

**All intern projects are dependent upon available funding.**

*\* PLEASE NOTE: All students are responsible for their own transportation to/ from their internship site on a daily basis. Not all projects are located in areas with reliable public transportation (e.g. on college campuses). Only students who can confirm at the application time that they will have a vehicle available to bring to their internship location can be matched with projects requiring personal vehicle for project-related travel. Students without vehicles are still encouraged to apply. We only offer one project per student. If you are offered an internship project requiring a personal vehicle and are later unable to bring one, we cannot offer you a different project. Therefore, please answer accurately the application question regarding your availability to bring a vehicle to the internship.*

## Advisor Project Summaries 2018

### 1) Headwater streams of Chicago Wilderness: Assessment and communication

Hosting Organization: Openlands

Project Location: Chicago, IL

#### Project involves the following:

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods sitting for computer work
- conducting surveys or interviews with the public or special interest groups
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**

#### Project Description:

This project involves assisting with a headwater stream study in McHenry County and will entail sampling for fish, macroinvertebrates, and other aquatic life with Openlands and McHenry County Conservation District staff, entering data into a database, creating and interpreting maps and writing “stories” about headwater streams in the Chicago Wilderness Region for Openlands’ website. The intern may also assist with mussel surveys, and other Chicago Wilderness initiatives, throughout the Chicago Wilderness region, and may assist with entering data from these surveys. The stories created by the intern will convey the importance of headwater streams to a general audience in an engaging way. Approximately one day a week will be spent in the field, one day on data entry, research, or map creation, and three days on writing the stories. The intern may interview biologists and land managers to get information for stories, may write them from his or her own experience in the field and may take them from Openlands report Headwater Streams of the Chicago Wilderness Region: Status and Recommendations, adapting and expanding them for the web. At the end of the internship period, there will be collection of the stories written by the intern posted on Openlands website to highlight the importance and value of protecting and restoring headwaters.

#### Some of the student's duties and responsibilities will be:

- assisting with field work
  - wading through streams sampling fish, macroinvertebrates and mussels using nets and also possibly backpack electroshockers
  - sampling other aquatic life as needed such as mussels and amphibians.
- assisting with data interpretation and entry
  - preparing spreadsheets of data collected in the field
  - analyzing maps layers and aerial photography for the purpose of prioritizing headwaters to be sampled
  - attending meetings of natural resource managers and looking at and discussing the

- data as a group to establish criteria for selecting headwaters to be sampled
- writing about headwaters to convey their importance to a general audience in an engaging way
  - interviewing biologists and land managers/owners to get information for stories
  - Student should have an interest in writing.
- assisting with posting the headwater on Openlands website to highlight the importance and value of protecting and restoring headwaters

## **2) Invasion of Maculata apple snail the role of the invasive Water Hyacinth**

Hosting Organization: Southern Illinois University

Project Location: New Orleans, LA

### **Project Involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work

### **Project Description**

The Maculata Apple Snail, a native of South America wetlands, has recently invaded many wetlands in coastal Louisiana. In its introduced range, it has high fecundity, few predators, and the capacity to dramatically reduce submerged, floating and emergent wetland vegetation. At Jean Lafitte National Park, south of New Orleans, LA, its invasion is relatively new but it is rapidly spreading. The habitats in which it is most abundant are semi-permanently flooded backswamps with understories dominated by the invasive water hyacinth.

Based on observations in Summer 2017, it appears that female snails are frequently using stems of water hyacinth as a substrate on which to lay their eggs. Information from other regions where the snail has already invaded indicates that the snail also utilizes water hyacinth as a food source. The first objective of the proposed study is to determine which substrates the snails use to lay their eggs and whether there are preferences. The second objective is to determine whether the snails prefer certain types of wetland plant species for food. The study will require a field survey of egg masses and substrate types and a replicated aquaria study in the laboratory. If water hyacinth is facilitating the snail's invasion, this interaction may be an example of exotic-exotic facilitation during the snail's establishment phase. The snail may also have negative impacts on water hyacinth growth and abundance if it uses it preferentially as a food source.

### **Some of the student's duties and responsibilities will be:**

- familiarizing themselves with relevant scientific literature
- collecting data in the field
- establishing the aquaria experiment
- entering data and working to analyze the data statistically
- intern will also be in charge of preparing drafts for the abstract and poster to turn in to me and then revising them according to my edits and comments.

### **3) Land use impacts on microbial community structure and function in an urban wetland**

Host Organization: University of Wisconsin - La Crosse

Project Location: La Crosse, WI

#### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- extended periods of lab work
- extended periods sitting for computer work
- experience in general microbiological lab techniques (desired)

#### **Project Description:**

Today, more than ever before, there is an appreciation for the complex and highly valuable services that wetlands provide. Urban wetlands, in particular, are recognized for improving surface water quality, attenuating floods, providing critical habitat for wetland-dependent plant and animal species, and for their recreational and educational uses. Even so, urban wetlands experience a unique set of challenges. Along with the competing interests of development and conservation, polluted runoff from surrounding roads and other paved surfaces may compromise the functional integrity and biological productivity of urban wetlands.

The objective of this project is to build a spatial profile of microbial communities in the sediments of Myrick Marsh, an urban wetland, with different land use inputs (e.g., commercial, residential, transportation). These microbial profiles will include density, genetic diversity, and carbon utilization profiles (a measure of community structure) of the microbes present. These data will be utilized to assess the impact of land use on microbial community structure and ecosystem function.

