. In press. Estimating multinomial effective sample size in catch-at-age and catch-at-size models. Fisheries Research. Available online Nov. 23, 2016.

Clark, R.D Jr., J.R. Bence, R.M. Claramunt, J.E. Johnson, D. Gonder, N.D. Legler. 2016. A spatially explicit assessment of changes in Chinook Salmon fisheries in lakes Michigan and Huron from 1986 to 2011. North American Journal of Fisheries Management. In Press. Accepted April 26, 2016.

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1. **Presentations**

**Dr. James Bence**

Bence, J.R. 2017. Assessing and managing fish populations in the Great Lakes in the face of radical environmental change. Invited seminar. Chesapeake Biological Laboratory, University of Maryland Center for Environmental Science, Solomons, Maryland. March 2017.

 Stevens, B.S., J. R. Bence, W. F. Porter, and C. J. Parent. 2016. Ecology matters: robustness and management tradeoffs for maximum harvests of wild turkeys. Oral presentation at the 11th National Wild Turkey Symposium, January 2016, Tucson, Arizona.

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Truesdell, S.B. and J.R. Bence. 2017. admb2r: example output and figures. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. Invited presentation. March 2017.

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Truesdell, S. and J.R. Bence. 2016. Sensitivity of TACs to changes in selectivity. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. March 2016.

Truesdell, S., J. Syslo, and J. Bence. 2016. Effective sample size in catch-at-age (or size) models. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. March 2016.

Truesdell, S., and J.R. Bence. 2016. Evaluation of ways to set constant harvest limits. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. March 2016.

Truesdell, S. and J.R. Bence. 2015. MSC task updates: Impacts of selectivity on SPR-based TACs, evaluation of ways to set constant harvest limits, and review of Lake Trout and Lake Whitefish model structure and ADMB code. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. September 30, 2015.

Stevens, B. S., M. L. Jones, W. F. Porter, J. R. Bence, C. A. Stewart, and D. R. Luukkonen. Using structured decision making to inform wild turkey management: an update. Oral presentation at the annual meeting of the Michigan Department of Natural Resources, Wildlife Division, August 2015, Roscommon, Michigan.

Scribner, K., T. Brenden, J. Bence (Presenter), W.L. Stott, I. Tsehaye, and J. Kanefsky. 2015. Joint analysis of genetic and age data to estimate trends in strain-specific recruitment of emerging wild lake trout populations in Lake Huron. Lake Huron Technical Committee. Port Severn, Ontario. July 2015.

Mayhew, S., S. Winterstein, and J. Bence. 2015. Bearing it all: exposing the details of the SCAA models” at the Michigan Department of Natural Resources Wildlife Division Meeting. Roscommon, MI. August 2015.

Mayhew, S., S. Winterstein, and J. Bence. 2015. A meeting of the Michigan Department of Natural Resources Wildlife Division Northern Lower Peninsula Regional Staff. Cadillac, MI. April 2015

Mayhew, S., S. Winterstein, and J. Bence. 2014. A New Picture of Michigan’s Bears. A meeting of the Michigan Department of Natural Resources Wildlife Division Northern Lower Peninsula Regional Staff (Cadillac, MI April 2015)

Bence, J. R. 2015. Introductory ideas on harvest policies. Modeling subcommittee meeting for 1836 Treaty Waters, Tustin, Michigan. March 2015

Mayhew, S., S. Winterstein, and J. Bence. 2014. The Michigan Department of Natural Resources Bear Symposium. Roscommon, MI. December 2014.

Mayhew, S., S. Winterstein, and J. Bence. 2014. A meeting of the State of Michigan/Tribal Government Wildlife Technical Committee (Roscommon, MI December 2014).

Mayhew, S., S. Winterstein, and J. Bence. 2014. A meeting of the Michigan Department of Natural Resources Wildlife Division Bear Workgroup (Lansing, MI November 2014)

Mayhew, S., S. Winterstein, and J. Bence. A meeting of the Michigan Natural Resources Commission

**Dr. Mary Bremigan**

Bremigan, M. 2016. Michigan Inland Lakes Meeting.

**Jordan Burroughs**

Burroughs, J.P. 2016 (invited). Uninvited Garden Guests: What’s eating your plants and why? Michigan‘s Masters Gardeners Online Webinar.

Burroughs, J.P. and H. Campa. 2016 (invited). Integrated white-tailed deer control: present and future. Great Lakes Fruit, Vegetable and Farm Market EXPO. Grand Rapids, MI.

Burroughs, J.P. and K. Phillips. 2016 (invited). Thinking Outside the Box to Reach New Groups for Conservation. Midwest Association of Fish and Wildlife Agencies Director’s Conference. St. Louis, MO.

Burroughs, J.P. 2017 (invited). Recruitment, Retention, Reactivation – R3. Michigan United Conservation Clubs Annual Convention. Big Rapids, MI.

Burroughs, J.P. 2017 (invited). Recruitment, Retention, Reactivation and the Outdoor Recreation Adoption Model. Conservation Coalition. Lansing, MI.

Burroughs, J.P. 2017 (invited). Stepping Down the R3 Plan in Michigan. Midwest Association of Fish and Wildlife Agencies and Western Association of Fish and Wildlife Agencies Joint R3 meeting. Phoenix, AZ.

Burroughs, J.P. 2017 (invited). Creating New Hunters: Michigan’s Learn to Hunt Program. National Wild Turkey Convention - Conservation Conference. Nashville, TN.

Burroughs, J. P., C. Stewart, H. Schauer. 2017. When Wildlife and Communities Collide. Michigan Township Association Annual Conference. Lansing, MI.

Burroughs, J.P. 2017 (invited). Recruitment, Retention, Reactivation: Challenges and Opportunities. Saginaw Field and Stream Club. Saginaw, MI.

Burroughs, J.P. 2017 (invited). Recruitment, Retention, and Reactivation Efforts: The National Plan and Michigan Examples. Michigan Sportsmen’s Caucus. Lansing, MI.

**Dr. Dan Hayes**

Nisbet, M, and D. Hayes. 2017. Habitat Selection of Brook Trout (Salvelinus fontinalis) and Rainbow Trout (Oncorhynchus mykiss) in a Lake Michigan Tributary. Midwest Fish and Wildlife Conference, Lincoln, NE. February 3-8, 2017.

Beaubien, J., J. Lepper, M. Nisbet, and D. Hayes. 2017. Benthic Foragers Selecting for the New Zealand Mud Snail. Midwest Fish and Wildlife Conference, Lincoln, NE. February 3-8, 2017.

Andrews, R., D. Hayes, and T. Zorn. 2017. Comparison of Methods for Characterization of Fish Thermal Habitat. Midwest Fish and Wildlife Conference, Lincoln, NE. February 3-8, 2017.

