Annual Meeting
Great Plains / Rocky Mountain Division
American Association of Geographers

Programs and Abstracts
13-14 October 2017
University of North Dakota, Grand Forks, ND
Department of Geography and Geographic Information Science
Sponsors

Drs. Douglas and Laura Munski

Virginia George Inheritance Fund

2017 Meeting of the Great Plains/Rocky Mountain Division of the
American Association of Geographers, Grand Forks, ND, 13-14 October 2017
Welcome!

The University of North Dakota (UND) is the state's oldest and largest University, with nearly 14,500 students and 200+ fields of study. Founded in 1883, six years before North Dakota statehood, UND was organized initially as a College of Arts & Sciences, with a Normal School for the education of teachers. Nearly 3,000 courses, 40 online degree programs, and 80 graduate education programs are organized within eight colleges: Arts and Sciences, School of Medicine and Health Sciences, Engineering and Mines, Education and Human Development, Nursing and Professional Disciplines, Business and Public Administration, Odegard School of Aerospace Sciences, and School of Law.

Geography courses have been taught at the University of North Dakota since the opening of the University in 1883. Originally part of the Geology Department, Geography became a separate department in 1942. UND Geography currently offers B.S., M.A., and M.S. degrees, as well as a Graduate Certificate in GISc.

Grand Forks is a city of 55,000 people. It is recognized as a top place to live, a Best Small Place for Business & Careers, among the Most Secure Small Cities, a leading (U.S. Metro) location for economic growth, and among the top 100 places to live for cities between 20,000 and 350,000. Transplanted Southern Californians, such as the GP/RMD Chair, find the short commute time – second shortest in the U.S., especially attractive. Oh, and we like our hockey. UND ranked first in NCAA Men's Division I hockey attendance in 2015-2016, at an average of 11,634 a game, and was rated America's best hockey town in 2017 by SmartAsset.
Special Thanks

There are numerous people to thank:

- Dr. Derek Alderman for agreeing to provide the GP/RM 2017 Keynote Address. I take no credit for his topic being such a timely one.
- Drs. Shawn Hutchinson (KSU), Brandon Vogt (UCCS), and Bradley Rundquist (UND), who were tapped several times for help and advice. Dr. Greg Vandeberg (UND) was especially involved in all stages of the planning process.
- Dr. Greg Vandeberg, Chair of the Department of Geography and GISc at UND, for giving me a one-course reduction during the fall semester 2017 to organize the conference.
- Dr. Christopher Atkinson, for handling the organization of the Geo Bowl competition.
- Drs. Enru Wang, Greg Vandeberg, and Douglas Munski for organizing the field trips.
- A special shout out to Dr. Michael Niedzielski, who did all the technical work on the conference web page while on developmental leave in Poland. Mike, your prompt and efficient attention to these details was appreciated greatly!
- The AAG for providing the $1000 AAG Council Award for Outstanding Graduate Student Paper, and to the Great Plains/Rocky Mountain Division for the various other student paper/poster cash awards.
- I cannot imagine trying to do this without the help of UND Conference Services. Special thanks to Gretchen Schatz, Associate Director, and Trish Young, Personal & Professional Development Coordinator, of the UND Office of Extended Learning. It was a pleasure working with you both.

When the department agreed to host this meeting the State of North Dakota was flush with cash, and running a $1 Billion surplus. Then the price of oil went from $120 a barrel to $40 a barrel, crop commodity prices plummeted, and the strength of the Canadian dollar to the American dollar weakened. The state entered a financial crisis (self-inflicted, in part, but we do not want to go there), and university budgets were cut significantly. Then Donald Trump was elected President, and the Canadians pulled out of what was supposed to be a joint GP/RMD – Canadian/Prairie Division Meeting due to his executive order regarding immigration. Oh, the joys of being a conference chair. It is a special ‘Band of Brothers and Sisters’ of which I am now a member.

Paul E. Todhunter
Chair, Great Plains / Rocky Mountain Division, AAG
Professor of Geography
GP/RM AAG Officers for 2017-2018

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2017 Conference Web site  
http://arts-sciences.und.edu/geography/ 
gprmd_annual_meeting/gprm2017.cfm
Banquet and Awards Ceremony Speaker
Saturday, 14 October 2017, 6:00 – 8:00 pm
Alerus Conference Center Ballroom #5

On Makin’ It REAL: Engaging Geographies of Race, Memory, and Heritage Tourism

Dr. Derek H. Alderman
President, American Association of Geographers
Professor & Head
Department of Geography
University of Tennessee

Derek H. Alderman (dalderma@utk.edu) is Professor of Geography at the University of Tennessee and President of the American Association of Geographers (AAG). His research and teaching specialties include race, public memory, heritage tourism, critical place name study, and the African-American experience—including slavery, the Jim Crow and Civil Rights eras, and more contemporary social and spatial justice campaigns. He is the author of over 110 articles, book chapters, and other essays along with the award-winning book (with Owen Dwyer), Civil Rights Memorials and the Geography of Memory. Alderman is part of a multi-university team completing a study of the politics of remembering slavery at southern plantation museums and identifying places for making interventions in the historical neglect of enslaved identities and struggles. He is also engaged in a project (with Josh Inwood) that explores the role of resistant geospatial intelligence and counter-mapping within SNCC (Student Non-violent Coordinating Committee), one of the important organizations of the Civil Rights Movement in the 1960s. The National Science Foundation has funded both projects. Alderman is a strong advocate of a greater incorporation of civil rights, social justice, and critical race study within geographic education. He is the recent recipient of the Distinguished Mentor Award from the National Council for Geographic Education and the Distinguished Career Award from the Ethnic Geography Specialty Group of the AAG. As President of the AAG, Alderman is developing the “Geography is REAL (Responsive, Engaged, Advocating, and Life-Improving)” initiative, which encourages and supports greater public intellectualism, communication savviness, and disciplinary promotion. Alderman can be followed on Twitter @MLKStreet.
Student Cash Awards

Paper / Poster Competition Awards

All students presenting a paper or poster at the 2017 AAG GPRMD Annual Meeting will be entered in one of four competitions: (1) best undergraduate student paper, (2) best undergraduate student poster, (3) best graduate student paper, and (4) best graduate student poster. All papers and posters entered into the competition must report on original research conducted primarily by the student presenting the paper or poster. Papers and posters will be judged on the basis of content, organization, style, graphics, and, in the case of papers, quality of oral presentation. Awards are funded by the GP/RM Division, except where noted.

The award amounts are:

Undergraduate student paper
- 1st place: $100, 2nd place: $50, 3rd place: $25

Undergraduate student poster
- 1st place: $100, 2nd place: $50, 3rd place: $25

Graduate student paper
- 1st place: $1000* (AAG Council Award), 2nd place: $50, 3rd place: $25
  * Winner must attend the 2018 AAG National Meeting in New Orleans to receive funds.

Graduate student poster
- 1st place: $100, 2nd place: $50, 3rd place: $25

Students must submit an abstract no later than September 1, 2017 (see details above).

Winning Geo Bowl Team Awards

Each member on the winning Geo Bowl team (up to six) receives a cash award of $600. This award is provided by the AAG central office, and can only be used for travel expenses toward attending the 2018 AAG Annual Meeting in New Orleans, LA on 10-14 April 2018.
Conference / Event Location

**Directions:** Coming from the south on I-29, take exit 140 (DeMers Ave). Turn right (east) on DeMers Ave to the first stoplight. Turn right (south) on S 42nd Street, to the Alerus Conference Center / Canad Inn.
Paper Sessions: Oriole, Pheasant, Hawk rooms
Business Meeting, Storage: Mourning Dove room
Poster Session: Ballroom #5
Luncheon, Banquet: Ballroom #5
## Conference Schedule

### Friday, 13 October 2017

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 am – 4:00 pm</td>
<td>Field Trip: Long-Term Flood Recovery: Grand Forks Twenty Years Later Meet in Canad Inn Lobby @ 8:30 am (Paul Todhunter, Enru Wang, Ryan Brooks) [Must be pre-paid]</td>
</tr>
<tr>
<td>6:00 – 8:00 pm</td>
<td>Participant Registration Alerus Pre-Function Area (enter at Door #5)</td>
</tr>
<tr>
<td>6:00 – 9:00 pm</td>
<td>Opening Reception Upper Playmakers, Canad Inn <em>Cash Bar, Hors d’oeuvres</em></td>
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### Saturday, 14 October 2017

