

2015 MIDWEST UNDERGRADUATE GEOGRAPHY SYMPOSIUM (MUGS)

Saturday, April 18, 2015, at Gustavus Adolphus College in St. Peter, MN

ABSTRACTS – Oral Presentations

Alysha Alloway, Macalester College

"Coldwater Spring: The Question of Sacred Space"

What is sacred? If land is sacred, should it be treated as an object, returned to its original owner, or should it be opened equally for all people? Coldwater Spring and its surrounding land presents this complex issue in the question of how land considered sacred should be treated. In this presentation I will discuss the history of Coldwater Spring, question what it means for land to be considered sacred, and look to Coldwater Spring as an example to better understand the effects of changing landscape and urbanization on land that several groups are trying to claim- all who have a different best interest and function in mind. What is the best course of action for land that is disputed, in both its ownership and actual status as 'sacred'?

Gabrielle Anderson, Macalester College

"Wayward as the Minnehaha: A Mapped History of Human-Environment Interaction in the Minnehaha Creek Watershed District"

Minnesotans have enjoyed and valued the water bodies of the Minnehaha Creek Watershed District for generations. This relationship between the people and the water is found in stories of flour mills, amusement parks, and re-meandering projects set within the watershed's boundaries. Using the ArcGIS Online Story Map Journal application, this presentation brings these stories together and elegantly displays them as an interactive tour through space and time - while educating the viewer on the rich history that watershed residents have created since the early nineteenth century.

Nathaniel Bettin, University of St. Thomas

"Assessing Minnesota's Wind Power Potential"

A transition from more expensive, nonrenewable fossil fuels will likely become inevitable in the future, due not only to rising costs but also due to the negative environmental impact they cause. If Minnesota is to make this transition away from fossil fuels, then assessments of different types of renewable energy and their potential will need to be made.

One of the major factors to consider when assessing renewable energy resources is energy sprawl. By determining how much land is needed for different types of renewables, such as biofuels or solar power, we can better determine what may be the best investment for the state of Minnesota, and possibly for other states as well.

This presentation will focus on mainly on one potential energy resource: wind energy. This assessment has three main criteria, namely portability, excluded areas, and agricultural lands. By constructing a GIS model using data such as energy usage, energy infrastructure, and wind speed, we can better understand which areas have the highest potential for energy generation. Using a separate GIS model, we can then determine which areas contain criteria that would make them unsuitable for placement of wind turbines, whether it is because they are too close to airports and lakes, or if the wind speeds in an area are too low to make for efficient energy generation. Finally, by using data to show agricultural areas, it can be shown what areas are already suitable for the building of new wind turbines and wind farms.

By showing not only the total area that in the Minnesota required for wind farms in order to cover the state's energy needs, as well as which areas of the state are most suitable for the placement of turbines or may be already developed in a way that would make them ideal for the placement of turbines, we can better understand what using wind power in Minnesota would mean for the state, as well as gain a better perspective as to whether it is a viable option for other states and beyond

Aileen Clarke, Macalester College

"The Ethnoburb: A New Ethnic Social Form in Midwestern America?"

Minority and migrant groups in America have typically been studied in the context of chain migration and ethnic enclaves. In light of shifting urban/suburban trends, the typical methods of studying and classifying the spatial dispersions of minority, migratory populations are no longer sufficient. Using the concept of the "ethnoburb" to frame the case study, this paper argues that the out-migration of Hmong from the Twin Cities central core to the suburbs is likely part of an evolution into an "ethnoburb." This work analyzes the history of the Hmong in Minneapolis-St. Paul, MN and whether current trends suggest the formation of an ethnoburb, a suburban cluster of co-ethnics who have concentrated in an area to live but not necessarily work. Minority co-ethnics living in an ethnoburb are relatively more spatially diverse than the population of an ethnic enclave would typically be considered. In an ethnoburb, group members are considered more socioeconomically assimilated to American society, though socioeconomic heterogeneity is still characteristic of this urban form. The suburban Hmong population of the Twin Cities appears to be evolving according to the definition of an "ethnoburb," migrating in large numbers over the last decade to suburbs like Brooklyn Park and Brooklyn Center.