Stanton, S., W. Keiper, S. Herbst, and D. Hayes. 2017. Early Invasion Dynamics of New Zealand Mudsnails. Midwest Fish and Wildlife Conference, Lincoln, NE. February 3-8, 2017.

Beaubien, J., J. Lepper, M. Nisbet, and D. Hayes. 2017. Benthic Foragers Selecting for the New Zealand Mud Snail. Michigan Chapter AFS, Mackinaw City, MI. March 15-16, 2017.

Andrews, R., D. Hayes, and T. Zorn. 2017. Comparison of Methods for Characterization of Fish Thermal Habitat. Michigan Chapter AFS, Mackinaw City, MI. March 15-16, 2017.

Hayes, D.B. 2017. Invited presentation – U Maine Orono – present to undergrads “Grad School Pointers” 30 March 2017.

Zorn, T., D. Hayes, and D. McCullough. 2016. Effects of Dreissenids on potential walleye recruitment in Big and Little Bays de Noc. Lake Michigan Technical Committee.

Hayes, D.B., and B. Burroughs. 2016. A Systems Feedback Control Loop Representation of the Resource Management Process. Innovations in Collaborative Modeling. June 14-15, 2016. East Lansing. MI.

Watson, J.M., S.M. Coghlan, Jr., J. Zydlewski, D.B. Hayes, and I. Kiraly. 2016. Dam removal and fish passage improvement influence fish assemblages in the Penobscot River, Maine. Atlantic Salmon Ecosystems Forum, January 6-7, 2016, Orono, ME.

Hayes, D. 2016. Lessons to be learned from the growth and trajectory of MSU Department of Fisheries and Wildlife. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI. 25-27 Jan, 2016.

McCullough, D., and D. Hayes. 2016. Predator and prey: comparing larval yellow perch selection and response to varying prey communities across multiple systems. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI. 25-27 Jan, 2016.

Gulotty, E., and D. Hayes. 2016. Effects of artificial habitat structures on fluvial geomorphology and trout distribution. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI. 25-27 Jan, 2016.

Smith, K., D. Hayes, S. Herbst, M. Jones, N. Popoff, and B. Roth. 2016. Current state of Michigan crayfishes. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI. 25-27 Jan, 2016.

Hayes, D. B. 2016. Can We Get a Pulse? Data Needs to Detect Climate Change Impacts on Fish Populations. Annual Meeting of the American Fisheries Society, Kansas City, MO. 21-25 August, 2016.

Watson, J., I. Kiraly, D. Hayes, J. Zydlewski, and S. Coghlan, Jr. 2016. Dam Removal and Fish Passage Improvement Influence Fish Assemblages in the Penobscot River, Maine. Annual Meeting of the American Fisheries Society, Kansas City, MO. 21-25 August, 2016.

Smith, K., Roth, B. M., Hayes, D. B., Herbst, S., Jones, M. L., Popoff, N. (January 26, 2016) *Changes of Native and Invasive Crayfish Ranges in Michigan*. Abstract presented at Midwest Fish and Wildlife Conference, Grand Rapids, MI.

**Dr. Dana Infante**

Foley, M. M., F. J. Magilligan, C. E. Torgersen (presenter), J. J. Major, C. W.
Anderson, P. J. Connolly, D. J. Wieferich, P. B. Shafroth, J. E. Evans, D. M. Infante, L. S. Craig, and J. J. Duda. 2017. Landscape context and the biophysical response of rivers to dam removal in the United. Annual Meeting of the Ecological Society of America, August 6-11, 2017, Portland, Oregon.

Paukert, C. P., A. J. Lynch, T. D. Beard, Y. Chen, S. J. Cooke, M. J. Cooperman, I. G. Cowx, L. Ibengwe, D. M. Infante, B. J. E. Meyers, N. P Hao, I. J. Winfield. 2017. Helping managers adapt to the effects of climate change on inland fish and fisheries: Lessons learned from North America and a path forward. 50th Anniversary Symposium of the Fisheries Society of the British Isles, July 3-7, 2017, Exeter, England.

Daniel, W. M., D. M. Infante, and J. Stewart. *Invited*. 2017. FishVis and FishTail:
Decision support mappers for assessing current and future fish habitat. Adapting Forested Watersheds to Climate Change Workshop, US Forest Service, March 15, 2017, Minocoqua, Wisconsin.

Clilverd, H. M., Y. P. Tsang, A. M. Strauch, A. Lynch, D. M. Infante. 2017. Assessing climate-driver changes in streamflow in the Hawaiian Islands. The Association for the Sciences of Limnology and Oceanography Annual Meeting, February 26-March 3, 2017, Honolulu, Hawaii.

Daniel, W. M., D. M. Infante (presenter), A. Cooper, R. Tingley, Y. P. Tsang, K.
Herreman, D. Wieferich, W. W. Taylor. 2017. Condition of stream fish habitat across the United States. Poster. Michigan State University Agriculture and Natural Resources Week Luncheon Poster Reception. March 7, 2017, East Lansing, Michigan.

Cooper, A. R., and D. M. Infante. 2017. National Aquatic GAP Analysis: Update.
Aquatic GAP Program stakeholders webinar (~8 participants). January 30, 2017.

Infante, D. M., W. M. Daniel, G. Whelan, K. Herreman, A. Cooper, R. Tingley.
2017. 2015 National Fish Habitat Assessment Webinar. National Fish Habitat Partnership and other stakeholders webinar (~50 participants). January 13, 2017.

Infante, D. M., W. M. Daniel, G. Whelan, K. Herreman, A. Cooper, R. Tingley.
2017. 2015 National Fish Habitat Assessment Webinar. National Fish Habitat Partnership and other stakeholders webinar (~90 participants). January 6, 2017.

Tsang, Y. P., A. M. Strauch, H. M. Clilverd, D. M. Infante, and A. Lynch. 2016. The
natural flow regime of Hawai’I streams. Poster. American Geophysical Union Fall Meeting, December 12-16, 2016, San Francisco, California

Paukert, C., D. M. Infante, J. Stewart, W. M. Daniel, N. Sievert, J. Whittier, K.
Herreman, N. Estes, and Y. P. Tsang. 2016. FishTail: A decision support mapper for conserving stream fish habitats of the NECSC region. Plains and Prairies Pothole Landscape Conservation Cooperative Science and Data Committee webinar (~15 participants), December 7, 2016.
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Infante, D. M., W. M. Daniel, K. Herreman, and A. Cooper. *Invited*. 2016.
Landscape-scale assessment of stream fish habitats: Results from 2015 National Fish Habitat Partnership inland stream assessment. Michigan Department of Natural Resources Fisheries Division Biologists Meeting, November 30, 2016, Crystal Mountain, Michigan.

