Jacob Bower- Bir

We aim to study, in a laboratory setting, how groups of individuals interact when managing a shared resource. Natural resources are finite, and individuals often overexploit these when they encounter other individuals that also have access to the resources in question. Collaboration and teamwork may help individuals overcome this overexploitation, allowing more individuals to enjoy resources equitably. But what happens when there are multiple teams; teams that do not necessarily have the same values or capabilities? It is possible that the benefits of teamwork might be undone when groups of cooperating individuals encounter other groups. Our experimental treatments will allow us to better understand the limits of cooperation and the behavior of groups in strategic settings.

What are the connections to sustainability?

The world faces species extinction, deforestation, and pollution at unsustainable levels. In many of these cases, competing groups are the drivers of the overexploitation of resources. Our research aims to study the interaction between groups collectively managing a common resource so as to make better predictions about group behavior and ultimately help in crafting more effective policy for more sustainable use of resources.

Will there be any implications for the IU-Bloomington communities?

We intend to conduct two, one-hour workshops where interested undergraduates are introduced to experimental methods and social dilemmas. An additional workshop will be held for members of IU’s Student Sustainability Council.

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Environmental consequences stemming from climate change produce extensive livelihood adjustments, particularly for people in acutely vulnerable social-ecological systems. Water scarcity resulting from climate change is a major global sustainability challenge. Livelihood systems in the Mount Kenya region rely on small-scale agriculture and are directly dependent on water availability. However, climate change, population increase, and water scarcity make livelihoods particularly vulnerable.

To cope with difficult environmental conditions, such as water-scarcity, poor soil quality, and high temperatures, farmers apply principles of sustainable agriculture, such as mulching and intercropping. Effective water governance within the Mount Kenya region is increasingly important as population pressures increase and irrigation becomes more prominent. Water management at the local and regional levels involves multiple actors and rules which ensure that water is used efficiently in times of both water scarcity and abundance. This research investigates the water governance structure as well as the sustainable agricultural practices throughout the Mount Kenya region in an effort to understand systems that may be better equipped to cope with changing water availability. The research takes a participatory approach where both researchers and farmers actively exchange ideas and knowledge through workshops, community meetings, and participatory video making initiatives.

What are the connections to sustainability?

Many water-scarce locations face future challenges related to climate change and variability of rainfall. In the Mount Kenya region, water governance plays a significant role in ensuring water availability during times of shortages. This project investigates the governance structure, water use, and agricultural practices of small-holder farmers with a focus both on their present and future resilience to changing water availability. Sustainability of livelihood practices is multi-scalar with the household, village, and regional levels all interacting with one another. At the household level, agricultural practices such as cover cropping, mulching, and intercropping all influence the sustainability of operations and ensure efficient use of available water. At the village level, water rationing between households and programs encouraging rain water harvesting guide efforts promoting sustainable water use. At the regional level, coordinated rationing and water use rules between villages located within a common sub-catchment exist to allow households and communities to meet their basic needs in times of water scarcity, as well as to ensure that water is used efficiently when abundant.

This research effort examines these multi-scalar practices across thirty village-level water projects in five different sub-catchments. The wide geographic scope allows for accumulation of knowledge and practices that are taking place to ensure sustainable water use and agricultural practices. By amassing this information, we will offer findings of which practices are particularly effective to assist in governance and decision making activities at the household, village, and regional levels.

Will there be any implications for the IU-Bloomington communities?

This research effort is taking a participatory approach where an active exchange of ideas will take place between researchers and farmers. We plan to raise awareness of water insecurity and the consequences of climate change by sharing with the IU community the experiences of farmers who engage in water rationing and sustainable agricultural practices to meet their daily needs. These practices will be documented through video interviews with water project
managers, government representatives, and small-holder farmers. Videos will be made available for viewing to the IU community, as well as to village members and actors within the water governance structure of the Mount Kenya region. This will create a link between the IU community and the local farmers involved in the project and aim to enhance a sense of global sustainability consciousness.
The RAIN Initiative

The IU Championship Golf Course borders the IU Research and Teaching Preserve (IURTP) and large ravines and eroded areas have developed as a result of golf course runoff during rainstorm events. Our research tests the biodiversity-ecosystem functioning hypothesis that species diversity promotes enhanced functioning of ecological processes. We hypothesize that species-rich plantings will perform better than low richness plantings at trapping sediment, absorbing nutrients, and slowing flow velocity during storm events. Downstream water sampling sites will be established at each experimental ravine to monitor sediment yields, nutrient outfalls, and water flow as a function of diversity treatment.

What are the connections to sustainability?

Sustainability includes human interaction with landscapes and water resources. Our research will provide important information for making sustainable land use decisions on campus, helping to validate initiatives for native plants, rain gardens, and ecological restoration.