Britta Dornfeld, Macalester College

"Healing and Wilderness: Minnehaha Creek Methodist Hospital Re-meander"

In 2009, Minnehaha Creek Watershed District completed its first remeander project on a portion of Minnehaha Creek near Methodist Hospital in order to restore the river to its pre-channelized conditions and create a healing garden. This project has both a scientific and aesthetic aspect, each of which is important when considering the success of the remeanders. The remeander fits in well with changing scientific trends in river restoration as it reflect principals of Rosgen's Natural channel design philosophy. The aesthetic component of the remeander is especially important to the second goal of the project, to create a healing garden. Using a restored river as a healing garden is much different than the traditional approach to healing gardens, and it reflects a balance between intense design and a growing desire for wilderness.

Katie Feterl, Gustavus Adolphus College

"Local Food Innovation Center Feasibility Study in Pine River, MN"

A feasibility study for establishing a "Local Foods Innovation Center" in the Pine River area (north-central Minnesota) was conducted as part of a larger five-county collaborative project towards creating a regional local foods network. The primary goal of the center was to make the local market more accessible to small area farmers without duplicating or encroaching upon other pre-existing efforts. Early work on the study relied on conversations with local producers at farmers' markets and on their farms to gain a sense of the climate of the agricultural community and the challenges faced by small farmers. These conversations illuminated a complex array of issues influenced in part by the economic conditions and rural geography of the region. Gaps in the current system include access to value-adding facilities, business and marketing training, streamlined markets for institutional buyers, and farmer-to-farmer networking. Identifying these areas of need provided a starting point for more in-depth research on the exact role the proposed center could best serve.

Brianna Furey, Gustavus Adolphus College

Brendan Maloney, Gustavus Adolphus College and

Talia Moorman, Gustavus Adolphus College

"Examining Urban Change in Mankato's Lincoln Park Neighborhood"

This study draws on archival research and documents to investigate the process of urban change in the historical Lincoln Park neighborhood of Mankato, Minnesota. Lincoln Park was founded in the late 1800s and thrived for many years as the "ideal residential area" of the city. There was an increase in rental properties in the neighborhood when Mankato State University moved to its current location and students sought nearby housing. In response to this increase, the city implemented new ordinances regarding rental licenses in 2008. In recent years, while some properties are shifting back to owner-occupied, there are still many rental properties in the neighborhood. Currently, about one-third of the neighborhood's properties hold rental licenses. The neighborhood is now culturally and economically diverse, and efforts have been made to increase the "neighborliness" of Lincoln Park to make it a more cohesive neighborhood. We argue that the recent rental license ordinance is encouraging the gentrification of the Lincoln Park neighborhood, and understanding the processes at work can aid future policy-

making for effective neighborhood planning.

Josh Greenwell, University of St Thomas

"Low Input and High Diversity: Restoring Minnesota Grasslands With Energy Landscapes"

The need to transition from fossil fuels is fueling a transition to renewable energy. Minnesota's current renewable landscape consists of wind, solar and ethanol production. Ethanol production is associated with a number of limitations and problems including energy sprawl. This research studies the potential environmental benefits of transitioning from ethanol to low input and high diversity (LIHD) bioenergy systems surrounding prairie lands. LIHD is a mixture of grassland perennials that are cut periodically and used as biofuels. To accomplish this, we put a buffer of 5km around current prairie preserves. Next, we calculated the amount of corn within the buffer zones. Given that 1 hectare of LIHD produces 28.4 GJ of energy, we can calculate the amount of bioenergy resulting from this form of improving environmental reserves within Minnesota.