Infante, D. M., W. M. Daniel, R. W. Tingley, A. Cooper, K. Herreman, J. Ross, Y.
P. Tsang, D. Wieferich, L. Wang, and W. W. Taylor. *Invited*. 2016. 2015 assessment of the status of fluvial fish habitats for the National Fish Habitat Partnership. Midwest Glacial Lakes Partnership Science and Data Committee Meeting, November 9, 2016, East Lansing, Michigan.
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Infante, D. M. *Invited*. 2016. Landscape-scale assessment of stream fishes and
their habitats: Lessons learned and future directions. Graduate Student Seminar Series, Department of Natural Resource Ecology and Management, Iowa State University, October 14, 2016, Ames, Iowa.

Paukert, C., D. M. Infante, J. Stewart, W. M. Daniel, N. Sievert, J. Whittier, K.
Herreman, N. Estes, and Y. P. Tsang. FishTail: A decision support mapper for conserving stream fish habitats of the NE CSC region. Northeast Climate Science Center stakeholder webinar (~50 participants), October 12, 2016.

Cooper, A. R., W. M. Daniel, P. Badra, and D. M. Infante. *Invited*. 2016. Modeling
fluvial habitat suitability for 11 of Michigan’s listed unionids. 146th Annual Meeting of the American Fisheries Society, August 21-25, 2016, Kansas City, Missouri.

Daniel, W. M., D. M. Infante, and E. Throckmorton. *Invited*. 2016. A strategic
conservation plan for threatened and endangered mussel species of the Gulf Coast Prairie Region. 146th Annual Meeting of the American Fisheries Society, August 21- 25, 2016, Kansas City, Missouri.

Hsiao, J., D. M. Infante, Y. P. Tsang, and A. J. Lynch. 2016. Understanding spatial
linkages between terrestrial and coastal systems: Improving conservation of coastal habitats. 146th Annual Meeting of the American Fisheries Society, August 21-25, 2016, Kansas City, Missouri.

Sievert, N., Y. P. Tsang, W. M. Daniel, C. P. Paukert, D. M. Infante, J. Whittier, K.
Herreman, and J. Stewart. *Invited*. 2016. Assessing climate impacts based on observed fish responses to stream temperature and flow metrics. 146th Annual Meeting of the American Fisheries Society, August 21-25, 2016, Kansas City, Missouri.

Wieferich, D., D. M. Infante, and Y. P. Tsang. *Invited*. 2016. National and
regional data assets and needs to help assess climate impacts on fish. 146th Annual Meeting of the American Fisheries Society, August 21-25, 2016, Kansas City, Missouri.

Infante, D. M. 2016. Summarizing catchment information for understanding
condition of stream habitats. Community for data integration project team meeting. August 3-5, 2016, Denver, Colorado.

Daniel, W. M., D. M. Infante, and E. Throckmorton. 2016: Strategic coordination
of quadrula species research and conservation: Support for development of a conservation plan. Gulf Coast Prairie Landscape Conservation Cooperative end-ofproject webinar (~35 participants), August 3, 2016.

Infante, D. M. *Invited*. 2016. Recent innovations in Aquatic GAP: Informing
conservation of fluvial habitats over large regions. Aquatic GAP Analysis Program leadership webinar (~30 participants), June 28, 2016.

Daniel, W. M., D. M. Infante, C. Paukert, N. Sievert, J. Stewart, J. Whittier, K.
Herreman, N. Estes, and Y. P. Tsang. 2016. FISHTAIL: A decision support mapper for conserving stream fish habitats of the NECSC region. Northeast Climate Science Center stakeholder webinar (~75 participants), June 9, 2016.

Infante, D. M., and W. M. Daniel. *Invited*. 2016. 2015 inland assessment for the
National Fish Habitat Partnership: National results and highlights for Chesapeake Bay. Chesapeake Bay: Sustainable fisheries goal implementation team webinar (~100 participants), June 2, 2016.

Daniel W. M., D. M. Infante, and E. Throckmorton. 2016. Strategic coordination
of Quadrula species research and conservation: 2nd stakeholder webinar. Webinar with the Gulf Coast Prairie Landscape Conservation Cooperative Science and Data Committee and Stakeholders (~30 participants), April 11, 2016.

Gibson, P., D. M. Infante, R. Tingley, K. Herreman, W. M. Daniel, and W. W. Fetzer. 2016. Influences of wetlands on stream fish assemblages: Investigation of regional trends across Michigan’s Lower Peninsula. Michigan State University Undergraduate Research and Arts Forum, April 8, 2016.

Infante, D. M., R. W. Tingley, W. M. Daniel, K. M. Herreman, Y. P. Tsang, and A.
R. Cooper. *Invited*. 2016. Assessing threats to Hawaiian streams for the 2015 National Fish Habitat Assessment. Hawaii Stream Conservation Workshop 2016, February 23-25, 2016, Honolulu, Hawaii.

Tingley, R. W., D. M. Infante, A. R. Cooper, and K. Herreman. 2016. Enhancing
conservation planning for Hawaiian streams under current and future threats. Hawaii Stream Conservation Workshop 2016, February 23-25, 2016, Honolulu, Hawaii.

Daniel, W. M., D. M. Infante, C. Edwards, B. Kahler, and E. Throckmorton. 2016.
Development of a strategic conservation plan for Quadrula species of the Gulf Coast Prairie region. 2016 Freshwater Mollusk Conservation Society Workshop, February 16-19, 2016, Shepherdstown, West Virginia.

Daniel, W. M., D. M. Infante, A. Cooper. 2016. National fish habitat assessment’s
2015 inland draft results for Alaska. Webinar for the All Alaska Fish Habitat Partnership Meeting (~50 participants), February 9, 2016.

Daniel, W. M., A. R. Cooper, P. Badra, and D. M. Infante. 2016. Michigan’s fluvial
habitat suitability for 11 listed unionids. 76th Midwest Fish and Wildlife Conference, January 25-27, 2016, Grand Rapids, Michigan

Daniel, W. M., N. Sievert, D. M. Infante, C. Paukert, J. Stewart, J. Whittier, T.
Wagner, K. Herreman, and Y. P. Tsang. 2016. Current conservation status of stream fish habitat in the Midwest and northeastern United States. 76th Midwest Fish and Wildlife Conference, January 25-27, 2016, Grand Rapids, Michigan.

Fetzer, W., B. Roth, D. Clapp, R. Claramunt, D. Fielder, D. M. Infante, T.
Newcomb, and T. Zorn. 2016. Spatial and temporal dynamics of nearshore fish communities in the Michigan waters of the Great Lakes. 76th Midwest Fish and Wildlife Conference, January 25-27, 2016, Grand Rapids, Michigan.