Will there be any implications for the IU-Bloomington communities?

The flux of material and energy between natural and built interfaces make habitat edges important ecologically and socially. The “edge effect” applies to human stewardship as well, as a land management approach that emphasizes coordination of efforts and the promotion of interdisciplinary knowledge. We plan to harness the potential of these social and ecological exchanges in our stormwater research project by involving students in our research and publishing findings on our online portfolio.

The RAIN Initiative

What were the first steps that you took to start your research?

We partnered with University Landscape Architect, Mia Williams and IU Golf Course Manager, Mike Freel, around the idea that a well-designed project for bio-infiltration will improve and add value to the golf course, while providing many other ecological benefits to the surrounding watershed. We had to make sure that a design would be compatible with the golf course play and layout, that the design would function to mitigate land and water issues, and that we could accurately quantify the effect of that design (nutrients, sediment, and discharge). We have garnered support from the IU Research and Teaching Preserve, Monroe County Soil and Water Conservation District, the IU Golf Course, IU Landscape Design, Environmental Health and Safety, Environmental Quality and Land Use Working Group, and fellow students to get the project off the ground and running. Now we are focused on obtaining pre-mitigation nutrient and runoff measurements.

What are your working conditions?

We are interested in collecting data during the peak flow of storm events, which means that we have to go out on the Golf Course when it is raining to collect our data. Since the flush comes through ravines quickly, we have to be prepared to respond. We have been
working to make our process more efficient by concentrating flow through weirs, which we are building by hand with help from Michael Chitwood at the IU Research & Teaching Preserve. Those of us that can meet each Friday to do necessary field work. Simultaneously, we are tailoring designs to each ravine and coordinating logistics for the construction of a pilot water and sediment basin.

Do you have a mentor that you are working with?

We work with professors Keith Clay, Heather Reynolds, and Melissa Clark, who offer guidance in their area of expertise. Melissa Clark also supports the project through access to the Jones lab for water analysis. Todd Royer has given us technical support in regard to concentrating and measuring flow. Rafael Vega and Scott Wagner from the Natural Resource Conservation Service have helped us to develop technical designs for water and sedimentation basins. The project requires that we coordinate across disciplines for appropriate design and measurements.

How has the grant helped you? How are you using the funds?

Project funds have been used to purchase field and lab equipment, weir construction, and greenhouse fees. We expect our largest use of funds to be for the construction of a pilot Water and Sediment Control Basin (WASCOB) this fall, and subsequent green infrastructure.
Both long-term and short-term exposure to elevated concentrations of atmospheric aerosol particles poses a significant threat to human health. Marion county (in which Indianapolis is based), was nonattainment for the national air quality standard for fine particulate matter (solid or liquid particles less than or equal to 2.5 micrometers in diameter, referred to as PM$_{2.5}$) from 2005-2012. Our research objectives are to:

- Analyze spatiotemporal variability of PM$_{2.5}$ in an urban environment
- Investigate sources of PM$_{2.5}$ in Indianapolis, Indiana, and specifically try to differentiate the impact of local versus distant or regional sources.
- Investigate causes of observed extreme concentrations
- Quantify the exposure of residents of Indianapolis to harmful air quality.
- Identify neighborhoods at particular risk for exposure to air toxins.

Our research comprises two key experimental components: Fixed site monitoring across the city and mobile sampling collected during bicycle transects of the city. Fixed monitoring can only be conducted at a few specific locations. Mobile sampling will help to better understand the degree to which particle concentrations (and human exposure) vary across a city.

In the longer term – through our close collaborations with the IUPUI Center for Urban Health, our colleagues, and the Indiana Department of Environmental Management, we hope to be able to identify measures that can be put in place to reduce human exposure to air toxins and thus to improve the sustainability of Indiana’s largest urban area.

**What are the connections to sustainability?**

26 million people in the Midwest live with air quality we know is harmful to their health. Indianapolis has failed the National Air Quality Standard for PM$_{2.5}$ for the last decade and thus we know hundreds of thousands of people in Indiana are suffering negative health consequences because of exposure to this environmental toxin. Understanding the sources and actual exposure to this toxin will allow us to better attribute the causes of the high concentrations, to understand who is being exposed and when, and ultimately to reduce these exposures. These are the very cornerstones of all efforts to enhance sustainability. Further, exposure to unhealthy air quality is far from uniform across the city of Indianapolis. Our initial research has shown strong spatial gradients and that neighborhoods with lower socio-economic indicators tend to be characterized by worse air quality. Thus, this issue, has strong and direct links to social justice, and to economic prosperity since exposure to this environmental toxin leads to a range of human morbidity (e.g. increased asthma incidence) that impairs the ability of the exposed individuals to work.