<table>
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<tr>
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<tr>
<td>7:30 am – 6:00 pm</td>
<td>Participant Registration Alerus Pre-Function Area (enter at Door #5)</td>
</tr>
<tr>
<td>8:30 – 10:10 am</td>
<td>Concurrent Paper Session #1 Oriole, Pheasant and Hawk Rooms</td>
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<tr>
<td>9:00 am – 3:00 pm</td>
<td>Poster Session Ballroom #5</td>
</tr>
<tr>
<td>10:00 – 10:45 am</td>
<td>Poster Session with Presenters in Attendance Ballroom #5</td>
</tr>
<tr>
<td>10:10 – 10:30 am</td>
<td>BREAK</td>
</tr>
<tr>
<td>10:30 am – 12:10 pm</td>
<td>Concurrent Paper Session #2 Oriole, Pheasant and Hawk Rooms</td>
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<tr>
<td>12:10 – 1:15 pm</td>
<td>Lunch Ballroom #5</td>
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<tr>
<td>12:45 – 1:15 pm</td>
<td>GP/RM Division Business Meeting Mourning Dove Room</td>
</tr>
<tr>
<td>1:20 – 3:00 pm</td>
<td>Concurrent Paper Session #3 Oriole, Pheasant and Hawk Rooms</td>
</tr>
<tr>
<td>3:00 – 5:00 pm</td>
<td>GP/RM Division Geo Bowl Competition Meet in Alerus Conference Center Lobby</td>
</tr>
<tr>
<td>2:30 – 6:00 pm</td>
<td>Field Trip: Glacial Landscapes of Eastern North Dakota [Must be pre-paid]</td>
</tr>
<tr>
<td>3:00 – 6:00 pm</td>
<td>Field Trip: Grand Forks Historic Walking Tour</td>
</tr>
<tr>
<td>6:30 – 9:00 pm</td>
<td>Banquet, Keynote Speaker, and Awards Ceremony Alerus Conference Center Ballroom #5</td>
</tr>
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Friday Schedule

Conference Registration
6:00 – 8:00 pm
Location: Alerus Pre-Function Area (enter at Door #5)

Field Trip: (preregistration is required for all field trips)

1) Long-Term Flood Recovery: Grand Forks Twenty Years Later
8:30 am to 4:00 pm (Todhunter, Wang, Brooks)
Meet in Alerus Conference Center Lobby

Opening Reception
6:00 – 9:00 pm
Location: Upper Playmakers, Canad Inn
Cash Bar, Hors d’oeuvres
Saturday Schedule

Conference Registration
7:30 am – 6:00 pm
Location: Alerus Pre-Function Area (enter at Door #5)

Poster Session
9:00 – 3:00 pm
Location: Ballroom #5

Poster Session with Presenters in Attendance
10:00 – 10:45 am
Location: Ballroom #5

Habitat fragmentation in western North Dakota after the introduction of hydraulic fracturing
Richard Bohannon (1)
(1) Department of Geography and Planning, St. Cloud State University

The new united fruit: Palm oil in Guatemala
Tristan Boyd (1)
(1) Department of Geography and Environmental Sciences, University of Colorado - Denver

Multi-regression analysis of water quality and land use change in a sub-watershed of the Republican River Basin, 2000-2014
Morgen Burke (1), Mojtaba Shahabi, (1), Yeqian Xu (1), Haochi Zheng (1), Xiaodong Zhang (1) and Jeff VanLooy (1)
(1) Department of Earth System Science & Policy, University of North Dakota

An evaluation of gridded temperature products and their effectiveness in modeling small-scale ambient temperature
Barrie Chileen (1), Thomas P. Albright (2) and Devin Jacobs (2)
(1) Department of Geography, Kansas State University
(2) Department of Geography, University of Nevada - Reno

Shifting boundaries: Did 2011 congressional redistricting change district demographics
Casey Dunn (1)
(1) Department of Geography & Geology, University of Nebraska - Omaha
Proposing a geographic information dashboard: Why and how
Amariah Fischer (1) and Shawn Hutchinson (1)
(1) Department of Geography, Kansas State University

The Kansas Geographic Alliance: History and current status
John Harrington Jr. (1)
(1) Kansas Geographic Alliance, Kansas State University

Crop production changes in the Mekong Delta region of Vietnam
Austen Hawley (1)
(1) Department of Geography and Environmental Studies, University of Colorado - Colorado Springs

Time series analysis of vegetation phenometrics for the Flint Hills ecoregion, 2001-2015
Shawn Hutchinson (1) and Austin Braget (1)
(1) Department of Geography, Kansas State University

Determining the effects of fire on spatial patterns of nutrients in an oak savanna
Abbey Marcotte (1) and Kendra McLauchlan (1)
(1) Department of Geography, Kansas State University

Comparison of two sUAS to map and monitor vegetation
Grayson Morgan (1), Teresa Gomez (1), Ryan Jensen (1) and Steve Petersen (1)
(1) Department of Geography, Brigham Young University

Promoting North Dakota landscape study for the general public through presenting the Prairie Churches Traveling Exhibit
Douglas Munski (1) and Laura Munski (2)
(1) Department of Geography and GISc, University of North Dakota
(2) Dakota Science Center

Revisiting the historic Swedish presence in North Dakota as a springboard for heritage tourism-based conversations about persistence of the Swedes in Minnesota
Douglas Munski (1) and Laura Munski (2)
(1) Department of Geography and GISc, University of North Dakota
(2) Dakota Science Center

Analysis of urban growth in Edwardsville/Glen Carbon, Illinois using remote sensing and population change data
Hilda Onuoha (1) and Shunfu Hu (2)
(1) Department of Geography, Kansas State University
(2) Department of Geography, Southern Illinois University - Edwardsville
Fire management plans and spatial patterns of forest burn in Central America
Caitlin Parsons (1)
(1) Department of Geography and Environmental Studies, University of Colorado - Colorado Springs

Understanding and measuring anthropogenic soil salinity in brine spill impacted farmlands of Bottineau County, North Dakota, using multi-temporal Landsat data
Neha Patel (1), Gregory Vandeberg (1) and Bradley Rundquist (1)
(1) Department of Geography and GISc, University of North Dakota

Examining the relationship between ENSO and seasonal precipitation across drainage basins within the State of Wyoming
Jonathon Preece (1), Jacqueline Shinker (1) and Clifford Riebe (1)
(1) Department of Geography, University of Wyoming

Measuring walkability: An illustration in Brookings, SD
Joseph Schmunk (1) and Jamie Spinney (1)
(1) Department of Geography, South Dakota State University

The relationship between urban tree LAI and urban heat
Amanda Shepherd (1) and Ryan Jensen (1)
(1) Department of Geography, Brigham Young University

A preliminary report on urban tree species of London and their potential impact on temperature
Andrew Smith (1) and Ryan Jensen (1)
(1) Department of Geography, Brigham Young University

The spatial analysis of global eSports tournaments
Owen Stuckey (1)
(1) Department of Geography & Geology, University of Nebraska - Omaha

A spatial and temporal investigation of daily newspaper endorsements during the 2016 Presidential Election cycle, with a supplementary examination of historical trends
Lindy Westenhoff (1) and Gerald Webster (1)
(1) Department of Geography, University of Wyoming

Public spaces for the few: Exclusion of skateboarders from public spaces in Omaha, Nebraska
Daniel Williams (1)
(1) Department of Geography & Geology, University of Nebraska - Omaha
Zooarchaeological analysis of the northern San Juan Basin
Daniel Yun (1)
(1) Department of Geography, University of Wisconsin - Madison

Paper Session 1a
8:30 – 10:10 am
Location: Oriole

Sacred Spaces / Contested Spaces
Chair: Kevin Romig, Northwest Missouri State University

1) 8:30 - 8:50 - Green spaces for the dead: The aesthetics of Russian cemeteries
Mikhail Blinnikov, St. Cloud State University

2) 8:50 - 9:10 - A postmortem of honorary place names: Political beneficence, toponymic inscription, and the reinterpretation of the past
Joshua Hagen, Northern State University

3) 9:10 - 9:30 - "Piping in some commonsense": Plains & pipelines in media coverage of environmental controversy
Christina Dando, University of Nebraska - Omaha

4) 9:30 - 9:50 - Segregated Kansas City: Structural racism and contemporary identity
Kevin Romig, Northwest Missouri State University

Paper Session 1b
8:30 – 10:10 am
Location: Pheasant

Geographic Education
Chair: Jamie Spinney, South Dakota State University

1) 8:30 - 8:50 - Challenges and benefits of developing a geoscience careers course at community colleges
Patrick L. Shabram, Front Range Community College - Larimer Campus

2) 8:50 - 9:10 - Composing and refining a learning progression for place
Thomas B. Larsen, Kansas State University
3) 9:10 - 9:30 - Some perspective of teaching Physical Geography at lower level undergraduate courses
Debasree Chatterjee-Dawn, North Dakota State University

4) 9:30 - 9:50 - Clickers in the classroom: A tool for student engagement?
Jamie Spinney, South Dakota State University

Paper Session 1c
8:30 – 10:10 am
Location: Hawk

Geospatial Analysis
Chair: Mbongowo J. Mbu, University of North Dakota

1) 8:30 - 8:50 - Addressing geographic disparities in access to ambulance services: Ensuring access while minimizing cost
Yvonne C. Jonk, University of North Dakota

2) 8:50 - 9:10 - Identifying prominent wildfire evacuation trigger points with reverse geocoding
Dapeng Li, South Dakota State University

3) 9:10 - 9:30 - Incorporating estimation uncertainty of American Community Survey micro-geography data into regression analysis using a Monte Carlo simulation approach
Jeff Ueland, Bemidji State University

4) 9:30 - 9:50 - Noise mapping of an educational environment: A case study at South Dakota State University
Sujan Parajuli, South Dakota State University

5) 9:50 - 10:10 - Habitat suitability analysis for mountain lions (Puma concolor) recolonization/reintroduction in Minnesota
Mbongowo J. Mbu, University of North Dakota