Sievert, N. A., Y. P. Tsang, W. Daniel, C. P. Paukert, D. M. Infante, J. Whittier, K.
Herreman, J. Stewart, and T. Wagner. 2016. An assessment of potential changes in habitat classes due to climate change in the Northeast Climate Science Center Region. 76th Midwest Fish and Wildlife Conference, Grand Rapids, Michigan, January 25-27, 2016.

**Dr. Dan Kramer**

Mitterling, Anna M. and D.B. Kramer. Correlates of hunting satisfaction among participants in quality deer management cooperatives. Numerous of presentations to Quality Deer Management (QDM) deer cooperatives around the state.

Dr. Frank Lupi

Lupi, F. (January 2016) Competing Values in Great Lakes Resource Management. Midwest Fish and Wildlife Conference, Grand Rapids, MI

Lupi, F. (February 2016) *Economics of Lake Erie HABs*. Presented research and needs overview at Great Lakes Day & GLC Semiannual Commissioners Meeting, Great Lakes Commission, Washington, DC.

Simoes, J., Lupi, F. (January 2016) *Great Lakes Anglers’ Preferred Trade-Offs Between More Fish, Native Fish, and Risk of Ecosystem Collapse*. Presented paper at Midwest Fish and Wildlife Conference, Grand Rapids, MI.

Lupi, F. (January 2016) *Fishing for Benefits of Reducing Agricultural Pollution*. Presented paper at Pathways: Human Dimensions Fish and Wildlife Management, Kenya.

Garnache, C., Swinton, S. M., Herriges, J., Lupi, F., Stevenson, R. J. (January 3, 2016) *Solving the phosphorus pollution puzzle: Synthesis and directions for future research*. Presented paper at AAEA Invited Paper Session at the Annual Meeting, Allied Social Science Association, San Francisco, CA.

Lupi, F., Reeling, C. (August 2016) *Bear lottery demand*. Presented paper at ERE day, Michigan State University, East Lansing, MI.

Reeling, C., Verdier, V., Lupi, F. (August 2016) *Valuing Natural Resources Allocated by Dynamic Lottery*. Presented paper at AAEA Annual Meeting, Agricultural and Applied Economics Association, Boston, MA.

Knoche, S., Lupi, F. (August 2016) *A Mixed Logit Model Approach to Investigate Trout Angler Preferences for Fishing Site Attributes*. Presented paper at American Fisheries Society, Grand Rapids, MI.

Lupi, F. (August 2016) *Coupling Recreational Fisheries and Phosphorous to Estimate Impacts of Nutrient Loadings on Freshwater Fishing Demand and Value*. Presented paper at American Fisheries Society, Grand Rapids, MI.

Nohner, J., Lupi, F. (August 2016) *Property Owners' Willingness to Accept Natural Shoreline Conservation Programs on Their Inland Lake Properties in Michigan*. Presented paper at American Fisheries Society, Grand Rapids, MI.

Palm-Forster, L. H., Swinton, S. M., Lupi, F., Shupp, R. S. (January 3, 2016) *Too burdensome to bid: Transaction costs and pay-for-performance conservation*. Presented paper at AAEA Invited Paper Session at the Annual Meeting, Allied Social Science Association, San Francisco, CA.

Cheng, L., Lupi, F. (August 2016) *Combining Revealed and Stated Preferences to Value Water Quality at Great Lakes Beaches*. Presented paper at AAEA Annual Meeting, Agricultural & Applied Economics Association (AAEA), Boston, MA.

Goeb, J., Lupi, F., D. T. (August 2016) *Toxicity and Price-Quality Information and Pesticide Demand: RCT Evidence from Smallholder Tomato Farmers in Zambia*. Presented paper, poster at AAEA Annual Meeting, Agricultural & Applied Economics Association (AAEA), Boston, MA.

Agyekum, M., Lupi, F., Donovan, C. (August 2016) *Novel IPM Intervention in West Africa: Smallholder Farmers’ Preferences for Biological versus Synthetic Control Strategies for Cowpea Pests*. Presented paper at AAEA Annual Meeting, Agricultural and Applied Economics Association, Boston, MA.

Srivastava, L., Garnache, C., Lupi, F., Hand, M. (August 2016) *Valuation of Water-Related Ecosystem Services Under Climate Change: The Case of Chaparral Landscapes in National Forests*. Presented paper at AAEA Annual Meeting, Agricultural and Applied Economics Association, Boston, MA.

Lupi, F. (August 2016) *Revealed Preference Estimates of Natural Resource Damages (Panel)*. Presented paper at Camp Resources, University of North Carolina & JEEM, Wrightsville Beach, NC.

Lupi, F. (June 2016) *Recreation Demand Models and valuation of lost user days*. Presented paper at AERE Annual Meeting, Association of Environmental and Research Scientists, Breckenridge, CO.

Yang, H., Lupi, F., Liu, J. (April 2016) *Feedback effects of telecoupling: The case of a payment for ecosystem services program*. Presented paper at International Association for Landscape Ecology (IALE), Ashville, SC.

Cheng, L., Lupi, F. (March 2016) *Beach demand modeling in the Great Lakes and algae*. Presented paper at Center for National Resource Economics & Policy (CNREP), New Orleans, LA.

Lupi, F. (February 2016) *Combining revealed and stated preferences within large demand systems*. Presented paper at Multistate Research Project W3133, United States Department of Agriculture,

Dr. Shawn Riley

Rudolph, B.A. and S.J. Riley. 2016. Trust me, you don’t want to use bait: examining linkages between gaining hunter compliance and building trust in agencies. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI.

Goguen, A. D., S. J. Riley, B. A. Rudolph, and J. F. Organ. 2016. Sharing and receiving wild harvested venison in Michigan: Implications for relevancy of hunters and hunting. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI.

Lederle, P. E., S. J. Riley, and M. M. Cross. 2016. Increasing capacity for conservation: do the WGPs enhance or hinder partnerships? 81st North American Wildlife and Natural Resources Conference, Pittsburg, PA.

Riley, S. J. Trust and confidence in state wildlife agencies. Seminar to The University of Florida Department of Wildlife Ecology and Management. Gainesville, FL.

Riley, S. J. 2016. An overview of the extent of sharing and receiving of wild-harvested meat in Michigan. A presentation to the MDNR-WD SE Regional staff. Holly, Michigan.

Riley, S. J. 2016. Highlights of research supported by MDNR-WD: public trust research, wild-harvest meat use. A presentation to MDNR-WD personnel at their annual divisional meeting. Houghton Lake, Michigan.

Riley, S. J. and A. D Goguen. 2016. Looks like meats back on the menu. An invited presentation at the International Symposium on Society and Resource Management, Houghton, MI.