Ryan Grow, University of St. Thomas and

Erik Sathe, University of St. Thomas

"Using GIS to Optimize Energy Landscapes: Siting Solar and Wind to Conserve Pollinators"

This study looked at two seemingly unrelated issues facing our planet as a result of climate change: renewable energy production and conservation of pollinators. Global energy demand is increasing every year and is projected to continue increasing for the foreseeable future. A transition from current practices to renewable resources is unavoidable, whether it be a result of climate change or of fossil fuel depletion. It is imperative that this transition is done correctly with the best practices possible, as it could lead to long term benefits that greatly outweigh the short term costs. One of the major things to consider in selecting the best practices is energy sprawl; how much land is required to produce a given unit of energy. Wind farms are not especially dense in terms of energy sprawl at 72.1km²/TW*hr/yr., as most wind farms have a permanent direct impact area of less than 0.5 hectares/MW (Denholm et al., 2009). Therefore it may be beneficial to use the vacant land surrounding wind turbines for other things. Solar panels would be a good thing to place in this land because they are extremely dense in terms of energy sprawl at 36.9km²/TW*hr/yr. However, saturating the land surrounding a turbine with solar panels would output far more energy than Minnesota currently produces. Therefore, we propose to use 50% of this area for solar panels and 50% for pollinator habitat, as pollinators are essential for ecosystem health and services. We used a variety of sources to make back of the envelope calculations to determine the energy currently produced by wind farms in Minnesota, how much 50% of the wind farm area with solar panels would produce, and how much native pollinator habitat can be restored. We found that we can produce more than enough energy using solar panels and wind on current disturbed wind farm land. We could at the same time increase Minnesota pollinator habitat by 57km².

Austen Hilding, Gustavus Adolphus College

"Benthic Macroinvertebrate Food Webs and Tropical Montane Stream Contamination in Monteverde, Costa Rica"

Many tropical montane streams are becoming increasingly contaminated as human population growth and land transformation add sedimentation and turbidity (Henley et al. 2010, Wallace & Webster 1996). In this study, benthic macroinvertebrates (BMIs) were collected from four stream sites in Monteverde, Costa Rica that experience different levels and types of contamination. The pristine forest site had 19 families, the site underneath the Monteverde Cheese Factory had 11 families, the site underneath a culvert and dirt road also had 11 families, and the site in the town of Santa Elena had only 1 family. Water quality was assessed using the BMIs as bioindicators and food webs were created to analyze how contamination affects them. Species richness, total number of links, linkage density, and similarity were reduced with more contamination. Fraction of omnivores (species feeding at multiple trophic levels) was significantly reduced with more contamination as well. Connectivity, fraction of basal, intermediate, and top species, and prey to predator ratio were not influenced by contamination, suggesting that there are "ecological equivalents" to the pristine species that are tolerant to some amounts of contamination which allows for certain ecosystem functions and feeding guilds to be retained. Preservation of pristine streams is vital and greater protection of contaminated streams is important for maintaining functions of stream ecosystems.

Joe Huber, Macalester College

"Consumer Expenditure and Gentrification: Minneapolis, A Case Study"

Gentrification is a complex issue with a lot of different ways of measuring it. Focusing specifically on consumer expenditure patterns, this presentation focuses on changes in these patterns in Minneapolis between 2011 and 2014. This research was done as part of the Macalester College Urban G.I.S. course in partnership with the Minneapolis Harrison Neighborhood Association and the Federal Reserve Bank of Minneapolis. This presentation will give insight into changes occurring now in Minneapolis neighborhoods measured by changes in such factors as expenditure on bicycles, non-white bread, cigarettes, and coffee!

Megan Lauzon, University of St. Thomas

"Analyzing a square kilometer of hybrid energy landscape in Minnesota"

With an ever increasing list of reasons to decrease our reliance on fossil fuels, more information is needed about the type and location of renewable energy development. Two major sources of renewable energy in Minnesota are wind and solar. Though both forms of energy exist around the world they range in their strength from place to place. In order to maximize profitability, the optimal siting for wind and solar resources is necessary. In the case of Minnesota, wind and solar both exist in high quantities in the Southwest corner of the state. This presentation examines the optimal use of these energy resources within a highly suitable square kilometer. The location being considered is currently agricultural land, but will be converted to a hybrid energy landscape. The turbines that exist will remain intact while the agricultural fields that surround it will be replaced by prairie and solar panels. By calculating the amount of energy produced here it can be determined how many square kilometers similar to this one are needed to power the state of Minnesota.