Break
10:10 – 10:30 am
Alerus Conference Center Lobby
Coffee, Tea, Water
Paper Session 2a
10:30 – 12:10 pm
Location: Oriole

Flood Hazard
Chair: Gregory Vandeberg, University of North Dakota

1) 10:30 - 10:50 - Estimation of peak flood levels of the Red River of the North based on tree scar elevations near Grand Forks, North Dakota
Gregory Vandeberg, University of North Dakota

2) 10:50 - 11:10 - Flood recovery in Grand Forks, ND: Land use change since the Red River Flood of 1997
Peter Brandt, University of North Dakota

3) 11:10 - 11:30 - Fill and floods: An assessment of the impact of parcel-level mitigation activities on residential flood loss reduction
Kayode Atoba, South Dakota State University

4) 11:30 - 11:50 - Why Grand Forks recovered so effectively from the 1997 flood disaster: Multi-layered recovery, basic principles, and unique particulars
Paul Todhunter, University of North Dakota

Paper Session 2b
10:30 – 12:10 pm
Location: Pheasant

Environmental Geography I
Chair: Christopher Atkinson, University of North Dakota

1) 10:30 - 10:50 - Field reconnaissance to determine the feasibility of long-term monitoring of Helen Glacier in the Wind River Range, WY: Lessons learned
Jeff VanLooy, University of North Dakota

2) 10:50 - 11:10 - Temporal trends and spatial patterns of warm season hot temperatures in Saudi Arabia
Ali S. Alghamdi, Kansas State University

3) 11:10 - 11:30 - Kansas tornados and climate change
Michael Molloy, Kansas State University
4) 11:30 - 11:50 - Impacts of land use and land cover change on water quality in the Big Sioux River: 2006-2016
Dinesh Shrestha, South Dakota State University

5) 11:50 - 12:10 - Poisson analysis of snowfall in Grand Forks, North Dakota
Christopher Atkinson, University of North Dakota

**Paper Session 2c**
**10:30 – 12:10 pm**
**Location: Hawk**

**Great Plains**
*Chair: Jason Holcomb, Morehead State University*

1) 10:30 - 10:50 - Perceptions and performances of wilder-scapes: Shaping contemporary social memories of the American West at Little House tourist sites
Kimberly Johnson, Oklahoma State University

2) 10:50 - 11:10 - The role of cartography in the promotion of rail travel to Yellowstone National Park
William Scott White, Fort Lewis College

3) 11:10 - 11:30 - Rural population decline and “free land” programs in the Great Plains
Karl Bauer, Kansas State University

4) 11:30 - 11:50 - Allotting the Omaha Reservation: Patterns and impacts, 1884-1940
Andrew Allen, University of Kansas

5) 11:50 - 12:10 - Revisiting the Internal Colonial Dependency Model in the Great Plains
Jason Holcomb, Morehead State University

**Lunch**
**12:10 – 1:15 pm**
**Alerus Conference Center Ballroom #5**
*Plated meal - (turkey sandwich, chicken & wild rice soup)*
GP/RM Division Business Meeting
12:45 – 1:15 pm
Location: Mourning Dove Room

Paper Session 3a
1:20 – 3:00 pm
Location: Oriole

Undergraduate Research in Focus: Exploring Cultural Change in the Rural Communities of Yamanashi Prefecture, Japan
Organizers: Aaron Kingsbury, Mayville State University; Lona Smith, Mayville State University
Chair: Aaron Kingsbury, Mayville State University

1) 1:20 - 1:30 - Opening Remarks: Aaron Kingsbury, Mayville State University

2) 1:30 - 1:50 - Comparing teaching methodologies in the American and Japanese education systems
Megan Maassel, Mayville State University

3) 1:50 - 2:10 - Comparing traditions in rural healthcare for the elderly in Japan and selected Native American cultures
Cherokee Durant, Mayville State University

4) 2:10 - 2:30 - Farm abandonment and the wildlife invasion of rural Yamanashi Prefecture, Japan: Possible solutions
Cheyenne Durant, Mayville State University

5) 2:30 - 2:50 - The complexities of documenting cultural change in rural Japan in film
Nick Peterson, Mayville State University

Paper Session 3b
1:20 – 3:00 pm
Location: Pheasant

Environmental Geography II
Chair: Bradley C. Rundquist, University of North Dakota

1) 1:20 - 1:40 - People and water: Decision-making impacts in the Republican River basin
Jean Eichhorst, University of Kansas
2) 1:40 - 2:00 - Estimate water temperature from the Landsat 8 TIR bands using the split window algorithm: A case study for Devils Lake
Afshin Shabani, University of North Dakota

3) 2:00 - 2:20 - Nuclear accidents and environmental resilience: The case of Chernobyl
George W. White, South Dakota State University

4) 2:20 - 2:40 - Malaria severity and access to health care in the Ngorongoro Conservation Area (NCA), Tanzania
Deborah Thomas, University of Colorado - Denver

5) 2:40 - 3:00 - A Geography of oil spills in North Dakota, 2014-2016
Bradley C. Rundquist, University of North Dakota

Paper Session 3c
1:20 – 3:00 pm
Location: Hawk

Human Geography I
Chair: Robert Watrel, South Dakota State University

1) 1:20 - 1:40 - The geography of NCAA (FCS) Football, 2017
Ted Goudge, Northwest Missouri State University

2) 1:40 - 2:00 - Historical geography of the Minnesota Twins roster, 1901-2017
Alicia N. Schieber, Northwest Missouri State University

3) 2:00 - 2:20 - "Make America Great Again": Trump's populist rhetoric and central Wisconsin
Katie Weichelt, University of Wisconsin - Eau Claire

4) 2:20 - 2:40 - Was the 2016 Presidential Election a realigning election?
Robert Watrel, South Dakota State University

Field Trip: (preregistration is required for all field trips)

2) Glacial Landscapes of Eastern North Dakota
2:30 to 6:00 p.m. (during Geo Bowl competition) (Vandeberg)
Meet outside Canad Inn
Field Trip: *(preregistration is required for all field trips)*

3) Grand Forks Historic District Walking Tour
3:00 to 6:00 p.m. (during Geo Bowl competition) (Munski)
Meet at the city parking lot north of City Hall, Downtown Grand Forks

Geography Bowl (Geo Bowl) Competition
3:00 – 5:00 pm
Location: Meet in Alerus Conference Center Lobby (Check in with Chris Atkinson, Geo Bowl Coordinator)

Evening Banquet, Keynote Address by Derek Alderman, and Awards Ceremony
6:30 – 9:00 pm
Location: Alerus Conference Center Ballroom #5
*Buffet meal and dessert table*
Habitat fragmentation in western North Dakota after the introduction of hydraulic fracturing

Richard Bohannon (1)
(1) Department of Geography and Planning, St. Cloud State University

Abstract: A large and increasing amount of research investigates the effects of hydraulic fracturing on water quality, air quality, and greenhouse gas emissions. Relatively little research has been conducted, however, on the effects of hydraulic fracturing on neighboring upland ecosystems. Beyond water-related issues, upland ecosystems can be affected by habitat fragmentation, increased diesel truck and freight rail traffic, increased noise and air pollution, and oil spills. This project looks specifically at habitat fragmentation resulting from hydraulic fracturing and oil extraction in the Little Missouri National Grasslands, which lie within the Bakken region of western North Dakota. Since 2007 the Bakken has been the site of a contemporary oil boom that has transformed North Dakota’s economy, making it the second-largest oil producing state in the country. The goal of this project is twofold: to assess and quantify the level of habitat fragmentation caused by hydraulic fracturing, and then to discover if such fragmentation has made a measurable impact on breeding bird populations, which can serve as a proxy for the health of local ecosystems. This project involves two primary methodological steps: measuring fragmentation caused by hydraulic fracturing, and analyzing data from the Breeding Bird Survey to determine if there is any discernable effect on bird populations in areas with extensive fragmentation. GIS datasets were developed by digitizing and editing road and well-pad footprints, based on NAIP (National Agriculture Imagery Program) imagery collected between 2003 and 2016.

Keywords: habitat fragmentation, oil, hydraulic fracturing, fracking, North Dakota, Bakken

The new united fruit: Palm oil in Guatemala

Tristan Boyd (1)
(1) Department of Geography and Environmental Sciences, University of Colorado - Denver

Abstract: Palm oil has an immense number of industrial and comestible uses, such as detergents, beauty products, and cooking oil. Currently, 85% of palm oil exports originate from Indonesia and Malaysia, but production is growing rapidly in the Americas, particularly Guatemala. The goal of this project was to locate
regions of palm oil expansion within Guatemala to determine what populations and watersheds are most at risk for deforestation and water pollution. Palm oil plantations were digitized from imagery provided by Google Maps, Google Earth, and ArcGIS. With these shapefiles of individual growth sites, Guatemalan census data and river basin data were overlaid to determine which departments and municipalities are affected by palm oil growth. These effects include watershed pollution from the release of sediments and nutrients after clear cutting, the influx of palm oil byproducts that are flushed into local ecosystems, and the loss of agricultural lands to local indigenous communities and farmers. The crop's growth is largely confined to two regions within the country: the Pacific Coast and the Transversal Norte, a strip of land stretching from the Caribbean to the Mexico border. Both of these regions are deemed crucial to economic development by the government of Guatemala and have important connections with past conflict in the country. Continued monitoring of its growth is needed to determine if other critical areas are at risk of being altered for development.