Riley, S. J., A.D. Goguen, P. E. Ljung, and G. Ericsson. 2016. Hunter-harvested meat as a coupler of humans and sustainable uses of wildlife. Special Symposium on Sustainability of Sustainable Use. Annual Conference of The Wildlife Society, Raleigh, NC.

Riley, S. J., and C. Sandström. 2016. Human dimensions insights for reintroduction of wildlife populations. Special Symposium on Reintroduction of Wildlife at the Annual Conference of The Wildlife Society, Raleigh, NC.

Riley, S. J. 2016. Is sustainable use of wildlife sustainable: changing values in America? Plenary Session, The Annual Conference of The Wildlife Society, Raleigh, NC.

Dr. Gary Roloff

Roloff, G.J. 2016 (Invited). 21st century forest management: Balancing complex expectations. Michigan Society of American Foresters Annual Meeting, Gaylord, MI, Oct 6-7.

Gray, S.M., G.J. Roloff, R.A. Montgomery, D.R. Etter, M.T. Wegan, and K.C. Vercauteren. 2016. Movements of feral swine in Michigan, USA. The Wildlife Society’s 23rd Annual Conference, Raleigh, NC, Oct 15-19.

Roloff, G.J., and C.V. Otto. 2016. Structural retention in Michigan clearcuts: Do the birds care? Michigan Society of American Foresters Annual Meeting, Gaylord, MI, Oct 6-7.

Etter, D., S. Gray, M. Wegan, G. Roloff, and K. Hollis-Etter. 2016. Bed site selection of feral hogs in Michigan. International Wild Pig Conference, Myrtle Beach, SC, Apr 18-20.

Roloff, G.J., A. Killion, and S. Mayhew. 2016. Citizens as scientists: Lessons learned from MI-Mast. Annual Meeting of the Michigan Chapter of The Wildlife Society, Gaylord, MI, Apr 7-8.

Killion, A.K., M.L. Gore, G.J. Roloff, J. Ratsimbazafy, S. Mc Carthy, M. Tambe. 2016. A spatial risk assessment to improve community policing and form optimal response teams: Illegal logging in Madagascar. Pathways Conference: Integrating Human Dimensions into Fisheries and Wildlife Management, Nanyuki, Kenya, Jan 10-13.

Shaffer, S. A., H. Campa III, and G. J. Roloff. 2016. Habitat use and detection of the eastern massasauga rattlesnake across southern Michigan. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.

Hunt, L.E.F., B. A. Maurer, and G. J. Roloff. 2016. Effects of pasture based dairy farming on grassland bird species. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.

Swem, T., A. Ihnken, and G. Roloff. 2016. Behavioral responses of eastern box turtle *Terrapene carolina carolina* to prescribed fire and implications for management. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.

Dokes, T., E. Clark, B. Silet, R. Aikens, J. Powell, and G. J. Roloff. 2016. Non-harvest mortality of American marten *Martes* *americana* in the eastern Upper Peninsula, MI. 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.

Muneza, A. B., Montgomery, R., Fennessy, J., Dickman, A., Roloff, G. and Macdonald, D. 2016. Regional variation, prevalence, and severity of Giraffe Skin Disease: A review of an emerging disease in wild and captive giraffe populations. 11th Fisheries and Wildlife GSO Research Symposium. Michigan State University, East Lansing, MI, Feb 26.

Dr. Brian Roth

Smith, K., B.M. Roth, D.B. Hayes, and M.L. Jones. 2016. Assessment of risks and consequences of non-native crayfish invasions in Michigan. Presentation to the Aquatic Invasive Species Core Team. October 31, 2016. Lansing, MI

Smith, K., D.B. Hayes, S. Herbst, M. Jones, N. Popoff, and B. Roth. 2016. Changes of native and invasive crayfish ranges in Michigan. Midwest Fish and Wildlife Conference. Feb. 2016. Grand Rapids, MI

**Dr. Kim Scribner**

Scribner, K. T. Results of 2014 BNT creel genetic analysis. Michigan DNR Fish Production Section Meeting. January 6, 2016 Platte River Hatchery.

Dammerman, K. and K.T. Scribner. Genetic and environmental components of phenotypic and behavioral trait variation during lake sturgeon *Acipenser fulvescens* early ontogeny. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Scribner, K.T. Markers, Methods, and Applications of Genetic Data Applied to the Management of Fish and Wildlife Populations. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Scribner, K.T. Effects of variability in stream physical and biotic factors on the reproductive success of lake sturgeon Acipenser fulvescens. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Walquist, R., J. Bauman, and K. T. Scribner. Effects of benthic macroinvertebrates on the body size and survival of Lake Sturgeon (*Acipenser fulvescens*) eggs and free embryos. Midwest Fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Valentine, S.A., J.. Bauman, and K. T. Scribner. Effects of Alternative Foods on Body Size and Survival of Larval Lake Sturgeon. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Ruzich, J., J. Bauman, K.T. Scribner. Effects of Alternative Food Types on Larval Lake Sturgeon Body Size and Survival. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Ross, D., J. Bauman, N. Barton, E. Baker, and K.T., Scribner. Migration Behavior of Spawning Adult Lake Sturgeon in the Black River, MI. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Baker, E. A., K. T Scribner, and S. Pledger. Evaluation of a Spawning Return-Time Mark-Recapture Model for Estimating Lake Sturgeon Population Parameters. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Waraniak, J., K.T. Scribner, N. Gezon, E.A. Baker. Predation of Larval Lake Sturgeon by Piscine Predators in the Black River, Michigan. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Scribner, K.T. A genetic perspective to potential costs and benefits of supplementation as a management tool. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Wassink, L., and K.T. Scribner. Behavioral responses of larval lake sturgeon to odorant cues. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Razak, S. and K.T. Scribner. Lake sturgeon gut microbiota assembly and successional dynamics allow ecological evaluations of neutral vs host-selective processes. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Bauman, J., E. Baker, T. Marsh, and K.T. Scribner. Survival of larval lake sturgeon as a function of different chemotherapeutant prophylactics. Midwest fish and Wildlife Meeting. January 24-26, 2016, Grand Rapids, MI.

Scribner, K.T., Winsor H. Lowe, Erin Landguth, Gordon Luikart, Dana M. Infante, Gary E. Whelan, Clint C. Muhlfeld. Applications of Genetic Data to Improve Management and Conservation of River Fishes and Their Habitats. Invited talk - Western Division, AFS, Reno NV. March 21-24, 2016

Miller, L.M., Farrell J.M., Kapuscinski, K.T., Scribner, K., Sloss, B.S., Turnquist, K., Wilson, C.C. A review of Muskellunge population genetics: implications for management. Hugh Becker Memorial Muskellunge Symposium: 50 years of Management, Research and Cooperation . Brainard, MN, February 26-28, 2016.