#### **Some of the student's duties and responsibilities will be:**

- participation in all aspects of collection
- lab processing
- data analysis of microbial community samples
- experience in general microbiological lab techniques
- Microsoft Office applications (e.g., Excel) is desired but not mandatory

### **4) Using automated behavioral phenotyping to explore how environmental drivers influence the behavior of aquatic invertebrates, with implications for wetland conservation**

Host Organization: National Great Rivers Research & Education Center (NGRREC)

Project Location: East Alton, IL

#### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- extended periods of lab work
- extended periods sitting for computer work

#### **Project Description:**

Animal movement is vital to species interactions, and thus has important impacts on ecological communities. For example, the relative movements of predator and prey determine the strength and

outcome of trophic interactions. As such, understanding how animals move—such as their velocity, acceleration, turn radius, or turn velocity—is central to basic and applied ecology. A large and diverse set of drivers influence how animals move, including internal states such as their size, sex, life stage, and degree of hunger, and external drivers, including temperature, light, and turbidity. However, while the scientific literature is replete with studies testing how internal and external drivers influence animal movement, very little work has explored these patterns for multiple interacting species within a local community. Doing so will shed light on the mechanisms by which environmental drivers, such as global climate change or agricultural practices, influence the structure and functioning of local communities.

Using state-of-the-art experimental methods, the student will conduct laboratory experiments to test how temperature, light, turbidity, and pH influence the movement of aquatic invertebrates inhabiting wetlands, many of which play important roles in structuring ecosystems. The student will collect invertebrates from field sites near the NGRREC field station, and will make use of emerging methods in automated tracking to quantify behavior.

**Some of the student's duties and responsibilities will be:**

- many literature sources and learn to navigate through appropriate search engines, i.e. Web of Science, Google Scholar, etc., to find that literature
- synthesize that literature and relate it to his/her project
- opportunities to work through the primary literature with the advisor as well as participate in lab meetings where we will discuss specific papers
- think critically, help with experimental design, analyzing results, and drawing a conclusion based on those results
- present results and conclusions in a scientific manner and will be involved with writing a manuscript post-internship
- collect aquatic invertebrates from field sites and house them in the laboratory, this includes animal husbandry while the invertebrates are in the laboratory
- use a sophisticated digital camera setup and associated software to perform automated-image tracking

**5) Assessing phosphorus bioavailability in Lake Shelbyville and Carlyle Lake, two reservoirs in the Kaskaskia River Watershed**

Host Organization: University of Wisconsin - Oshkosh

Project Location: Oshkosh, WI

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- sampling by boat (**Student must be able to swim.**)

**Project Description:**

Excessive amounts of nutrients in lakes causes eutrophication and subsequent harmful algal blooms, leading to ecosystem damage and impairments limiting recreational use. The main sources of the growth limiting nutrient (phosphorus) in the water column stem from nonpoint source pollution such as tile drained crop production, livestock operations, streambank destabilization, municipal and industrial point sources in the watershed and sediment feedback. This project involves a detailed investigation into

nutrient dynamics within Lake Shelbyville and Carlyle Lake, and availability of those nutrients to aquatic plants. Samples will be collected from several locations in these lakes. The student will work with a team to collect a range of samples from a research vessel, immediately transport, process, and analyze them, and conduct algal experiments. In this research we propose to use a Dual Culture Diffusion Apparatus to determine the fraction of bioavailable phosphorus in the lake water and sediments of the studied systems. The student will also assist in developing a depth profile of carbon, nitrogen and phosphorus present in the sediments. Bioavailability of phosphorus in the water column and sediments and a sediment nutrient profile has, to our knowledge, not been determined for these lakes. The data generated in this research may be of importance to those charged with the prioritization of management interventions to bring impaired surface waters back into compliance.

**Some of the student's duties and responsibilities will be:**

- experience all aspects of the scientific process
- collect, process, and analyze their own set of samples before interpreting and reporting the results
- responsibilities associated with field and laboratory work
- field work will include traveling to central Illinois
- extended periods of time sampling on boats, carrying heavy equipment and samples, and keeping detailed field notes
- conduct field work in extreme heat and in rainy conditions
- working in the lab filtering samples immediately upon returning from the field
- prepare and manage algal experiments
- follow standard operating procedures for nutrient analyses at the DNR certified UW-Oshkosh ultra low phosphorus lab
- make reagents and digestion solutions
- maintain a clean and safe lab space and acid wash glassware
- student will be trained on the use of a high pressure filtering apparatus, spectrophotometer, and DCDA incubations
- maintain a consistent and organized record of their findings for data reporting

## **6) Genetic survey of topminnows in Missouri**

Host Organization: Missouri Science and Technology

Project Location: Rolla, MO

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**

**Project Description:**

The authoritative guide to the distribution of fishes in Missouri is *The Fishes of Missouri* written by William L. Pflieger (1975, 1997). The field identification of topminnow species, *Fundulus notatus* and *F. olivaceus*, can be somewhat challenging, even for professionals, particularly since the primary differentiating character is the presence or absence of spots along the dorsal surface, which can vary regionally in intensity. The latest edition of *The Fishes of Missouri* is currently in preparation by Robert

Hrabik, ichthyologist for the Missouri Department of Conservation, and concerns have been raised regarding the accuracy of identification of vouchered specimens of topminnows collected between 1889 and 1980 (Hrabik pers. comm.).