**Will there be any implications for the IU-Bloomington communities?**

Although our research is focused in Indianapolis, air pollution is a regional issue across the Midwest. Better understanding of the local influences that result in high particulate concentrations in the region’s major metropolitan areas will provide a framework for sustainable growth and development in the Bloomington area.
Scott Breen

I am leveraging my internship in the Department of the Interior's Office of Youth, Partnerships, and Service to interview those that work on partnerships at the departmental level and at the bureau level, mainly at the National Park Service. The plan is to interview solicitors, partnership coordinators, park superintendents, and others who can provide insight into my research question. The hope is to better understand what legal authority exists to make partnerships and if there are any holes in that legal authority that impede the National Park Service from making innovative partnerships that would help further its mission. If sufficient legal authority exists, this will be an important finding for lawmakers as then they will know that no further legal authority needs to be given and the National Park Service should focus on changing its culture to better take advantage of their legal authority to form partnerships. Further, I also want to understand if the legal authority to form partnerships is adequately explained to those at the field level. If it's too complicated, it may be that those at the field level do not make partnerships because it’s too big a barrier to take the time to understand what partnerships the legal authorities allow them to establish and what is required of both sides when forming a partnership.

What are the connections to sustainability?

The Department of the Interior is charged with protecting America’s backyard—our public lands. The Organic Act of 1916 directs the National Park Service the manage its land such that it “leave[s] them unimpaired for the enjoyment of future generations.” Adequate management of our public lands is becoming more difficult in the face of declining budgets. In order to meet their important missions and to ensure that our public lands are adequately and sustainably managed, partnerships with non-federal entities are increasingly going to need to be utilized. Often working together allows for a more efficient use of resources with the results being better stewardship of our natural resources. However, if the legal authority doesn’t exist to form certain types of partnerships or the legal authority seems so complex that employees don’t consider potentially useful partnerships, then this efficiency and improved stewardship won’t come about, which makes meeting the mission of managing these lands so that they are unimpaired for future generations that much more difficult.

Will there be any implications for the IU-Bloomington communities?

There are a number of federally managed lands in Indiana including those under the United States Department of Agriculture like the Hoosier National Forest and the Charles C. Dean Wilderness Area, and also those under the Department of the Interior like the Indiana Dunes National Lakeshore and the Big Oaks National Wildlife Refuge. If these lands are managed better via partnerships, the IU-Bloomington community will benefit. Further, reading about the holes and complexity in partnership legal authority at the federal level may spur land management government bodies at the Indiana state level and local level to review their partnership legal authority as well.

What were the first steps that you took to start your research?

I knew that my research depended on gaining insights from those in the field. One of the great aspects of working at the Department of the Interior and under the Partnerships Coordinator for the Department, who himself worked at one of the most innovative National Park Service units in Golden Gate National Recreation Area, is that it wasn’t too hard to find good people to
interview. Before interviewing anyone though, I tried to develop a list of questions that got at my central question of how legal authority impacts the ability and motivation to form partnerships but also could be asked of most anyone involved in this area so that I could compare answers. This actually took a fair bit of work and revising, especially to make sure I was avoiding leading questions. In order for the questions to be intelligent ones, I had to read up on the various partnership legal authorities at the departmental and bureau levels. Luckily, the Department of the Interior (DOI) has a partnerships legal primer that the DOI Office of the Solicitor first published in 2004 (it can be accessed here: http://www.doi.gov/partnerships/upload/PartnershipLegalPrimer1stEdition.pdf). I also scoured google scholar for research that talked about interagency partnerships and public-private partnerships in the natural resources management areas. So, to sum up, my research started with the following steps: 1) Research on existing literature as well as on statutes and regulations addressing DOI’s and each DOI Bureau’s authority to form partnerships; 2) Develop a list of intelligent questions that could be asked of each interviewee; 3) Network to find valuable people to interview that could speak from experience on my research topic.

What are your working conditions?

The sequester meant that several positions in the DOI Office of Youth, Partnerships, and Service were not filled. Thus, I actually had my own desk, window, and—wait for it—couch! I could not have asked for a better set-up at the DOI headquarters in Washington, DC. I had a fantastic boss who was both smart and supportive. He was a lawyer so he had a lot of knowledge on my research topic; asking him questions gave me a good base of knowledge. The people in my office are dedicated to their jobs. My boss was extremely flexible in allowing me to do all the necessary interviews. He also supported my putting together a brownbag on the state of partnerships at DOI. I organized and moderated this brownbag, which was a panel of eight people focused on partnerships both inside and outside the Department that was open to the whole Department. About 30 people attended, it was filmed, and it will soon be posted publicly on the DOI partnerships website.

Do you have a mentor that you are working with?