**Keywords:** palm oil, Guatemala, indigenous peoples, water pollution, deforestation

**Multi-regression analysis of water quality and land use change in a sub-watershed of the Republican River Basin, 2000-2014**

Morgen Burke (1), Mojtaba Shahabi, (1), Yeqian Xu (1), Haochi Zheng (1), Xiaodong Zhang (1) and Jeff VanLooy (1)

(1) Department of Earth System Science & Policy, University of North Dakota

**Abstract:** The intensification of agriculture across the Great Plains of the U.S. may pose a threat to the natural waterways found throughout this region. As demand for greater crop yields becomes a necessity, the overuse of fertilizers may lead to the eutrophication of neighboring waterways. The Republican River has historically had low nitrogen concentrations relative to surrounding watersheds. However, modeled nitrogen flux values were found to vary from year to year, ranging from less than 70,000 kg/year to over 1 million kg/year. This variation was modeled against agricultural land use, as well as growing degree days, and cumulative precipitation using a multiple regression analysis. It was expected that changes in the planted areas of dominant agricultural crops in the region could be used to explain the nitrogen flux variation that was modeled. Instead, cumulative spring precipitation was found to significantly correlate with nitrogen flux.

**Keywords:** land use change, water quality, hydrology
An evaluation of gridded temperature products and their effectiveness in modeling small-scale ambient temperature

Barrie Chileen (1), Thomas P. Albright (2) and Devin Jacobs (2)
(1) Department of Geography, Kansas State University
(2) Department of Geography, University of Nevada - Reno

Abstract: The use of gridded temperature products is becoming increasingly prevalent in ecological research due to their accessibility, low cost, and spatial and temporal coverage. While few studies have compared gridded products against each other and weather station data, little research exists that attempts to verify the accuracy of these gridded products on finer spatial scales in field settings. In this study, we use two networks of temperature sensors to evaluate the effectiveness of these widely used gridded products in modeling ambient temperatures and compare tradeoffs between spatial and temporal resolution of gridded products. We deployed 65 temperature sensors in radiation shields (Holden 2013) at the Kofa wildlife refuge in Southwestern Arizona and 80 sensors on the Snake Range of Eastern Nevada. From 2014 to 2015, the sensors recorded hourly temperatures. We then compared the sensor-collected temperatures against three widely used gridded temperature products at varying spatial and temporal resolutions: NLDAS 10 km at hourly intervals, PRISM 4 km at daily intervals and Daymet 1 km at daily intervals. We find that gridded products provide strong overall fits with sampled datasets but have a tendency to underestimate maxima and overestimate minima. Of the gridded products used, Daymet was the most accurate at capturing Tmax and hourly temperatures (average $R^2 > 0.90$), while NLDAS was the least accurate ($R^2 = 0.70$). While this suggests that the benefits of finer spatial resolution may outweigh the benefits of finer temporal resolution, other factors unrelated to resolution may have contributed to the differences among products.

Keywords: gridded products, NLDAS, Daymet, PRISM, geography, temperature products, R, Logtag

Shifting boundaries: Did 2011 congressional redistricting change district demographics

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Abstract: Advances in GIS technologies facilitated precision gerrymandering in 2011 and were noted as ideal tools in the Republican State Leadership Committee (RSLC) development plan. The Redistricting Majority Project (REDMAP) was the plan created by the RSLC to win state legislative seats, in order to influence the 2011 redistricting cycle and control congressional redistricting. This poster will look at the REDMAP initiative and see if non-political
demographics were shifted between congressional districts in 2011. Analysis
focuses on 185 of the 435 Congressional Districts in states that neither gained
nor lost seats. The data used in this project is 2011 and 2012 5-year estimate
data published by the U.S. Census Bureau for the 112th and 113th Congress’.
These sessions were chosen because the 112th Congress started just as
redistricting was underway and the 113th Congress is the first session following
the 2011 redistricting cycle.

**Keywords:** redistricting, census data, demographics, boundaries

**Proposing a geographic information dashboard: Why and how**

Amariah Fischer (1) and Shawn Hutchinson (1)
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**Abstract:** Information dashboards have been utilized in businesses since the
late 1990s because of their ability to provide owners and management with a
quick, easy to understand assessment of business performance. However, there
is very little peer reviewed research on information dashboards and their
effectiveness as a visualization. Additionally, information dashboards have not
been applied outside of the business sector. This research shows why
geography as a discipline could benefit from applying information dashboards to
demographic information and proposes a method for creating and evaluating the
resulting geographic information dashboard. Through the combination of R
statistical software and research from geographic visualization, a geographic
information dashboard can be formed. Then, by pulling ideas from Cognitive Fit
Theory and research on spatial thinking, a method for evaluating the geographic
information dashboard’s performance can be constructed.

**Keywords:** geovisualization, spatial thinking, information dashboard, RStudio,
Cognitive Fit Theory

**The Kansas Geographic Alliance: History and current status**

John Harrington Jr. (1)
(1) Kansas Geographic Alliance, Kansas State University

**Abstract:** Decisions by the National Geographic Society have the future of state-
based geographic alliances in doubt. Alliance coordinators have been told that
the current funding cycle, with funds for the period August 1, 2017, through
November 1, 2018, will be the last. From the beginning, the Kansas Geographic
Alliance (KGA) was a partnership involving geography faculty at Fort Hays State
and Kansas State University. The poster documents three important phases in
the advancement of the KGA over time. The initial phase, which lasted from
1991-2001, is labeled the “Lift Off Phase” in the KGA Strategic Plan. During this initial phase, $250,000 in funds from the State of Kansas were matched by National Geographic to partially endow the efforts of the KGA. A second period, which lasted from 2002-2008, was identified as the “Geostationary Orbit Phase.” The current phase, which began in 2009, has the label: “Reflection and Planning for the Next Mission.” It is within this most recent phase that a strategic plan, which has been reviewed and updated annually, was prepared by the KGA. Poster content discusses each of these three phases, with examples of major activities. Major KGA activities for the final year of funding from the National Geographic Education Foundation are identified, including Geography Awareness Week, GeoInquiry, a workshop on Kansas Ecological Culture, and working with pre-service teachers.

**Keywords:** Geographic Alliance, Kansas, history, status

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**Crop production changes in the Mekong Delta region of Vietnam**

Austen Hawley (1)

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**Abstract:** Increasing development and national policy changes in Vietnam have resulted in long term farm holders in the Mekong Delta migrating to cities. This migration pattern is accompanied by changes in rainfall patterns associated with climate change, and results in land use changes such as shifts in crop production. Given that Vietnam is the bread bowl for Southeast Asia and the Mekong Delta provides the majority of agricultural production, these land use changes can impact food security. In my research I am using satellite imagery and census data to measure the land use changes and identify their potential negative implications. The measurements are based on observations of crop production, specifically rice, sweet potatoes, shrimp, maize, and fish. These crops are the major agricultural products for local consumption and export, and are the most likely to be impacted by changes in national policy. Preliminary analysis of data from 1995 to 2015 shows large increases in agricultural production around the mid-2000s. Without measuring these changes the Vietnamese government is not able to develop policy designed to mitigate changes in agricultural production and address food insecurity. The methodology I am using relies on freely available data and therefore can be utilized by governments in the developing world.

**Keywords:** Vietnam, Mekong River Delta, crop production, policy change
**Time series analysis of vegetation phenometrics for the Flint Hills ecoregion, 2001-2015**

Shawn Hutchinson (1) and Austin Braget (1)
(1) Department of Geography, Kansas State University

**Abstract:** Analysis of remotely-sensed images can support management of prairie landscapes by uncovering long-term trends in grassland vegetation greenness and quantifying important differences in the rate and timing of vegetation development. A time-series analysis of MODIS maximum value composite normalized difference vegetation index (NDVI) data was used to explore differences in a range of vegetation phenometrics for the Flint Hills ecoregion between 2001-2015. Data were extracted using TIMESAT and a Savitzky-Golay smoothing function to estimate seasonality parameters from the time series data using amplitude as the basis for defining growing season length. A total of eight phenometrics, including start of season, end of season, growing season length, middle of season, maximum value, small integral, left derivative, and right derivative, were produced for each year of the study and ANOVA was used to assess if significant differences existed across the study area. After aggregating pixel-level phenometrics to the county level, K-means cluster analysis was performed to identify administrative divisions exhibiting similar vegetation development. Significant differences existed for all phenometrics when considering the ecoregion as a whole. Results suggest that factors other than natural gradients in temperature and precipitation play a significant role in the annual cycle of Flint Hills grassland vegetation development. Unanticipated and sometimes geographically disparate groups of counties were shown to be similar in the context of specific phenology measures. These relationships may prove useful in future implementations of smoke management plans within the ecoregion.