The major objective of this project will be for a student to travel to original locations in Missouri, where vouchered specimens in question were collected, and to obtain fresh specimens for molecular genotyping. Fin clip tissue samples will be collected for molecular genotyping, and specimens will be preserved in formalin and deposited into an ichthyology collection for curation. The student will extract DNA and assay species-diagnostic genetic loci. The student will also compare the morphology of genotyped specimens to pictures of vouchered specimens from historical collections from the same sites.

**Some of the student's duties and responsibilities will be:**

The student should have interest and aptitude in:

- mucking around in rivers and catching fish
- preserving fish and learning fish morphology
- extracting DNA and using basic molecular biology techniques for genotyping
- preparing a final report for distribution (and publication)

**7) Status of the state-threatened four-toed salamander, *Hemidactylium scutatum*, in Jersey and Calhoun Counties of Illinois**

Host Organization: Southern Illinois University Edwardsville

Project Location: Edwardsville, IL

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
  - terrain will be rugged, student is expected to be in good physical condition
- extended periods of lab work
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel, some in remote locations **(Student must be able to bring a reliable vehicle to accept this position.)**

**Project Description:**

The Four-toed Salamander, *Hemidactylium scutatum*, is a small amphibian of the Family Plethodontidae and is listed as threatened in Illinois. The distribution of *H. scutatum* is highly disjunct and they are considered to be a glacial relict species. As conditions warmed during the post-glacial period, habitat became less suitable for *H. scutatum* and it was restricted to remaining cold, wet microclimates, including spring-fed ravines, bogs, and fens. A relict population of *H. scutatum* is known from two spring-fed ravines in Pere Marquette State Park. However, its current status is unknown. Populations of *H. scutatum* have been extirpated throughout Illinois and a subsequent survey of Pere Marquette State Park by Heafner (1997) failed to relocate them, indicating their possible extirpation.

In order to assess the conservation status of *H. scutatum* in the Confluence Region, we will conduct an extensive survey within the unglaciated parts of Jersey and Calhoun Counties along the Illinois and Mississippi River bluffs. This will include resurveying Pere Marquette State Park, as well as adjacent natural areas along the bluffs of the Illinois and Mississippi Rivers, not previously surveyed. We will identify potential suitable habitat for *H. scutatum* based upon site visits to known localities, topographic

maps, and aerial photos. Surveys will be conducted using standard methods, including visual encounters, surveys of breeding sites, night driving, dipnetting and seining.

**Some of the student's duties and responsibilities will be:**

- responsible for identifying reptiles, amphibians, and plants found in the Confluence Region of Southern Illinois
- be expected to drive a personal vehicle to scattered and remote field sites for survey work
- intern is expected to be in excellent physical condition because of rugged terrain

## **8) Taste, odor, and algae on the Missouri and Meramec rivers**

Host Organization: Missouri American Water

Project Location: Saint Louis, MO

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**
- sampling by boat **(Student must be able to swim.)**

**Project Description:**

As a water supplier for approximately 1 million people in the St. Louis Region, Missouri American Water (MOAW) has special interest in the quality of our area rivers. Four MOAW water treatment plants across St. Louis County utilize the Missouri and Meramec Rivers as the source of drinking water for many St. Louis County, St. Charles County, and Jefferson County residents. Additionally, our counterpart in Illinois, Illinois American Water (ILAW), utilizes the Mississippi River as a source of drinking water. Thus, the health of our regional watershed is vitally important to protecting the quality of our source waters. In addition to supplying water that meets all safety standards, MOAW strives to provide water that is also aesthetically pleasing. Taste and odor compounds formed by algae can impart earthy or musty characteristics to water that are unpleasant. If algae grow out of control, they may even form Harmful Algal Blooms (HAB), which can produce toxic or harmful effects on people and wildlife. To better understand the presence of algae on our source waters and therefore maintain and improve the quality of water provided to our customers, MOAW is proposing a time-series algae quantification study of the Missouri and Meramec Rivers.

**Some of the student's duties and responsibilities will be:**

Under the supervision of MAWC and NGRREC staff, the intern will be expected to perform the following duties related to this project:

- Assist with preparing the sampling supplies.
- Assist with conducting sampling.
- Conduct field analysis.
- Assist with basic water treatment laboratory procedures.
- Under supervision of NGRREC and MAWC staff, record data and conduct statistical analysis in accordance with methods provided.
- Under supervision, prepare report, poster and presentation for intern symposium.

## **9) Investigating the relationship between angler behaviors and social normative beliefs**

Host Organization: University of Illinois at Urbana-Champaign

Project Location: Urbana-Champaign, Illinois

### **Project involves the following:**

- extended periods sitting for computer work
- conducting surveys or interviews with the public or special interest groups
- participating in a workshop with practitioners

### **Project Description:**

Aquatic invasive species (AIS) threaten the fundamental structures and functions of ecosystems in Illinois. Water-based recreationists, particularly anglers, contribute to the spread of AIS that can be transferred when equipment used in an invaded waterbody is then used elsewhere. Once AIS are present, mitigating their impacts is difficult, if not impossible. Consequently, AIS management is largely focused on prevention, particularly through educational outreach to anglers. To address this management need, a better understanding of the drivers of angler behavior is urgently needed. The proposed National Great Rivers Research and Education Center (NGRREC) internship will provide an opportunity for a student to engage with a program of research focused on the human dimensions of natural resources, particularly surrounding management of AIS in IL waterways. This independent research experience will examine the relationship between anglers' norms and environmental behaviors that threaten the health and ecological integrity of large river ecosystems, as well as enable a student to learn about multiple phases of the environmental social science research process, including survey design, data collection, analysis of research results, and the communication of findings to academic and applied audiences. Not only will the student advance a crucial area of research, s/he will inform strategies for engaging stakeholders in conservation that limits the impacts of AIS in the Midwestern US.