Ryan Merry, University of St. Thomas

"Supplying Renewable Energy for Electric Vehicles through Rooftop Solar in Minnesota"

As the world pushes towards carbon neutrality, a major shift will need to occur in fossil fuel based transportation, which is a major contributor of carbon dioxide emissions. A shift to biofuel combusting vehicles using ethanol or biodiesel, however, does not look promising in meeting the energy demand required to replace fossil fuels due to inefficiency and energy sprawl. Electric vehicles offer a means to restrict the carbon footprint of transportation. Carbon neutrality through electric vehicles is largely dependent on renewable energy sources such as wind or solar. This study uses GIS to assess the feasibility of powering transportation in Minnesota with solar energy sited on impervious surfaces in Minnesota, excluding roads. It was found that only 14 percent of impervious surfaces in Minnesota would need to be covered with solar panels. Most of this area is composed of commercial structure rooftops or parking lots. Commercial rooftops can provide ready infrastructure for solar panels, while parking surfaces would require the construction of scaffolding to raise solar panels above vehicles. However additional infrastructure construction above parking lots may not be necessary since only 14 percent of the impervious surfaces in the state need to be covered in solar panels, reducing costs for the power conversion.

Spencer Nelson, Macalester College

"The Modern Lake District: A Cartographic History of Urban Development and Reinvestment in the Calhoun-Isles Community from 1980-2015"

This presentation explores the last thirty-five years of the Calhoun-Isles community, or the Lake District, cartographically. Using a plethora of demographic and housing variables, this cartographic history displays relevant and important variables to the Lake District, spatially. Furthermore, this presentation examines the relationship between relevant historical events and mapped data, to reveal change and continuity in the neighborhood, temporally.

Dan Pastika, University of St. Thomas

"Low-Input High-Diversity Biofuel and the Conservation of Grassland Bird Species Habitat"

Biofuel technologies are currently being pushed as an alternative energy source to fossil fuels for both direct-fuel use and electricity generation. Currently, corn ethanol is the leading biofuel being produced in Minnesota. While it does reduce the use of fossil fuels somewhat, it still is input-intensive when grown on the industrial scale because of the use of herbicide, fertilizer,

irrigation, and fuel for the farm implements to apply these them. In addition to the amount of inputs, growing corn for conversion into ethanol is done almost exclusively in monoculture form, which limits the biodiversity in those areas. Low-input high-diversity (LIHD) biofuels could be substituted for corn grown on marginal or degraded lands in order increase the net-energy gains of Minnesota's biofuels. Low-input high-diversity biofuel growth utilizes perennial prairie grass species—species that are common in the breeding and foraging habitats of migratory songbirds that spend their summers in Minnesota's grasslands. The first goal of this research is to target lands that could be profitably converted from corn to LIHD biofuel. The second goal is to analyze where grassland bird species would most benefit from this transition.

Mitchell Schaps, University of St. Thomas

"Finding the Food Deserts of Minneapolis and Saint Paul."