**Keywords:** phenometrics, remote sensing, time series analysis, Flint Hills, grassland dynamics

**Determining the effects of fire on spatial patterns of nutrients in an oak savanna**

Abbey Marcotte (1) and Kendra McLauchlan (1)
(1) Department of Geography, Kansas State University

**Abstract:** Fire frequency and climate both play crucial roles in maintaining the balance of grass and tree composition in savanna ecosystems. Additionally, vegetation composition also influences soil properties, with organic matter concentrations increasing under forested vegetation. While it is known that fire plays an important role in maintaining savanna systems, it is unclear how fire and grass-tree balance affect soil properties, including nutrient concentrations. At our
study site, Cedar Creek Ecosystem Science Reserve, Minnesota, U.S.A., oak savanna plots are burned at various frequencies, ranging from every year to not at all as part of a long-term fire experiment that began in 1964. To disentangle the direct and indirect effects of fire on this experiment we collected soils samples in increments to 100 cm depth across 12 burn units with differing fire frequencies under patches of trees or grass. We then used a handheld XRF analyzer to non-destructively estimate elemental concentrations in the dried soil samples. We found that fire frequency, soil depth, and vegetation composition all influenced soil nutrients, particularly base cations such as calcium, magnesium, and potassium. Soils in high fire frequency plots had higher concentrations of base cations than soils in low fire frequency plots, which could be linked to soil organic material and pH, both of which are influenced by fire regimes. Surface soils had up to 10 times greater nutrient concentrations than deep soils. These types of spatial relationships can help us better understand how fire and tree-grass composition affect nutrient cycling dynamics.

**Keywords:** fire frequency, oak savanna, handheld x-ray fluorescence analyzer (XRF), soil nutrients, base cations

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**Comparison of two sUAS to map and monitor vegetation**

Grayson Morgan (1), Teresa Gomez (1), Ryan Jensen (1) and Steve Petersen (1)

(1) Department of Geography, Brigham Young University

**Abstract:** Small unmanned aerial systems (sUAS) have proven useful to identify and map vegetation species, and researchers have many sUAS and sensors available for such studies. This study compares two sUAS, the DJI Phantom 4 with a Sentera Single Sensor NDVI camera and 3DR Solo Quadcopter with Sony QX-1 RGB and NIR cameras, to determine which provides the most accurate data to create an orthomosaic that can then be processed to determine vegetation species and density. Image data were acquired over basin and range sites just west of Elko, Nevada. Missions were flown at 100 ft above ground level using automated flight paths, and individual images were processed into an orthomosaic using Pix4D software. Processing the Phantom 4 data was more automated than processing 3DR Solo Data. However, preliminary analysis suggests that there may be more spectral detail in the data acquired by the SONY QX-1 cameras flown on the 3DR Solo sUAS. Using E-cognition software we will run object-based image analysis on the images and compare them to the manual classifications done on site. The preliminary study suggests the two platforms are adequate to gather large amounts of data that can later be processed into orthomosaics and then analyzed. However, due to its geolocation abilities, data collection and initial processing is simplified for images collected by the DJI Phantom 4. This may indicate the DJI Phantom 4 is best for quick processing and analysis while the 3DR Solo is better for in depth spectral analysis.
Promoting North Dakota landscape study for the general public through presenting the Prairie Churches Traveling Exhibit

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(2) Dakota Science Center

Abstract: Interest in the North Dakota landscape is not exclusively the purview of academicians and professional historic preservationists. The general public often values rural and urban places as part of celebration of community and maintenance of shared memories of place. Viewing and visiting prairie churches particularly evokes such interest among residents as well as tourists. Consequently, significant efforts have been made over a number of years by Preservation North Dakota with the National Trust for Historic Preservation and the State Historical Society to attempt to record and to catalogue rural churches and associated structures plus cemeteries. One major end-product of this endeavor is the Prairie Churches Traveling Exhibit. This particular set of panels was featured in a month-long hosting at the Grand Forks Public Library during the summer of 2017. The traveling exhibit then served as the context for a special public talk on the topic which then was followed by a guided tour of the panels. Such outreach in community development illustrates the role of applied historical geography in heritage tourism.

Keywords: North Dakota, landscape study, prairie churches

Revisiting the historic Swedish presence in North Dakota as a springboard for heritage tourism-based conversations about persistence of the Swedes in Minnesota

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Abstract: Each year during mid-August in the western part of Minnesota's Polk County, the East Grand Forks Heritage Village holds a three-day celebration of memories of rural life. A theme is chosen to highlight a dimension of "the good old days". The 2017 event featured prairie churches and ethnic groups. While prominent statewide, the historic Swedish population of this particular part of Minnesota is less well-known than that of the Norwegians, French Canadians, and Germans. However, Swedish presence in North Dakota during the 1870s-
1930s is well-documented. Consequently, a retired traveling exhibit of the State Historical Society of North Dakota became the focal point of presentations on ethnicity and churches in the Granville Church. This is a relocated structure on the Heritage Village’s grounds originally from near Oslo, Minnesota. These particular panels then served as the springboard to encourage conversations about persistence of the Swedes in Minnesota as part of encouraging future heritage tourism locally, regionally, and statewide for community development.

**Keywords:** Swedish, North Dakota, Minnesota

**Analysis of urban growth in Edwardsville/Glen Carbon, Illinois using remote sensing and population change data**

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(1) Department of Geography, Southern Illinois University - Edwardsville

**Abstract:** Rapid urbanization is one of the global issues. This significant social and economic phenomenon has brought about much debate in the past twenty years. Understanding its dynamics and patterns is important to develop appropriate policies and make more informed planning decisions. Many dimensions to the urban land growth have been identified in related literature, including drivers, relationship with other factors, such as population, impacts, and methods of measurement. In this study, urban growth in Edwardsville/Glen Carbon, Illinois is analyzed spatiotemporally using remote sensing and population change data from 1990 to 2015. The objectives of this study are to: (a) identify the major land use changes in the Edwardsville area; (b) analyze the rate of urban growth and its relationship to population change in the study area; and (c) identify the spatial pattern of urban growth in the study area. Using multi-temporal satellite images to classify and derive changes in land cover classes, the results show that the land cover classes with major changes are the urban/built-up land and agricultural/grassland, with a steady increase in the former and steady decrease in the later.

**Keywords:** urban growth, remote sensing, population change, Edwardsville Illinois

**Fire management plans and spatial patterns of forest burn in Central America**

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(1) Department of Geography and Environmental Studies, University of Colorado – Colorado Springs
Abstract: Fires are widely used in Central America to clear land for agriculture. This cultural practice can have negative implications for forest conservation when fires escape and cause natural forests to burn. Forest fires in tropical regions produce 2.1 billion tons of carbon dioxide every year, which contributes to climate change. This work aims to identify category IV and V protected areas (habitat/species management areas and protected landscapes/seascapes respectively), as defined by the IUCN, that have been affected by fire between the years of 2000 and 2015. After identifying these fires, a comparative analysis of fire management plans implemented by Central American governments seeks to explain spatial patterns of burned protected areas. This work relies upon freely available data, which makes it accessible for use by governments of developing nations. This information may allow policy makers to improve fire management plans in Central America, which could result in improved forest conservation and climate change mitigation.

Keywords: fire, climate change, mitigation, forest conservation, protected landscapes, management

Understanding and measuring anthropogenic soil salinity in brine spill impacted farmlands of Bottineau County, North Dakota, using multi-temporal Landsat data

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Abstract: Excess soil salinity poses an environmental challenge because of its impact on the alteration of soil structure, and the ability of plants to use soil water. Oil and gas extraction processes generate about 1,113 to 1,590 liters of saline water (brine) per 159 liters of oil produced. This saline water must be retained and disposed of properly. Untreated brine discharged on the ground increases soil salinity causing degradation that can decrease plant productivity or even kill the plants at higher concentrations. Our research objective was to identify brine-impacted soils using Landsat imagery from June 1984, 1993, and 2017 in Bottineau County, North Dakota. These multi-temporal Landsat TM, ETM+, and OLI images were analyzed using the Canopy Response Salinity Index (CRSI) to determine the health of croplands. The CRSI uses ratios of near infrared and infrared bands from Landsat imagery. Select Bottineau County farmlands with known brine spills had CRSI values ≤ 0.6, indicating high soil salinity.

Keywords: brine spills, petroleum production, North Dakota, Bottineau County
Examining the relationship between ENSO and seasonal precipitation across drainage basins within the State of Wyoming

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Abstract: Previous studies have delineated a region of uncertainty regarding the influence of El Niño Southern Oscillation (ENSO) on precipitation spanning Wyoming and the important headwaters located therein. This study aims to identify any seasonal or between-basin heterogeneity in ENSO-precipitation response between the Green, Wind-Bighorn, Snake-Salt, and Platte river basins within the state of Wyoming. We utilized the Multivariate ENSO Index to select the top ten strongest El Niño and La Niña events that occurred from 1950-2016. Precipitation data with a spatial resolution of 4 km was retrieved from the Parameter Elevation Relationships on Independent Slopes Model (PRISM). To assess the influence of ENSO on seasonal basin precipitation, we calculated and plotted quantile values for seasonal precipitation totals within each basin for our selected events. We then performed a rank-sum analysis to quantify the statistical significance of any observed trends. Our results reveal an increase (compared to normal) in precipitation over the Green River Basin during the preceding fall, and a decrease over all basins during winter of strong El Niño events that is statistically significant at the 95% confidence level. Precipitation was shown to be significantly higher-than-normal over the Snake-Salt Basin during the preceding fall; significantly higher-than-normal over the Green, Wind-Bighorn, and Snake-Salt basins during winter; and significantly lower-than-normal over the Green and Snake-Salt basins during the succeeding fall of strong La Niña events. Thus, strong ENSO events exhibit an influence on precipitation during both phases that is most evident during the winter (DJF) season.