### **Some of the student's duties and responsibilities will be:**

- engage in fieldwork to learn about the environmental social science research process
- participate in regular discussions with the advisor and collaborators regarding study design, theory, objectives, and methods
- code and analyze survey data from license-holding anglers in Illinois
- synthesize results and communicate findings in a final paper, poster, and oral presentation.

## **10) Can sediments in reservoirs reduce agricultural pollutant loads in rivers? A case study of the Kaskaskia River watershed, central Illinois**

Host Organization: Saint Louis University

Project Location: St. Louis, MO (Field/ lab work conducted at: Lake Shelbyville and Carlyle Lake, IL; NGRREC in East Alton, IL)

### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**

- sampling by boat (**Student must be able to swim.**)

**Project Description:**

Agriculture can lead to excess inputs of normally limiting nutrients, like nitrogen (N) and phosphorus (P), to water resources. High levels of nutrients in water resources are responsible for increased primary productivity, leading to a range of human health impacts, like liver toxic algal blooms in Lake Erie, and environmental risks, like the expanding Dead Zone in the Gulf of Mexico. These effects are predicted to increase in magnitude and frequency, exacerbated by increasing pollution and climate change. This project will examine patterns of nutrient storage in lakebed sediments in a series of reservoirs along the Kaskaskia River in Illinois. The Kaskaskia River is highly impacted by agriculture, but the reservoirs along the river may trap nutrients, preventing them from reaching the Mississippi River, and ultimately, the Gulf of Mexico. The student selected for this project will work with an interdisciplinary team of scientists to collect sediment samples across two reservoirs on the Kaskaskia River: upstream Lake Shelbyville and downstream Carlyle Lake. The intern will determine nutrient content for the sediment pore waters, on mineral surfaces, and in bulk sediment. Sediment nutrient dynamics will be compared to water chemistry data collected by the National Great Rivers Research and Education Center's (NGRREC) monitoring network and a research team at the University of Wisconsin – Oshkosh to obtain a holistic understanding of the impact of agriculture on river systems.

**Some of the student's duties and responsibilities will be:**

- collecting and processing samples, analyzing results, and interpreting data for sediments from Lake Shelbyville and Carlyle Lake
- field work will include preparing equipment prior to field excursions
- field work will be conducted under various conditions (hot, rainy, buggy, etc.)
- sampling from a boat for extended periods of time
- carrying and operating heavy field equipment
- collecting field samples
- maintaining a field notebook
- lab work will include processing field sediment samples for pore water chemistry, mineral surface chemistry, and bulk elemental composition
- Student will be trained in proper lab techniques including proper personal protective gear, making reagents, following standard operating procedures for sediment analyses, acid washing labware, and preparing extractants and digestates for analysis on a DA and ICP-OES.

**11) Investigating the links between cellular physiology, growth, and survivability in the invasive zebra mussel**

Host Organization: Bradley University

Project Location: Peoria, IL

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- extended periods of lab work

**Project Description:**

The invasive zebra mussel, which is widespread throughout the Illinois River, has caused significant ecological and economical damage since its introduction. As sessile invertebrates, zebra mussels are unable to relocate when environmental conditions become unfavorable. Since they are conformers, they

are also unable to regulate physiology as conditions fluctuate, and they must be able to tolerate environmental variation to survive. Given their highly invasive nature, there is great interest in understanding which habitat conditions are at or near their lethal limits, and therefore, reducing physiological performance or resulting in mortality. Yet, while many studies have examined zebra mussel physiology under a variety of conditions, less is known about their performance during the natural fluctuations that occur in the field. My research lab has been studying a zebra mussel population at Banner Marsh for several years, but, all of our studies to date have been laboratory based. During this summer project, the intern will set up and maintain field enclosures for a period of four weeks in order to track mussel physiology over time in the field. The project will investigate links between ambient conditions (water temperature, water quality, and food availability) zebra mussel performance (survival, growth, and reproduction), and the cellular stress response (protein levels for two key cellular stress markers).