Dammerman, K. and K.T. Scribner. Genetic and environmental components of phenotypic and behavioral trait variation during lake sturgeon *Acipenser fulvescens* early ontogeny. Genetics Society of America. June 24-27, 2016., Orlando, FL.

Karla Helena Bueno, \*Roshan Angoshtari, Frances Trail, Kim Scribner and Terence L. Marsh. Antifungal activity of bacterial isolates from the eggs of lake sturgeon (*Acipenser fulvescens*) against *Chaetomium* and *Saprolegnia.* Society for Microbial Ecology, August 20-22, 2016. Tampa, FL.

Shairah Abdul Razak, Terence L. Marsh, Kim T. Scribner. Sturcture of the gut microbiome in lake sturgeon larvae varies with early developmental stages. International Conference on Fish Biology, San Marcos, TX, June 20-22, 2016

Jay, K.J., J. McGuire, and K. T. Scribner. Ecological conditions affect phenotypic responses of Lake Sturgeon yolk-sac larvae. North American Sturgeon and Paddlefish Annual Meeting, Portland, OR, August 18-20, 2016.

Dammerman, K.J., J.P. Steibel, K.T. Scribner. Effects of parentage and microhabitat variation within adult-selected spawning sites on Lake sturgeon growth during early life stages. North American Sturgeon and Paddlefish Annual Meeting, Portland, OR, August 18-20, 2016

Crossman, James A., Patrick S. Forsythe, Kim T. Scribner, and Edward A. Baker. Substrate type influences levels of predation on lake sturgeon eggs and age-0 juveniles. North American Sturgeon and Paddlefish Annual Meeting, Portland, OR, August 18-20, 2016

Duong, Y, J. Kanefsky, and K. Scribner. International Fisheries Symposium (IFS), held at Phu Quoc Island (VN) from Oct. 31 - Nov. 2. ASEAN Fisheries Education Network.

Invited talks

Development of integrative approaches to quantify dynamics of microbial community assembly: applications aquaculture and fish ecology. Great Lakes Fishery Commission Fish Health Committee meeting - East Lansing, February 2, 2016.

Joint analysis of genetic and age data to estimate trends in strain-specific recruitment of emerging wild lake trout populations in Lake Huron. Great Lakes Fishery Commission Board of Technical Experts meeting March 1, 2016, Ann Arbor, MI.

Ecological, demographic and genetic complexities associated with studies of long-lived iteroparous species: acquisition, management and analytical challenges of “Big Data”. University of Winsor Great Lakes Institute of Environmental Research. Winsor, ON, April 8. 2016.

Ecological, demographic, and genetic complexities underlying recruitment dynamics revealed through studies of long-lived iteroparous species. Department of Biology, Purdue University, West Layfette, IN. November 8, 2016.

Genetic and Environmental Components of Phenotypic and Behavioral Trait Variation during Lake Sturgeon *Acipenser fulvescens* Early Ontogeny. Inter-Lab Quantitative Seminar, QFC, MSU, Feb 23 2016

1. **Support to DNR**

**Dr. James Bence**

* Instructional workshops and presentations to Modeling Subcommittee of the Technical Fisheries Commission for 1836 Treaty waters (see list of presentations).
* Oversight on development of online quantitative fisheries related courses through the Quantitative Fisheries Center.
* Outreach on Technical issues to Lake Huron Technical Committee and Modeling Subcommittee of the Technical Fisheries Commission for 1836 Treaty waters (see list of presentations).
* Convening of symposium and meeting to discuss issues related to major changes in Lake Huron for fishery biologists and managers. December 2014. Michigan State University.
* Active participant in Fisheries Division Research Section Meetings.
* Co-organizer: Great Lakes Conferences, MSU Agriculture and Natural Resources Week: March 2015, March 2016, March 2017. Annual conference with attendance >200 each year. Participation by Michigan DNR as speakers and attendees.

**Dr. Mary Bremigan**

* Fisheries Division, Michigan Department of Natural Resources, Member, Bass Regulations Evaluation Team, (2007 - Present).
* Fisheries Division, Michigan Department of Natural Resources – Active participant in Research Section meetings.
* Fisheries Division, Michigan Department of Natural Resources, Editor, (2015).
* Responsibilities: Conducted technical reviews of Fisheries Division publications including an extensive review of the new Fish Production Report.

**Jordan Burroughs**

Michigan Wildlife Council, Coordinator. Supported efforts of the Michigan Wildlife Council/Güd Marketing as they develop a marketing campaign to promote the important roles sportsmen and sportswomen play in wildlife conservation and management as well as the economic benefit to the state.

Learn to Hunt Program, Creator. Created curricula, implemented and evaluated mentored hunting programs with a sustainable food focus geared toward teaching adults, new to hunting, how to hunt. Pre and post surveys were administered to participants and a revised model/curriculum for adult hunter recruitment programs was developed.

Recruitment, Retention and Reactivation. I have been approached to take on various leadership roles involving hunter recruitment, retention, reactivation (R3) efforts within Michigan and nationally. In Michigan, I am collaborating with DNR and external partners to develop a framework for action (based-off the research outlined within the National R3 Plan) and align programs, efforts, and resources to establish effective R3 pathways and leverage capacity to make a positive R3 impact. I assisted with the coordination and facilitation of Michigan’s R3 Summit held in August. I meet monthly with a diverse cadre of individuals (representing industry, agency, NGOs) to develop the R3 brand and build recognition of the tools available to address R3 efforts nationally and at the state level. I joined forces with the Council to Advance Hunting and Shooting Sports to develop an R3 online questionnaire to determine the extent of the hunting and shooting sports community’s awareness of R3 and the National Hunting and Shooting Sports Action Plan.

MSU Extension. In an effort to facilitate linkages across MSU Extension Institutes, I continue to collaborate with my Extension colleagues in both the Children, Youth and Family Institute (via my 4-H Camp efforts) and the Agriculture & AgriBusiness Institute (via human-wildlife-ag issues). I helped convene a cross-institute group of MSUE specialists and educators to share information research and extension programming related to the agriculture and wildlife interface. In October, we hosted a workshop during the MSUE annual and we continue to host regular conference calls to explore cross-institute opportunities to increase our capacity to address human-wildlife-ag conflicts.

Gourmet Gone Wild. The Gourmet Gone Wild (GGW) program continued in FY 2016 and expanded to introduce new audiences to hunting, fishing, and conservation through the tasting of wild fish/game. In collaboration with MUCC, the program received a $147,500 grant by the Cabela’s Outdoor Fund to enhance GGW and to devote additional resources for new adult Learn to Hunt initiatives across Michigan. Several GGW events from Detroit to the Upper Peninsula were held. The first of several upcoming free wild game cooking demos associated with Farmer’s Markets was held in spring 2017. GGW partnered with the Lenawee Center Culinary Arts program in May 2017 to demonstrate wild game recipes to culinary students. Also in May 2017, a GGW event with the Keweenaw Young Professionals was held in Houghton. GGW will be collaborating on a “Will Forage for Food” event in Ann Arbor and a “Date Night” at the DNR’s Outdoor Adventure Center in Detroit later this summer.