Keywords: climate, ENSO, El Niño, La Niña, water resources, hydrology

Measuring walkability: An illustration in Brookings, SD

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Abstract: Walkability can be used as an objective determinant of a community’s environmental, economic, and public health. Walkability is a manifest variable that represents the suitability of an area for walking. Several objective and subjective latent variables are required to measure the multi-dimensional concept of walkability. This study reviewed the tools, techniques, and variables used to measure walkability and subsequently developed an adapted version of the Pedestrian Environmental Quality Index (PEQI) instrument. The adapted PEQI instrument was applied to the pedestrian environment in Brookings, SD, which is
home for 23,895 people, according to the 2016 Census, and is also home to South Dakota State University. The results of this study are illustrative of an areas' ability to accommodate the walking needs of its annual and seasonal residents. Moreover, the results also have a wide variety of applied research applications.

**Keywords:** walkability, PEQI, GIS, community, pedestrian infrastructure

**The relationship between urban tree LAI and urban heat**

Amanda Shepherd (1) and Ryan Jensen (1)
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**Abstract:** Leaf Area Index is a biophysical metric that may mitigate urban heat. In this paper, we examined what types of trees are most effective at cooling the surrounding urban areas. To accomplish this, LAI was measured in 200 trees in urban parks in Orem and Provo, Utah. A forward looking infrared (FLIR) camera was used to measure the thermal characteristics of each tree canopy and the ground below the tree canopy. We extracted temperature values from the FLIR images at thirty random locations under each tree to compute average temperature. Currently, we are comparing these temperature values with LAI using regression analysis and other statistical tests such as ANOVA to determine what relationship exists between these variables. We expect to find that trees with higher LAI values generally have lower temperatures in their shadows over grassy areas, and are more efficient at mitigating urban temperatures (disregarding other potential variables) than trees with lower LAI values. Our next step will be to determine which specific species are most effective at mitigating heat.

**Keywords:** LAI, urban heat, FLIR

**Impacts of land use and land cover change on water quality in the Big Sioux River: 2006-2016**

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**Abstract:** The increased demands on ethanol and rises in the price of corn led to increment of corn acreage in South Dakota. Other driving forces such as crop insurance subsidies and disaster payments encouraged farmers to (1) convert pasture, fallow, and grassland to corn acreage, and (2) shift from other crops such as wheat to corn. The increment on corn acreage and adjustments in crop rotation between corn and soybeans resulted in use of increased amount of industrial fertilizers. The excess nitrate runoff from agricultural land that the crops
could not completely consume leach into the Big Sioux River. The river transports the nitrates downstream leading to an increased nitrogen from the headwaters to the lower basin. Nitrate increases in the river may be associated with increased areas and intensities of agriculture in the watershed. High concentrations (10 ppm) are associated with human health issues and are regulated by the United States Environmental Protection Agency (EPA). This research focuses on determining the extent to which the nitrogen compounds are present in the Big Sioux River, especially brought by the nitrogen leaching from corn cropland. The research uses the National Agricultural Statistic Service (NASS) Cropland Data Layer (CDL) to characterize and determine the rates of land use land cover (LULC) change, uses Soil and Water Assessment Tool (SWAT) model in ArcGIS to calibrate and validate nitrogen data from East Dakota Water Development District (EDWDD) and analyze the temporal and spatial trend of nitrogen levels, and determine whether there is a correlation between LULC change and changes in nitrogen levels in the Big Sioux River.

**Keywords:** Big Sioux River basin, water quality, Soil and Water Assessment Tool (SWAT), land use/land cover, East Dakota Water Development District (EDWDD)

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**A preliminary report on urban tree species of London and their potential impact on temperature**

Andrew Smith (1) and Ryan Jensen (1)
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**Abstract:** London was once a Roman fortress that is now a bustling global city and among the most important economic and cultural hubs of Europe. This transformation was made possible in part by London’s climate and physical geography – making England ideal for various types of agriculture and mineral extraction. This preliminary study examines one part of London’s physical environment – urban trees – to determine how trees planted in urban areas affect temperature in London. This was performed by taking photos of various trees from all four compass directions, as well as a canopy photo of all trees in Hyde Park, Green Park, and the Bayswater neighborhood of west London. The location of each tree was plotted using GPS, its species was noted, and its canopy photo will be used to estimate leaf area index (LAI). Initial analysis shows a greater variety of tree species and tree ages, greater variation in location and frequency of trees, and a greater variety in estimated LAI in London’s public parks than urban neighborhoods. Further research will be conducted on London’s laws and regulations regarding urban trees – specifically regarding the differences in regulations between London’s public parks versus other urban areas. Additional research may be conducted regarding climatic indicators such as surface and air temperature and levels of carbon dioxide in public parks
versus heavily urbanized areas of London.

**Keywords:** urban, tree, species, London, impact, climate

**The spatial analysis of global eSports tournaments**

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**Abstract:** Very little academic research has been conducted about how eSports tournaments are distributed geographically. Better understanding of tournament location will improve future research into understanding why eSports tournaments are hosted in their eventual locations. This research aims to use spatial analysis to understand whether and where clustering is taking place, and show if large cities attract tournaments with large prize pools. Using tournament information from eSports informational database website www.liquipedia.com, it will be determined where tournaments for three major eSports games took place, to make analyses possible between global tournament locations. Next, location data for tournaments will be entered into a spatial database, and this layer of tournament locations will be analyzed and mapped. From this spatial database, spatial data analyses will be performed to make comparisons in tournament site location. It is expected that there will be greater numbers of tournaments in Southeast Asia. This may be due to larger populations of the Southeast Asian nations, a larger gaming participant pool in these countries, or also due to cultural factors such as more widespread appeal of online multiplayer strategy games or patterns of high pursuit of socio-economic advancement through technological careers in Asia. It is hoped that a sequence of maps generated will be able to visually communicate the chronological changes of site choice over time, perhaps showing that as popularity for tournaments grew, their prize pools grew, and the tournaments began being held in larger and larger cities.

**Keywords:** eSports, professional gaming, cluster, GIS

**A spatial and temporal investigation of daily newspaper endorsements during the 2016 Presidential Election cycle, with a supplementary examination of historical trends**

Lindy Westenhoff (1) and Gerald Webster (1)
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**Abstract:** In electoral geography, several methods exist to predict electoral trends in United States presidential elections, one of which is endorsements from daily newspapers. Endorsements of candidates in the 2016 presidential election
overwhelmingly favored unsuccessful Democrat Secretary Hillary Clinton over Republican candidate Donald Trump. This research examines when in the cycle candidates were endorsed by newspapers, the circulation size of each newspaper, and the spatial distribution of cities in which newspapers are published. Our analysis notes the emergence, in the 2016 election cycle, of “anti-endorsements” from newspapers. Rather than promoting a particular candidate, some newspapers instead advocated against a particular candidate. Perhaps related to this trend of “anti-endorsements” in the 2016 election cycle, more than one newspaper of significant size endorsed a third party candidate over the two major party candidates. Our analysis contextualizes these findings through an evaluation of historical data for 100 daily newspapers that have remained in publication since the 1980 presidential election. Endorsements were used to determine if long-running daily newspapers consistently endorse one political party, or if they are bipartisan in their recommendations. The 2016 election in particular saw many firmly Republican newspapers largely not endorsing either candidate or endorsing the Democratic candidate. This largely confirms the 2006 findings of Ansolabehere, Lessem and Snyder, and may point to a growing irrelevance of daily newspaper endorsements in contrast to other methods of predicting electoral trends.

**Keywords:** electoral, political, newspaper, circulation, endorsement, temporal, spatial

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Public spaces for the few: Exclusion of skateboarders from public spaces in Omaha, Nebraska

Daniel Williams (1)

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**Abstract:** Public spaces are created to promote community cohesion and provide a place for different forms of activity. However, through urban design, planners produce these spaces for specific groups and for specific activities. One specific group that is routinely excluded from public spaces are skateboarders because skateboarding is perceived as an act of vandalism and challenges social norms. This study examines how urban design is used to exclude skateboarders from different public spaces in Omaha, Nebraska. This case study uses personal observations to further understand three specific processes that make public spaces exclusive to some and inclusive to others. These three exclusionary tactics that this study focuses on are the built environment, social controls, and legal processes. Expected results for this study would show that areas of the city with higher average incomes will result in more exclusive spaces, while places that lack investment and redevelopment will have less evidence of exclusivity.