Yes. My boss, the DOI Partnerships Coordinator, Paul Batlan. I could not have asked for a more supportive person to collaborate with. He was with me from the beginning when I proposed the research grant to him. He even wrote a letter of support that I included with my application. He has worked in the field and knows lots of people. Thus, he was a great source of knowledge and also of contacts for me to interview. On top of all that, he’s also an extremely thoughtful person that’s always making everyone in the office feel comfortable and that they have someone to turn to with any issues.

How has the grant helped you? How are you using the funds?

The grant allowed me to live in Washington, DC. Without living and working in DC this research would not have been possible because the value-added is all these interviews with folks on the ground. I also put the funds toward my trip to California in August where I interviewed NPS professionals at Sequoia & Kings Canyon National Park and Golden Gate National Recreation Area.
Ben Inskeep

Professor Shahzeen Attari and I are examining two dimensions of household water conservation: how effective specific actions are at saving water, and how easy they are to implement. First, we are quantitatively estimating how much water the average U.S. household can save by implementing certain indoor and outdoor conservation actions. We will then rank actions based on their water-saving potential, creating a concise, ordered list that will help households prioritize among conservation actions. Finally, we are designing and disseminating a survey to examine how difficult or easy it is for households to implement each conservation action. Ascertaining how easy it is for households to implement these actions can assist decision-makers in designing effective residential water conservation policies by highlighting specific areas where households can more easily curb consumption.

What are the connections to sustainability?

To thrive within our means, we must use our scarce natural resources wisely. Our research highlights the tremendous potential to improve how efficiently we use water without sacrificing well-being. Not only is residential water conservation cheaper than finding, transporting, and treating new supplies, it has the added benefit of avoiding the carbon emissions associated with such an energy-intensive system.

Will there be any implications for the IU-Bloomington community?

Yes. The research will be applicable for any household looking to save money and help the environment by minimizing their daily water use.
Jess Vogt

Our research evaluates the tree-planting programs of 5 nonprofit organizations in the eastern U.S. We're interested in discovering what types of ecological and social impacts collective tree planting and maintenance has on neighborhoods and individuals. For instance, our nonprofit partner organizations have noticed that some of the neighborhoods in which they plant trees then go on to do other types of group activities, like a neighborhood crime watch. But so far, these are just anecdotes; we're interested in putting real data behind the question to see what impacts tree planting has. Our project will collect data on the trees planted between 2009 and 2011 to measure survival rates and growth rates. We will also survey and interview people who live in neighborhoods where trees were planted as well as in neighborhoods that did not plant trees to measure the differences in neighborhood and individual characteristics such as trust and neighbor-to-neighbor familiarity. The IUOS grant funds will be added to almost $400K in existing project resources, and will specifically help increase the number of people we can survey in each city.

What are the connections to sustainability?

Ultimately, our research will contribute to a better understanding of neighborhoods and the impact of neighborhood activities like tree planting on the ecological and social sustainability of a neighborhood. There is some research to suggest that characteristics like trust and familiarity are related to the ability of a group to respond to disturbances, like economic shocks or climate change. Our research will improve our knowledge of the linkages between greening activities like tree planting, other types of neighborhood activities, and the features of a neighborhood that could be connected to sustainability.

Will there be any implications for the IU-Bloomington communities?

We are partnering with 6 nonprofits in cities around the country: Keep Indianapolis Beautiful, Greening of Detroit, Forest ReLeaf of Missouri (in St. Louis), Pennsylvania Horticultural Society (in Philadelphia), Trees Atlanta, and Alliance for Community Trees. As we embark on data collection in the spring and summer of 2014, we will be making additional connections with local researchers and research universities in each of our study cities. National, collaborative research of this sort can set up IUB students and faculty for future collaboration in research and grant writing and foster additional projects with national impact.

What were the first steps that you took to start your research?

The survey we’re developing will be distributed next February-March. In preparation for this, we’ve been piloting the survey in 4 neighborhoods in Indianapolis this summer, to make sure that the questions we’re asking on the survey are the right questions and that the way we’re distributing the survey is the best method possible.

What are your working conditions?

Our research group is lucky enough to have office and conference room space at the Center for the Study of Institutions, Population and Environmental Change (CIPEC), at 408 N. Indiana Ave. (see attached picture).
Do you have a mentor that you are working with?

Dr. Burney Fischer at SPEA is the faculty mentor for this project and the leader of the Bloomington Urban Forestry Research Group at CIPEC, with which this project is affiliated.

How has the grant helped you? How are you using the funds?

We will be using the funds to pay for distributing surveys next February. Surveys cost approximately $5-6 each to send out. Since we only between 1 in 6 and 1 in 5 surveys are returned, this means that it cost approximately $25-30 per survey response. The IUOS funds will be used to survey approximately 1,000 individuals.