**Some of the student's duties and responsibilities will be:**

- trained (with supervision) to navigate the field site
- collect zebra mussels by hand
- set up and maintain lab aquaria
- harvest mussel tissue
- measure shell and soft tissue growth
- determine reproductive status
- isolate protein through tissue homogenization
- quantify proteins of interest using western blotting
- intern will also be guided through data analysis, including statistics, and presentation of data

## **12) Metal contamination and bioaccumulation in Asian Carp in the Lower Illinois River**

Host Organization: Department of Environmental Sciences, Southern Illinois University Edwardsville  
Project Location: Edwardsville, IL

**Project involves the following:**

- extended periods of lab work

**Project Description:**

Asian carp are the most important invasive species in the Great Rivers, and pose significant ecological and environmental threats to the Great Lakes. To effectively control the Asian Carp invasive species issue, various management options have been proposed and scientifically examined in past years, including development of economic and effective alternatives to the use of Asian carps. With the mindset of “Can’t beat ‘em, eat ‘em”, Illinois-caught Asian carp have been processed in the Midwest and exported worldwide as a food staple. Asian Carp contain high contents of protein and Omega-3 fatty acids among fresh water fish. Thus, generating high demand for Asian carp meal would help in controlling Asian carp populations in the Great Rivers. When Asian carp are used as a raw material for food production, the accumulation of various metal contaminants in Asian carp must be determined to assess its quality or suitability for human and pet consumption. The specific research objectives are to determine the concentrations of different metal elements in water samples collected from the Lower Illinois River and quantify the concentrations and distribution of different metal contaminants in different fish tissues/organs of Asian carp, including skin, muscle, bone, brain, liver, heart, and kidney. Concentrations of total metal contaminants in acid-digestion solutions will be measured using inductively-coupled

plasma-mass spectrometry (ICP-MS).

**Some of the student's duties and responsibilities will be:**

- participate in field sampling
- intern will be in charge of sample preparation (dissecting fish, drying and weighing fish samples) acid-digestion
- chemical analyses using ICP-MS
- data analyses
- preparation of the final research report in Lin's Lab under PI's supervision and assistance

### **13) Influence of changing hydrology on trematode parasitism in the Illinois River watershed**

Host Organization: Bradley University

Project Location: Peoria, IL

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**

**Project Description:**

Large rivers and associated wetlands undergo hydrological and other environmental changes as a result of both natural and anthropogenic factors. The intern involved in this project will work to examine how such changes are influencing an important but understudied component of these ecosystems: trematode parasites and their amphibian and mollusk hosts. A field survey will be used to assess patterns in parasite infection across wetlands in the Illinois River watershed. In particular, wetlands at Emiquon Nature Preserve will be surveyed to assess the consequences of an ongoing drawdown of water levels on parasite infection. The intern will quantify infection, use molecular tools for parasite identification, and analyze potential environmental drivers. Data that we collect on infection in Emiquon in summer 2018 will be compared to those for other wetlands as well as data from a 2017 survey. The results should provide valuable insights into the influence of hydrological changes and other environmental factors on parasitism in aquatic systems and the potential consequences for host populations.

**Some of the student's duties and responsibilities will be:**

- Student will be trained in:
  - field survey methods
  - trematode identification
  - DNA extraction and PCR
  - dissection, data analysis, and the written and oral presentation of science
- intern will collect samples of snails, larval amphibians, and water samples, and screen snails for parasite infection
- perform DNA extractions and PCR for submission for sequencing for parasite identification
- learn methods for quantifying parasite infection loads in larval amphibians via dissection under a microscope

- contribute to laboratory experiments assessing impacts of parasites on amphibians
- Intern should be willing to perform work in ponds in waders and spend substantial amounts of time in front of a microscope.

#### **14) Implementing a water-focused Environmental Issues Forum to guide students and teachers in deliberation towards community action**

Host Organization: The National Great Rivers Research & Education Center

Project Location: East Alton, IL

##### **Project involves the following:**

- extended periods sitting for computer work
- conducting surveys or interviews with the public or special interest groups

##### **Project Description:**

An Environmental Issues Forum (EIF) is a platform through which students and/ or communities engage in discussions around issues involving many stakeholders and viewpoints. Oftentimes EIFs are focused around controversial or contentious topics, such as climate change, and can be used to bring communities together to discuss and develop agreed upon action items with the help of a neutral moderator. EIF can also be a structured way for students to learn about important issues, see the issues from multiple perspectives, and develop their own action items for engaging in these issues on a local level. Additionally, EIF can be used as a means for students to develop their critical thinking skills and a stewardship ethic. This project aims to develop an EIF framework that can be used with students and teachers around water issues. The intern will assist in determining the specific water issue such as water quality, quantity, or conservation, which will be the focus of EIF framework to be produced through this internship. Once developed, the intern will coordinate the delivery of this framework to both students and teachers, and evaluate the effectiveness in the EIF lesson for providing students and teachers with strategies for action-oriented outcomes from healthy dialog on challenging water issues.

##### **Some of the student's duties and responsibilities will be:**

- be responsible for the development of a local, water focused Environmental Issues Forum platform for use with students and teachers
- outlining guidelines for implementing EIF hosting two EIF (one with teachers, one with students)
- developing materials for EIF participants which will include topic overview sheets and an EIF kit, and summarize the action items determined by the EIF groups
- receive training in developing discussion materials and in moderating EIF sessions
- Student also may be involved in recruitment of community leaders for a community focused EIF session.

#### **15) Northern Pike in Kankakee River floodplain lakes**

Host Organization: University of Illinois: Natural History Survey

Project Location: Champaign, IL

##### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- extended periods sitting for computer work

- Student must be able to swim.

**Project Description:**

Our projects primary purpose is to expose you to a variety of riverine environments, sampling methods, species identification, geographic information systems, data management, statistical analyses, and scientific reporting. Laboratory activities will take place in Champaign, Illinois, and field activities will be conducted within the Kankakee River basin in Illinois. We intend to provide you with a wealth of experience and hope to foster your interest in river ecosystems.