**Keywords:** public spaces, skateboarding, urban design

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2017 Meeting of the Great Plains/Rocky Mountain Division of the American Association of Geographers, Grand Forks, ND, 13-14 October 2017
Zooarchaeological analysis of the northern San Juan Basin

Daniel Yun (1)
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Abstract: Zooarchaeology, a subdiscipline of environmental archaeology, is the study of animal remains in archaeological sites. Geographers and archaeologists utilize zooarchaeology to figure out how humans in the past interacted with the environment. Increasingly other professionals, such as conservation biologists, are utilizing zooarchaeological data to help them restore the environment. The case study of the northern San Juan Basin is a prime example of how valuable zooarchaeological data can be. The northern San Juan Basin contains a rich cultural and environmental history. The region is home to over 300 species that includes 30 reptile, 30 mammal, and 100 bird species. In addition, the first humans (Paleoindians) arrived in the region about 10,000 BC or earlier. Then over time groups of people permanently settled in the region and became the Pueblo people who still have modern descendants to this day. This combination has created one of the most extensive in zooarchaeological data in the world. By analyzing zooarchaeological data in the northern San Juan Basin scientists figured out how animal populations were affected and how people adapted to their environment.

Keywords: zooarchaeology, San Juan Basin
Paper Abstracts
Listed alphabetically by last name of first author.

Temporal trends and spatial patterns of warm season hot temperatures in Saudi Arabia

Ali S. Alghamdi (1) and John Harrington Jr. (1)
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Abstract: Temporal trends and spatial patterns of six warm season hot temperature indicators (WSHTIs) in Saudi Arabia were developed and explored. The indicators focus on the frequency and intensity of hot days, warm nights, and heat waves. Taking into account the observed effects of climate change on the country’s climate, hot temperatures were defined using a monthly and decadal time-sensitive approach. Indicators of event frequency are count data; thus, different Poisson models were used for temporal analysis. Further, a novel method of time-series clustering was introduced to recognize spatiotemporal patterns of WSHTIs. Systematic upward trends in maximum and minimum temperatures were found at most of the stations, suggesting ongoing change in the climatology of the upper-tail of the frequency distribution. Different patterns were observed over time and space not only across stations but also among WSHTIs. The overall results suggest that not only local and regional factors, such as station elevation, latitude, and distance from a large body of water, but also large-scale factors such as atmospheric circulation patterns are largely responsible for the observed temporal and spatial patterns.

Keywords: hot temperature indicators, time-sensitive approaches, spatial pattern recognition, time-series clustering, Poisson models, Saudi Arabia

Allotting the Omaha Reservation: Patterns and impacts, 1884-1940

Andrew Allen (1)
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Abstract: In the late 1800s a combination of Eastern reformers and Western land interests advocated for allotment of Indian reservations and was a prominent part of the assimilation process. The objectives of allotment were to break up unity and to promote the agricultural economy by giving individuals their own parcel of land. While often associated with the Dawes Act, many tribes were allotted prior to its passage in 1887. Among these were the Omaha, who assigned allotments in separate sessions in 1884 and 1900. After allotment, the Omaha were alienated of large parcels of land through land sales and leasing agreements. In studying the impact of allotment, I traveled to the National Archives and collected allotment or estates records, and leasing information.
recorded by the local Indian agency. After transcribing the records, a GIS database was created through which I examined the geographic, economic, and social patterns related to the selection of allotments as related to land cover, transportation networks, and preexisting population patterns. Future research will examine land loss and fractionation of allotments.

**Keywords:** historical geography, GIS, cultural geography

### Poisson analysis of snowfall in Grand Forks, North Dakota

Christopher Atkinson (1)
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**Abstract:** A continental climate, Grand Forks, North Dakota, experiences a variety of snowstorms every winter. Everything from spotty, light snow flurries to large, multi-county blizzards can impact the region. Using data from the Grand Forks NWS WFO, the study aims to examine the probability for different threshold-level snowfalls for Grand Forks. The Poisson distribution is utilized for this analysis. Specifically, a comparison of days with light and heavy snowfalls for two time periods, 1957-1986 and 1987-2016, indicates any changes in probability for wintertime snow in the city. Historical snowfall data provides a context for what can be expected in Grand Forks and helps city and regional personnel plan for different snowfall scenarios.

**Keywords:** snow, physical geography, statistics

### Fill and floods: An assessment of the impact of parcel-level mitigation activities on residential flood loss reduction

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**Abstract:** Parcel fill enables land in floodplains to be raised above base flood elevations using dirt/fill and is gaining popularity in many suburban communities. However, with recent repetitive flood damages, it is uncertain how filled parcels perform during flood events, or whether there are adverse impacts on unprotected adjacent parcels. To address the lack of comprehensive knowledge on the impact of fill, this research poses two questions: is fill effective in mitigating flood damages? Does fill adversely impact flood damages of adjacent unfilled parcels? This research applies a two-step analysis of propensity score estimation to match fill and unfilled parcels, and a spatial autoregressive model to examine the difference in flood damages between fill and non-fill parcels. A post-match analysis of the pooled sampled parcels indicates significant flood damage differences between fill and non-fill properties. Additional analysis of flood
damage clusters using exploratory space-time analysis methods such as local indicator of spatial autocorrelation and a bi-variate Ripley’s K point pattern analysis indicates significant clusters of flood damages relative to fill parcel locations. These results highlight the importance of examining parcel-level flood mitigation methods that have cross-jurisdictional economic and planning implications, as well as a cumulative effect on flood damages at both the community and regional watershed scale. This research also provides insight into the need for ad-hoc structural and non-structural methods and incentives to compensate for the use of fill in floodplain development and planning.

**Keywords:** parcel fill, flood mitigation, propensity score matching, floodplain planning

**Rural population decline and “free land” programs in the Great Plains**

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**Abstract:** For as many as 100 years, population decline has been a chronic issue in much of rural North America. Nowhere is it more spatially widespread or noticeable than in the Great Plains. Its effects have been felt through consolidations of schools and places of worship, loss of services, and under extreme circumstances, the abandonment of entire communities. This study explores the history of rural settlement in the Great Plains and the root causes of rural population decline. It also examines “free land” programs, which are being employed to attract new residents to rural communities to reverse population loss to varying degrees of success.

**Keywords:** rural geography, rural, free land, Great Plains, Kansas, population, population decline, economic development

**Green spaces for the dead: The aesthetics of Russian cemeteries**

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**Abstract:** There is an old tradition in geography of studying landscapes of the dead, namely cemeteries. A number of approaches can be used, including toponymic, GIS, and cultural interpretation. Perhaps because of their distinct focus on the afterlife as understood by the Orthodox theology and the unusual layered history of the pre-Soviet, Soviet, and post-Soviet periods, Russian cemeteries represent a curious and underexplored subject for such analysis. This paper aims to present some common themes for the exploration of the aesthetics of existing Russian cemeteries, both urban and rural, and suggests some future
avenues for research. Of particular interest is the role cemeteries play in sustaining biological diversity in densely populated parts of the country and their evolving forms in preserving cultural meaning in the morally relativist landscape of post-modernity.

**Keywords:** biodiversity, cemeteries, cultural landscapes, necrogeography, Russia

**Flood recovery in Grand Forks, ND: Land use change since the Red River Flood of 1997**

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**Abstract:** In April of 1997 the Red River of the North overflowed its banks, taking a devastating toll on Grand Forks, North Dakota. A large-scale evacuation took place, damage was extensive, and the recovery process was both lengthy and expensive. Subsequently, significant change occurred as the city rebuilt and took steps to prevent future disasters. The purpose of this project was to assess changes in land use in Grand Forks from before and after the 1997 flood. Pre-flood and post-flood land uses were classified from National Agriculture Inventory Program imagery from 1991 and 2012, using the broad categories of agriculture commercial, industrial, park/undeveloped, and residential. Ground truth points were collected in order to assess the accuracy of the post-flood classification. The results of this project indicate that significant land use change occurred in Grand Forks since the Red River flood of 1997, with 28.3% of the study area changing land uses between the study years. Citywide, agriculture was the only land use category that decreased from before to after the flood, with residential and commercial land uses experiencing the greatest growth. There are certain identifiable land use changes that can easily be attributed to the flood. In many cases, though, the impacts of the flood on land use may have been more indirect or land use change may have occurred independent of the effects of the flood, although this is difficult to determine with certainty.

**Keywords:** land use, Grand Forks, 1997 flood

**Some perspective of teaching Physical Geography at lower level undergraduate courses**

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Abstract: Teachers are designers. We design courses with vision of desired learning results in mind. The stages of result-oriented design can help us to set priorities with considerable goals within limited time. I found this technique is coherent to convey the concept in Physical Geography, especially for general education purposes. A wide array of information and resources are available for online teaching. Some instructional designs are developed to deliver each content using important concepts, their interconnections, and creating some games with key components as formative assessments. Active student participation and increasing interests in learning is observed through the process. However, learning should be quantified through the collection of assessment data, which is required to perform as summative assessment in this process.