In 2014, the Food and Agriculture Organization of the UN estimated that "804 million people around the world are living with food insecurity" (www.fao.org). Due to commercials from organizations like UNICEF, many people probably believe that food security is only a problem in the developing world, in the countries of Africa for example. What many people do not likely know is that undernourishment is also a problem here in the US. The USDA estimates that inside the US, "23.5 million people live in areas where they are likely to be undernourished, and have malnutrition" (USDA.org). The difference between the situations is that in the developing world, people with food insecurity often have access to no food at all. In the US, we have what are known as food deserts or food swamps. Food Deserts, as defined by the USDA, are "urban neighborhoods and rural towns without ready access to fresh, healthy, and affordable food." Like the rest of the world, however, it is the poor who bear the brunt of this issue in the US. The USDA estimates that of the 23.5 million people living in food deserts, "13.5 million are low-income." Food deserts are a problem that affect both rural and communities, in states across the US. Being a Minnesotan, and one that is currently living in downtown Saint Paul, I decided to investigate this situation in my new home, and its Twin City, Minneapolis

Tommy Schlundt, University of St. Thomas and also authored by Alex Plunkett, University of St. Thomas

"Analyzing the Relationship Between Developed Lands, Solar Energy, and Public Transportation Needs in Minnesota"

Busses in Minnesota currently travel 1,149,873 miles annually. The vast majority are powered by fossil fuels. Innovations in on-board electric bus designs could allow for solar energy to substitute for fossil fuels. We find that current electric bus designs require 1.92kWh per mile and at 1,149,873 miles traveled, 2.2GWh are required annually. Factoring the inefficiencies of the solar panels, there would have to be 6400 square meters of panels to cover the energy needed for the electric busses.

This research targets the optimal placement of solar panels in Minnesota based on two main criteria: Proximity to public transportation lines and degraded landscapes such as the rooftops of urban buildings which would allow for less energy sprawl.

Danielle Yaste, Gustavus Adolphus College

"Hazards of Being Human: GIS Analysis of Human Trafficking in Uganda"

Despite international and national laws prohibiting the slave trade and the thousands of Non-Governmental Organizations (NGOs) that fight human trafficking world-wide, more than 20.9 million individuals continue to be bought and sold on an annual basis. Research points to the need to go beyond simplistic explanations and the emphasis on criminalization because "the problems of trafficking begin not with the traffickers themselves, but the conditions that caused . . . [the victims] to be vulnerable to exploitation" (Chuang, 2006, pg. 138). In order to restore dignity and address this hazardous human phenomenon, a new approach to human development needs to be taken.

This study, done in partnership with the Ministry of Internal Affairs of Uganda, uses Uganda as a case study for identifying cultural values, ideas, and perceptions that help make certain regions of Uganda to become greater source areas for human trafficking. These factors have been combined with internationally known influences for analysis. Data from the Ugandan Government, NGOs, and expert informants provide the base of the analysis. Using Geographic Information Systems (GIS), qualitative and quantitative data on the current state of Uganda is analyzed using a weighted overlay analysis to predict and recognize which regions of the country are more likely to produce a human trafficking market. Equipped with the knowledge of the cultural ideals that contribute to human trafficking drives, both Ugandan NGOs and the Ministry of Internal Affairs will be able to address the problem more effectively by stopping trafficking before it begins.

ABSTRACTS – Poster Presentations

Claire Norman, Macalester College

“An Inventory of the Minneheha Creek Watershed’s Aquatic Invasive Species”

The Minnehaha Creek Watershed is home to many invasive species including zebra mussels, Eurasian watermilfoil, flowering rush, and the common carp. An inventory of these species and the efforts to eradicate them will aid the watershed in designing future methods of invasive species prevention and control.

Zoey Perse, Macalester College

“A Closer Look at the Eleven Sub-Watersheds in Minnehaha Creek Watershed”

An analysis of the sub-watershed units in the Minnehaha Creek Watershed District.

Stephanie Shimota, Macalester College

“Asset-Based Mapping of the Minnehaha Creek Watershed”

I am designing an interactive asset map of the Minnehaha Creek watershed. The map includes the locations and descriptions of projects completed by the Minnehaha Creek Watershed District and their partners. It is my hope that organizations can use this map to learn about successful projects that are already in place and to analyze areas that may be in need of projects but have been looked over in the past. I am using ArcGIS Online to create a public map, and have gathered data from organizations' websites.

Danielle Yaste, Gustavus Adolphus College

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