The project will focus on northern pike (*Esox lucius*) populations in the remnant Kankakee River floodplain lakes. We will provide managers with valuable distribution, abundance, and condition information. Additionally, we will measure ecological factors with the potential to influence their abundance and condition. The project includes surveys of fish assemblages, aquatic plants, physical habitat, and water quality. We will conduct fish surveys using boat and tow-barge electrofishing. Macrophyte specimens will be identified and mounted for preservation. Google Earth and field measurements will be used to characterize physical habitat, and water quality measurements will be taken using a handheld sonde. The acquired data will be used to construct a database to store and organize the data.

**Some of the student's duties and responsibilities will be:**

- identify fish and plant species
- use Microsoft Office (Word, PowerPoint, Access)
- calculate fish indices and enter data
- occasionally work long hours while performing strenuous activities, these activities will include hiking while carrying heavy gear and dip-netting large fishes
- Student with previous experience boating and using dichotomous keys is preferred, but not required.
- For safety reasons, we ask that the student have the ability to swim short distances.

**16) Developing Interpretive Materials and Evaluating their Effectiveness in Communicating Scientific Topics to the Public**

Host Organization: National Great Rivers Research and Education Center

Project Location: East Alton, IL

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- extended periods sitting for computer work
- conducting surveys or interviews with the public or special interest groups

**Project Description:**

A public understanding of relevant and timely scientific research is imperative to fostering informed citizens. However, science communication can falter if experts presenting the information can't discern what an audience needs in order to digest the message effectively and accurately. For example, an expert may unknowingly be considering themselves to be the ideal audience member, thus delivering on what they regard as the most important or interesting pieces of information, or using terms that are interpreted differently by their audience. Learning what your audience needs requires empirical evidence,

and in order to maximize what an expert has to offer, two-way communication with the audience must take place.

The intern for this project will shadow three research groups at the National Great Rivers Research and Education Center (NGRREC) in East Alton, IL and will develop interpretive materials that relay the researchers' work to a public audience. The intern will be responsible for choosing the media that is to be used (infographics, video blog, interactive display, etc.), and will develop a short survey with which to collect feedback from the public regarding how these materials were received. The intern will then write a short report guiding NGRREC's future interpretation efforts based on the results of this survey. The ideal intern will have an interest in science communication and preferably experience in multi-media.

**Some of the student's duties and responsibilities will be:**

- participate in multiple types of field work and/or lab work
    - assisting with data collection
    - asking necessary questions to make sure they fully understand the work being done
  - document, photograph, and/or record relevant aspects of field and lab work for use in the development of interpretive materials
  - research various media types, depending on their level of expertise in multi-media, to determine best fits
  - have nearly complete creative freedom to decide which medium is appropriate for showcasing which project
  - be responsible for learning, under the guidance of a multi-media specialist, to properly use and create with the media they have chosen
  - develop in-depth, comprehensive, and clever interpretive materials to be used as science communication pieces aimed at public audiences
  - submit their work to the researchers to whom it pertains to ensure accuracy
  - research evaluation techniques and chose those components that are relevant to this project
  - design a short evaluation survey to collect feedback on their interpretive materials
  - showcase their materials at public event(s) and communicate with their audience regarding their work
  - collect survey responses at public event(s)
  - analyze survey responses and write a short report detailing suggestions for future interpretative material development at NGRREC
  - put together a poster and PowerPoint presentation for the symposium
  - attend the Tyson colloquium and collaborate with their humanities fellows
  - host the Tyson Humanities fellows at NGRREC for a day
  - Potentially collaborate with the advisor beyond the internship for any publication opportunities
- Additionally, the ideal intern will have an interest in science communication and will preferably have some multi-media experience, though the latter is not a requirement.

**17) Forest bird community response to honeysuckle control from aerial spraying and prescribed fire**

Host Organization: The National Great Rivers Research & Education Center (NGRREC)

Project Location: East Alton, IL (field work to be conducted in a 90 mile radius of NGRREC field station)

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)

- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel **(Student must be able to bring a reliable vehicle to accept this position.)**

**Project Description:**

Illinois's Recreational Access Program (IRAP) has been implementing aerial spraying of bush honeysuckle followed by prescribed fire on private lands to control and reduce coverage of this invasive shrub since 2014. National Great Rivers Research & Education Center (NGRREC) has partnered with Illinois Department of Natural Resources to create the Habitat Strike Team (HST) and support habitat management on private lands within IRAP. Although there has been some research on effects of honeysuckle removal on wildlife, no one has assessed aerial spraying/fire impacts on forest bird communities. Aerial spraying is a promising cost-effective strategy that has the potential to be a wide-reaching prescription for heavily invested honeysuckle areas. Our project builds upon a previous 2017 NGRREC intern project that aims to elucidate avian forest bird response to these treatments.

Most importantly this internship will provide an intern with exposure to a multitude of career building experiences, including the research process, habitat management techniques, and programmatic aspects of a private lands conservation program. Thus our program has 4 major intern goals: 1) investigate the effects honeysuckle control techniques on the forest bird communities; 2) gain field experience with other HST projects surveying herps/vegetation 3) gain practical hands-on habitat management experience working directly with NGRREC's HST; and 4) become familiar with a private lands conservation program.