City of East Lansing, Facilitator, Outreach and Engagement. Continue to assist with outreach and engagement efforts related to the City of East Lansing’s urban deer management program. Engagement efforts encompass issue scoping meeting, metrics of success meetings, relationship building, and periodic information meetings.

Serve as a member of the following committees in support of the Department:

* Internal R3 Team (DNR)
* Michigan R3 Task Force (statewide)
* Midwest R3 Group (national)
* Invited R3 Communication Committee (national)
* Invited R3 Development Committee (national)
* Invited North American Wildlife and Natural Resource Conference Steering Committee (national)
* Invited National Wild Turkey Federation Hunting Heritage Advisory Committee (national)

**Dr. Dan Hayes**

* Fisheries Division, Michigan Department of Natural Resources, Member, Walleye Management Committee, (2015 - Present) and assisted in develop a base for management plan development.
* Fisheries Division, Michigan Department of Natural Resources, Member, Mollusk Technical Advisory Committee, (2013 - Present). Responsibilities: Threatened/Endangered Species Review.
* Fisheries Division, Michigan Department of Natural Resources, Member, Fish Technical Advisory Committee, (2005 - Present). Responsibilities: Threatened/Endangered Species Review.
* Fisheries Division, MDNR, Statistical outreach, (2016).
* Planned for upcoming analyses of sample size for conducting statistically appropriate sampling for fish pathogens.
* Fisheries Division, Michigan Department of Natural Resources, Co-Chair, Lake Sturgeon Management Committee, (2013 - 2015).
* Provided comments on the Draft Nearshore Framework for the Great Lakes to Gary Whelan, 24 May 2016 and on Shiawassee rock ramp Status of Fishery Report authored by Joe Leonardi 28 August 2016.
* Attended and provided comments at the Arctic Grayling Initative Meeting on December 6, 2016.
* Provided an update of New Zealand Mudsnail project progress to DNR/DEQ Aquatic Invasive Species Core Team, September 12, 2017.

**Dr. Dana Infante**

* Great Lakes Fishery Trust Habitat, Member, Steering Committee, (2009 - Present).
* Great Lakes Environmental Assessment and Mapping (GLEAM), Core Working Group Member, (2009 - Present).
* Active in the Fisheries Division Research Section Meetings.
* National Fish Habitat Partnership – Lead national inland fish habitat assessment; assisted with the lakes assessment being done by the Midwest Glacial Lakes Fish Habitat Partnership; and a member of the Board’s Science and Data Committee.

**Dr. Frank Lupi**

Economics of Asian Carp (and other ANS) in the Great Lakes: 2016 – Present. I have been working extensively with the ACOE to advise and support their efforts to assess the possible economic effects (positive and negative) of investments to reduce the risk of Asian Carp entering the Great Lakes via the Mississippi River system. In the process, I am involved also with the MDNR, the Great Lakes Fishery Commission, the Great Lakes Commission Panel on Aquatic Nuisance Species, and NOAA' Great Lakes Environmental Research Laboratory.

Lake Erie HABs: 2016 – Present. My research and expertise on the economics of harmful algal blooms (HABs) on Lake Erie continues to be used by the IJC in policy recommendations and research priorities for dealing with HABs on Lake Erie. I had numerous interactions, webinars and meetings on this topic with IJC members and affiliates throughout 2015, including an invitation in September to present and answer questions with the IJC commissioners themselves.

Michigan Fisheries Management: 2016 – Present. My interactions with managers and my survey research and preference analyses have been used to develop segments and profiles for various types of anglers and angling behaviors of interest to managers, including continued presentations to Coldwater Resources Steering Committee and a plan to develop information for the revised Walleye management plan.

Economics of Commercial Net-Pen Aquaculture in the Great Lakes: 2016. I worked with the Senior Water Policy Adviser of the Michigan DNR to outline and coordinate reports on the economics of net-pen commercial aquaculture for the Science Advisory Panel for the Directors of the Michigan Departments of Agriculture and Rural Development, Natural Resources, and Environmental Quality. In addition to reviewing reports, I wrote one on risks to the value of natural resources that I also directly presented to the DNR director and executive management team.

Ongoing Support of DNR-level Economics Plans: 2016. Continued participation and discussions across DNR on department’s economics research efforts, internal and external needs for such analyses, and possible means of addressing gaps in the departmental efforts.

**Dr. Shawn Riley**

Review the role and importance of state game areas. Served on committee to refine the role, importance, and future management direction of state game areas (SGAs) to Michigan’s communities and economy. Eight formal meetings were held in FY 2016 (in addition to numerous ad hoc meetings) to review the history of SGAs, funding sources and implications for allowable use of SGAs, patterns and trends of usage of SGAs throughout southern Michigan, and heard testimony about the potential effects of SGAs on communities and businesses. Coauthored the final report in fall 2016. Made a presentation of the report to the Natural Resources Commission on October 13, 2016.

Assessing and building trust and credibility with stakeholders.A meta-analysis of more than 1,900 research papers on trust and confidence in organizations (winnowed to 190 with empirical data) was conducted. Re-analyzed a mail-back questionnaire that assessed factors affecting trust and confidence in Michigan’s Department of Natural Resources’ Wildlife Division by licensed hunters. Presented findings at two professional conferences and prepared two manuscripts, that were submitted for publication in the *Journal of Wildlife Management* and *Journal of Applied Psychology* in early FY2017. Revised and submitted a book chapter for publication in *Conservation Criminology*.

Operationalization of the public trust doctrine. Participated in a group of prominent wildlife researchers and managers from throughout the US to develop training workshops on implementation of public trust principles in state wildlife management. Piloted a prototype workshop to transfer knowledge on principles of governance for the Florida Fish and Wildlife Commission. Assisted in developing and presenting a subsequent workshop in Michigan during May 2016 for MDNR-Wildlife Division. Additional activities:

* A presentation, coauthored by the MDNR-WD Planning and Adaptation Section Supervisor, was developed for the 2016 *North American Wildlife and Natural Resources Conference* from which a paper was subsequently published in the Transactions.
* A plenary session and symposium titled *Partnerships Across the Spectrum of Wildlife Governance* was developed for the Annual Conference of The Wildlife Society.
* As an outgrowth from research results related to procedural fairness and subsequent stakeholder trust and confidence in the Wildlife Division, a textbook chapter that emphasizes governance and legitimacy of public institutions such as state wildlife agencies in wildlife reintroductions of was completed and submitted for publication.
* Completed work on the role of sharing wild-harvested meat (from hunting) on attitudes toward hunting and hunters in Michigan. Similar data, not specifically covered under this project, were also collected in Sweden for comparison. The comparison will increase knowledge and understanding about the role of wild-harvest meat, the extent of sharing and receiving, and the subsequent effects under two forms of wildlife governance.