**Some of the student's duties and responsibilities will be:**

- conducting literature reviews
- learning local forest birds by sight, song and call
- learning common forest native shrubs, trees, and understory forbs
- navigating to survey sites with compass/maps and GPS/ArcGIS Collector
- conducting point-counts
- coordinating travel with other HST interns
- conducting vegetation/herp surveys
- interacting with private landowners
- working as a team member of the HST
- maintaining a positive attitude in adverse conditions and among different personalities
- practicing and following safe equipment protocols
- writing research reports and learning data analysis
- developing presentation materials
- presenting research results at the Intern Symposium
- willingness to work as a team and keep a positive attitude in adverse conditions

## **18) Evaluating the effectiveness of aerial spraying and prescribed fire to control invasive bush honeysuckle (*Lonicera* spp.) and the response of native ground flora**

Host Organization: The National Great Rivers Research & Education Center (NGRREC)

Project Location: East Alton, IL (field work to be conducted in a 90 mile radius of NGRREC field station)

### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel (**Student must be able to bring a reliable vehicle to accept this position.**)

### **Project Description:**

Originally introduced from Asia for landscaping purposes and wildlife cover, bush honeysuckle (BH; *Lonicera* spp.) has taken over environments throughout eastern North America. Life history characteristics allow BH to displace many native plant species outside its native range. In 2014 the Illinois Department of Natural Resources started combating infested honeysuckle areas with a combination of aerial spraying and prescribed fire. Last year's intern project started investigating the effects of these applications and initial results indicate a reduction of honeysuckle coverage. However, a continued long-term and in-depth investigation of honeysuckle and native plant response to this prescription is needed.

In addition to the mentored research project, the intern will get hands-on experience with restoration techniques from working directly with the Habitat Strike Team (HST) and assist with other HST research projects (bird and herp sampling). The intern will learn to identify management needs of various habitat types, be trained to operate management equipment safely, and gain exposure to conservation programs and professionals at multiple sites within a 90 mile radius of the NGRREC field station (East Alton, IL). The project will require strenuous activities on challenging terrain in adverse weather conditions and a mode of transportation to field sites (reimbursable mileage).

### **Some of the student's duties and responsibilities will be:**

The student selected for this internship will gain hands-on experience involving all aspects of environmental stewardship, invasive species treatment, ecological restoration, and habitat management. Using a number of different management techniques, they will gain a better understanding of ecosystems as a whole.

- reviewing literature pertaining to project
- setting up sample plots
- learning and identifying native forbs/trees/shrubs
- collecting data
- analyzing data
- presenting findings
- navigating to survey sites with compass/maps and GPS/ArcGIS Collector
- coordinating travel with other HST interns and HST/NGRREC staff
- operating backpack and UTV mounted herbicide sprayers

- operating power tools (i.e. chainsaws, brush cutters, leaf blowers, mowers, etc.)
- assisting with other intern projects
- maintaining a positive attitude in adverse conditions and among different personalities
- being a team player
- interacting with landowners

## **19) Enhancing agro-ecosystem services in the Kaskaskia Watershed: A value mapping study**

Host Organization: University of Illinois at Urbana – Champaign

Project Location: Urbana, IL

### **Project involves the following:**

- extended periods sitting for computer work
- conducting surveys or interviews with the public or special interest groups

### **Project Description:**

The proposed National Great Rivers Research and Education Center internship will provide an opportunity for a student to contribute to a human dimensions research project. The project will address socio-cultural (e.g., recreation) and ecological (e.g., water quality) dimensions of agro-ecosystem sustainability in the Kaskaskia River Watershed. This project will increase understanding of how management actions that enhance some services from agricultural lands (e.g., productivity), may have contrasting effects on others (e.g., soil health). The student will become part of an interdisciplinary team of researchers in the van Riper Lab at the University of Illinois at Urbana-Champaign. S/he will be engaged in multiple phases of the research process, including data analysis, report writing, and distribution of results from a participatory value mapping study. Specifically, the intern will be responsible for answering the following research question: what are the spatial relationships of perceived agroecosystem services within the Kaskaskia River Watershed? The student will engage with a dataset consisting of spatially-explicit indicators of stakeholder benefits and existing/projected stressors that influence provision of agroecosystem services. Collectively, this study will enable decision-makers (e.g., Illinois Department of Natural Resources) to adopt more sustainable practices that build capacity of the Kaskaskia community to cope with changes to the agro-environment.

### **Some of the student's duties and responsibilities will be:**

- discussing and engaging in conversations about the study design and methods used to collect survey and observational data from stakeholders in the state of Illinois
- assisting with interview data collection with the primary advisor in the Kaskaskia River Watershed region
- coding and analyzing focus group and interview data
- synthesizing results to be reported at the conclusion of the internship

## **20) Freshwater mussel habitat in river systems: The physico-chemical dimension**

Host Organization: Illinois Wesleyan University

Project Location: Bloomington, IL

### **Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)

- spending up to four hours in the water at a time
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)
- extended periods of lab work
- **Must have experience with laboratory techniques such as proper use of analytical balances and volumetric glassware (equivalent to completion of a course in general chemistry) is required to be offered this internship.**
- Student must be able to swim.

**Project Description:**

Freshwater mussels are organisms that are nearly invisible to most people, living buried in the sediment at the bottom of rivers, known only from the occasional dead shell on the bank. Yet freshwater mussels are a keystone species for freshwater river ecosystems in the Midwest. They are also greatly imperiled by a history of exploitation, environmental contamination and the radical alteration of the landscape around them. One challenge with conserving mussel habitat is that the mussels themselves can be difficult to find, both because they inhabit the sediment at the bottom of the river and because they occur in disperse patches.