Measuring changing public beliefs in America relative to wildlife.Traveled to Colorado State University to coordinate with principal investigators from throughout the US along with numerous conference calls conducted pre- and post-meeting. A questionnaire was collaboratively developed for a nation-wide survey along with questions specific for Michigan. The survey is being conducted during the summer of 2017.

Additional Activities:

* Organized and sponsored a session at WD In-service Training Session, “Meet the PERM faculty”
* Held multiple meetings with WD Chief to discuss progress on research and for informal consultation on wildlife matters, especially CWD.
* Participated on Blue Ribbon Advisory Committee related to State Game Areas.
* Countless phone/email communications with DNR WD staff related to myriad issues in wildlife management.
* Numerous consultations with State Wildlife Council contractors, GüD Marketing, over questionnaire design and administration.
* Participation on Michigan’s TB Advisory Committee.
* Consultation with Planning and Adaptation Section on revisions to WD’s strategic plan.
* Consultation and collaboration with Swedish researchers on carnivore governance. Michigan is one case study site and Dr. Riley helped facilitate connections to interviewees.

**Dr. Gary Roloff**

At the request of MDNR – Wildlife Division (T. Minzey), provided a presentation to the Upper Peninsula Habitat Workgroup on the northern hardwoods research project, Aug 30, 2016 (30 attendees [2 Natural Resource Commissioners in attendance]).

At request of MDNR – Parks Division, consulted on the experimental design for a mark-recapture study on eastern box turtles at Fort Custer Recreation Area. Conducted preliminary data analyses and presented the results to Parks Division (Jun – Jul 2016).

At the request of T. Minzey and B. Scullon, attended the Commercial Forest Act/MDNR Partners meeting to present the Hardwood Regeneration Project, Jun 9, 2016.

Helped write, review, and advocate for “*Habitat Enhancements for Snowshoe Hare*” document that was distributed to all MDNR Management Unit Biologists and Foresters.

Snowshoe hare hinge cutting and media interviews, Grayling Management Unit, Jan 30, 2016.

Invited presenter at the MSU Zoological Student Association monthly meeting. Invited to talk about career advice, Mar 15, 2016 (25 attendees).

Presentation to the MSU Extension Vertebrate Pest Management Working Group on the feral pig project, Feb 24, 2016 (15 attendees).

Provided a presentation on identification of deer browse at Michigan United Conservation Clubs (MUCC) Deer Browse Seminar, Feb 9, 2016. About 40 attendees from deer cooperative around the southern half of the state.

Additional Activities:

* Reviewed full proposal for Great Lakes Fish and Wildlife Restoration Act funding, USFWS (April 2016).
* Reviewed the promotion and tenure packet for Dr. Timothy Van Deelen, University of Wisconsin – Madison. Dr. Van Deelen was being reviewed for promotion to full professor (Jan 31, 2016).
* Program Co-Chair for the 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.
* Moderated the Midwest Fish and Wildlife Leadership Series at the 76th Midwest Fish and Wildlife Conference, Grand Rapids, MI, Jan 24-27.
* Elected as Secretary for the North Central Section of The Wildlife Society (Spring 2016 – Spring 2018)
* Invited (and accepted) to serve on the SFI Resource Committee (Fall 2013 – Fall 2016).
* Invited (and accepted) to serve on the SFI Interpretations Committee (Fall 2014 – Current).
* Invited (and accepted) to serve on the SFI Emerging Issues Committee (Spring 2015 – Current).

**Dr. Brian Roth**

* Active participant in Fisheries Division’s Research Section Meetings
* Building relationships with Fisheries Division Research staff and have started developing joint research proposals and projects, including one on predator diets in the Great Lakes.

**Dr. Kim Scribner**

PERM Service to Michigan DNR

* Presented talks at range of DNR Meetings in 2016 including Fish Production Section, Biologist Conference, and Research Section Meetings.
* Worked with Fish Production Section on Brown Trout creel project
* Worked with Fish Production Section on Steelhead genetic diversity project
* Member Lake Sturgeon Committee
* Facility manager and lead PI of the Black River lake sturgeon stream-side research facility
* Assisted with coordination with the Sturgeon in the Classroom Program
* Provided expert opinion on genetic effects of net-pen aquaculture and on potential Brown Trout broodstock supplementation opportunities to Ed Eisch and Gary Whelan
* Worked with Troy Zorn and Ed Baker on Lake Superior Splake
* Worked with Jory Jonas on Elk Lake lake trout
* Worked with Gary Whelan on streamscape genetics project
* Worked with Ed Baker (Research), Dave Borgeson (Management) and Ed Eisch (Hatcheries) associated with the Black River lake sturgeon project
* Worked with Jan Hessenhauer on aquatic invasive species and stream-scape genetics projects
* Provided testing opportunities and guidance on new eDNA sampling equipment
* Provided genotyping and data interpretation on Lake Herring DNA samples
* Provided genotyping and sequencing services for Law Division for DNA forensics cases
* Provided genotyping services to Wildlife Division in connection with Chronic Wasting Disease cases
* Developed a 3 day Fisheries Genetics Workshop which was published for use by workshop participants by the Michigan DNR. This is the first in a series of PERM workshops to improve Fisheries Division staff skills. Approximately 30 people participated in the Workshop.
* We host over 1000 people during spring and summer 2016 who toured the Black River Stream-side Research Facility near Onaway, Michigan. Activities include organized tours and young activities associated with late-summer releases of juveniles as part of the Cheboygan River lake sturgeon restoration program.
* We work with local K-12 teachers and Michigan Sea Grant to provide educational opportunities at our Black River Stream-side Research Facility. Activities includes participation in the Sturgeon in the Classroom program, K-12 student projects and demonstrations, and teacher continuing education.
* Instructional materials include data from our long-term research project that is available on our project web site (<http://www.glsturgeon.fw.msu.edu/>).
* We provide talks to local lake committees in the 'Tip-of-the-Mit' region and demonstrations at festivals and other local events in the region.
* We work closely with Michigan tribal biologists associated with collection of biological data and gametes for lake sturgeon.
* We work closely with the hydro-electric operators on Black Lake concerning conservation aspects of our lake sturgeon program. We provide data on T&E species sightings and aquatic invasive species.
* Stream-side rearing methodology for lake sturgeon are being used across the Great Lakes basin by agency and tribal fisheries biologists.