This study explores the link between the physico-chemical environment of the river sediment and the mussel community that inhabits it. The aim is to sample the Mackinaw River for mussels in a spatially intensive manner on both the scale of the river and of reaches within the river. The sediment will be analyzed for physico-chemical properties that can be related to mussel abundance and diversity. Some of these properties (such as the concentration of toxic elements) may also act as proxies for anthropogenic perturbation of the environment. By gaining better understanding of how sediment relates to mussels, we can understand the practices that can have the greatest impact on conserving mussel species.

**Some of the student's duties and responsibilities will be:**

- identifying native mussels based on shell morphology
- working with advisors to develop a sampling plan
- conducting water quality tests
- searching for live mussels and collecting dead shells
- identifying mussels collected and subdividing the reach for sediment sampling
- hiking to sites while carrying moderate amounts of gear, possibly without the aid of a trail, in or out of the water
- spending up to four hours in the water at a time
- In the laboratory, students will sieve sediments and weigh size particle fractions
- work with their advisor to acid digest sediments and analyze digests for trace elements
- Experience with snorkeling is recommended.
- Previous experience with laboratory techniques such as proper use of analytical balances and volumetric glassware (equivalent to completion of a course in general chemistry) is required.

**21) Searching for microplastics in the Great Rivers**

Host Organization: Lewis and Clark Community College

Project Location: Godfrey, IL

**Project involves the following:**

- fieldwork in various weather conditions (hot, buggy, etc.)
- physically strenuous activities (carrying heavy gear, operating machinery, etc.)

- extended periods of lab work
- extended periods sitting for computer work
- using a personal vehicle for field or project related travel (**Student must be able to bring a reliable vehicle to accept this position.**)
- **Student must be able to bring a reliable laptop to accept this internship.**

**Project Description:**

With growing public concern about plastics in our oceans and rivers, this project will explore the microplastic content in the Illinois and Mississippi rivers at different collection points. Microplastics are plastics less than 5 mm in size. There are primary microplastics, which were created that size, and secondary microplastics, which have degraded to that size. A day in the life of this research project will involve going to the different collection sites and collecting water samples. We will then go to the lab and filter the samples, weigh the samples and look at them under a microscope. We'll count the particles of plastic and find out how many microplastic particles per liter are present. We will compare the Illinois River to at least two different collection sites on the Mississippi River. One of our collection sights on the Mississippi will be near St. Louis, so we can compare the city's effluent with the effluent from smaller cities in Illinois. We will look for differences in micoplastic content. If we have time, we may collect from more areas. We will need to see how long it takes to analyze the water samples. In addition, the research intern will need to spend time studying about microplastics and plastic chemical composition on a computer of their own. This will help with the creation of a research poster at the end the research experience. We will work on the poster throughout the internship, so it will not be such a large project at the end of the internship.

**Some of the student's duties and responsibilities will be:**

- addresses a major problem with microplastics to the world and helps characterize this problem for various sites in the Great Rivers
- lifting 1 liter bottles of water and driving to water collection sites
- learning microscope and filtration skills
- reading papers and look at websites to gain a background for the problem to create an interesting presentation and poster
- student will need their own computer
- A student interest in environmental pollution would be ideal for this internship.
- This project is ideal for someone who is new to science and exploring science as a future career.

**22) Reducing nitrate inputs to rivers: Modeling performance of denitrifying bioreactors**

Host Organization: University of Illinois Urbana Champaign

Project Location: Urbana, IL

**Project involves the following:**

- extended periods sitting for computer work

**Project Description:**

Nitrogen is an essential nutrient, and therefore an important component of agricultural fertilizers. However, in rivers and other water bodies, increasing the concentration of nitrogen can disrupt the ecosystem. To maintain agricultural productivity without sacrificing the health of river and coastal ecosystems, it is therefore important to identify effective and economical ways to prevent nitrogen from

fertilizers from reaching rivers. One proposed approach is denitrifying bioreactors, which intercept subsurface tile drainage systems and facilitate biological removal of nitrate from the water. Typically, approaches to remove nitrate across a watershed would be compared both experimentally and with modeling studies. However, existing process-based models have not been tested or adapted for denitrifying bioreactors, preventing a model-based comparison of this approach. The proposed work will use, evaluate, and modify an existing biogeochemical model for agroecosystems for use with denitrifying bioreactors. The model results will be compared to existing measurement data from field-scale bioreactors in the United States. Application of this model will facilitate watershed scale studies designed to identify the most effective combinations of locations and management strategies to reduce nitrogen inputs into Midwestern rivers.

**Some of the student's duties and responsibilities will be:**

- Modeling
  - Learning about the nitrogen cycle in agroecosystems and its impacts on river water quality
  - Learning to run the DNDC model
  - Collecting and organizing field measurement data for input file development
  - Running case studies in DNDC
  - Calibrating and evaluating the model
  - Analyzing, presenting, and interpreting results from model runs
- General scientific
  - Keeping clear and detailed laboratory notebooks
  - Entering data into project database
  - Meeting daily with graduate student advisor and weekly with faculty advisors
  - Preparing multiple drafts of required summary, abstract, poster, and presentation
  - Incorporating feedback from graduate student and faculty advisors into later drafts
  - Meeting all NGRREC internship program requirements