Keywords: physical geography, online teaching, formative and summative assessments, instructional designs, games

"Piping in some commonsense": Plains & pipelines in media coverage of environmental controversy

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Abstract: The media’s coverage of national issues shapes public perception of the issues at hand and impacts their geographical imaginations. Using the examples of the Keystone XL and Dakota Access Pipelines and applying critical discourse analysis, I examine the framing of the pipelines in print media and the controversies, contrasting Plains sources with off-Plains sources. Media located in states crossed by the pipeline reflects local concerns as well as local stakeholders positions. Media published by companies off the Plains reflects their concerns and stakeholders, which can be markedly different than those on the Plains. Newspapers on the Plains states tend to support the pipeline, though dissenting voices can be found in editorials, opinion pieces and letters to the editor. In contrast, off-Plains print media focuses more on the Plains as a battlefield, minimizing the argument for the pipelines. Underlying the coverage are conversations about citizens’ rights to land, appropriate use of the Plains, and the nation’s energy needs and practices.

Keywords: Great Plains, landscape, media, pipelines

Comparing traditions in rural healthcare for the elderly in Japan and selected Native American cultures

Cherokee Durant (1)
(1) Mayville State University
Abstract: Japanese and Native American cultures could be depicted as being completely different. Yet they also share similarities such as respect for the elderly and belief systems that often involve traditional healing in caring for them. Nonetheless, in both cultures some friction exists between western medicine and these traditional ways. This presentation begins by focusing on the use of Kampo medicine in rural Japan, essentially a Japanese holistic medicinal care system. Interview data from Kampo doctors and patients collected in Japan inform this section. Next, the status quo of Kampo in Japan is compared to the practice of traditional health care in the Native American Chickasaw and Sioux tribes. Disparities in rural Japanese health are then compared to those often found in these tribes. The goal of this project is to draw on this comparison to improve rural health care for the elderly. Plans for further research directions are also explained.

Keywords: rural health, Kampo medicine, traditional healthcare, Japan, Chickasaw, Sioux

Farm abandonment and the wildlife invasion of rural Yamanashi Prefecture, Japan: Possible solutions

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Abstract: Social-cultural changes in rural communities of Yamanashi Prefecture in Japan have made farming an increasingly difficult occupation. Western influences and urbanization have caused many young people to leave their family farms in search of more prosperous careers, leaving aging rural populations and abandoned farmland. This has allowed wild boar (*Sus scrofa*) and deer to enter lower elevations and take up residence in these fields. The increasing encroachment of wild boar and other species causes spillovers into remaining farms, resulting in extensive damage to grape vineyards and stone fruit orchards. In 2012, for example, wild boar and deer in the prefecture caused over one million dollars in damage. This presentation draws from interviews with Japanese farmers and surveys of Japanese farmland to assess the wildlife invasion and determine optimal methods of deterrent.

Keywords: rural change, farm abandonment, wild boar, deer, Japan

People and water: Decision-making impacts in the Republican River basin

Jean Eichhorst (1)
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Abstract: Throughout time people have sought to tame and redirect water for their own benefit whether it was draining swamps, storing water, or digging irrigation ditches. At more discrete scales, human agency has effectively and significantly reduced surface flows and mined groundwater aquifers by redirecting water for municipal and agricultural purposes by re-configuring hydrological ecosystems. In 2013 the International Association of Hydrological Sciences launched Panta Rhei—every flows-change in hydrology and society, a decade devoted to promoting science and pursuing solutions for water-related issues from global to local that linked to changing environmental and social conditions (Montanari 2012). Sivapalan et al. (2012) have called it socio-hydrology a field that recognizes and works to incorporate human dynamics in modeling while acknowledging the difficulty of doing so. Hydrological connections between surface and groundwater are better understood and models effectively represent the relationship. What the models have not done to date is incorporate dynamic variables, namely society’s values, preferences, experiences, and changing perceptions about water. The Republican River basin provides an opportunity to examine human agency’s impact on stream flow and the relationship basin irrigators and water managers have with water. Stream flow scenarios from three sources illustrate human impacts on basin streams and interview results with basin irrigators and water managers highlight water relationships. I am presenting a socio-hydrological profile that equalizes the physical and human elements of the basin to understand the relationship between people and water, human-decision making, and hydrologic responses to those decisions.

Keywords: Republican River, socio-hydrology, human agency, stream flow, interviews

The geography of NCAA (FCS) Football, 2017

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Abstract: Sport and geography share a common spatial bond. Boundaries, delineation, demarcation, territorial control, spatial interaction, distance decay, etc. are essential elements of both. The role sport plays in the American way of life is inescapable. How many ESPN channels are there? Thus, academic investigation into the cultural geography of sport, sport landscape and sports impact on society is a data-rich subfield that poses unlimited possibilities. College football provides a significant focus for such investigations. The purpose of this project was to examine the geography of the Football Championship Subdivision (FCS). A geographic database consisting of over 12,000 FCS player origins was generated. In addition, an FCS program database was created from several variables associated with success. The variables that were assessed to determine successful programs included: average attendance, poll rankings,
post-season success, and number of All-Americans. The resulting maps provided insight into the regionalization of football involvement and comparisons drawn from the earlier work regarding the geography of American football.

**Keywords:** college football, recruiting, sport geography

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**A postmortem of honorary place names: Political beneficence, toponymic inscription, and the reinterpretation of the past**

Joshua Hagen (1)
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**Abstract:** Media attention has recently focused on the appropriateness of public statues, place names, and other displays honoring Confederate leaders. These heated debates reveal the perils of honoring public figures through statues, place names, and other spatial markers because public figures are continually subject to reappraisal in light of new information or simply because contemporary reinterpretations of the past are in constant flux. The late Senator Robert C. Byrd of West Virginia highlights some of the vagaries of these types of spatial commemorative practices. Byrd dedicated his later years in office to directing federal spending to his home state, a practice colloquially known as 'pork barrel' politics. Numerous places were subsequently named after Byrd, often in explicit recognition of Byrd’s influence over federal spending. Yet Byrd’s legacy has proven complicated. A former KKK member and strident opponent of the 1960s Civil Rights legislation, Byrd is hardly a hero for contemporary Democrats. Furthermore, West Virginia has transformed from solidly Democratic to staunchly Republican. The long-term economic impact of Byrd’s pork spending is also debatable as the state’s economic woes persist. In light of these shifts and the recent impulse to purge the public sphere of troubling reminders from the past, this presentation provides an initial postmortem of Robert C. Byrd place names and more broadly the pitfalls of honoring public figures through place names.

**Keywords:** commemoration, place names, pork barrel spending, Robert C. Byrd, symbolic capital, West Virginia

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**Revisiting the Internal Colonial Dependency Model in the Great Plains**

Jason Holcomb (1)
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**Abstract:** The Kansas High Plains has been described as a region that has migration and other population characteristics consistent with the Internal Colonial Dependency Model, a development model most frequently applied in the United States to the region of Appalachia. Prior research has drawn parallels
between the High Plains and Appalachia as two American regions that fit this model in certain ways. This study revisits and expands the model to the Great Plains as a whole, taking a historical view while also considering recent phenomena as evidence that the Great Plains exhibits characteristics of an internal colony. I consider the phenomena of Campbell Farming Corporation in Montana, past and present harvest labor, and the recent energy boom in the Great Plains. In examining migration and the recent Great Plains energy boom I make comparisons to fly-in/fly-out (FIFO) labor in Canada and Australia.

**Keywords:** Internal Colonial Dependency Model, Great Plains, migration, harvest labor, Campbell Farming Corporation

**Perceptions and performances of wilder-scapes: Shaping contemporary social memories of the American West at Little House tourist sites**

Kimberly Johnson (1)
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**Abstract:** Historical fiction provides a link between the past and present through storytelling, where children and adults learn about the significance of people and places. Geography can foster important understandings of how these historical and spatial narratives are interpreted in the present. While some geographers focus on the link between historical fiction and tourism, a lacuna exists in regards to the Little House book series and landscapes presented at various Little House tourist sites. The Little House series, by Laura Ingalls Wilder, chronicles the experiences of the Ingalls family as they move west from Wisconsin to Dakota Territory during the mid to late 1800s. In addition, the series has provided an avenue for reflecting and constituting social memory of the American West. I collected 290 surveys completed by tourists at the 2017 Laura Ingalls Wilder Pageant in DeSmet, South Dakota. In this paper, I address how participants felt about visiting and interacting with the landscape as well as their perceptions/memories concerning how the book is represented through the tourist site. The results of these surveys indicate that most visitors’ expectations were fulfilled, while very few visitors provided critical perspectives in regards to socio-cultural identities, such as race and gender. By accepting this landscape as a didactic site, tourists reinforce historical, predominately white, male narratives of the American West.

**Keywords:** tourism, historical fiction, American West, Little House book series
Addressing geographic disparities in access to ambulance services: Ensuring access while minimizing costs

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Abstract: Background: Recent rural hospital closures have tasked policymakers with preserving access to rural emergent health services. Potential solutions include setting up freestanding emergency departments or primary care clinics with ambulance services. Ambulance services within many states are put together on an “ad-hoc” basis, relying on volunteers to staff service areas. Reliance on community goodwill has proven insufficient. The system is in crisis and in need of reform. Objectives: Address existing geographic disparities in access to ambulance services and propose solutions that ensure access to care while minimizing costs. Methods: A national expert panel detailed the financial resources required to run three ambulance service tiers based on population density. A location set covering problem was used to determine the most efficient means of providing statewide coverage. Services were sequentially placed in towns with over 8000 people, hospitals, incorporated towns, and paved roads. Sensitivity analyses within a GIS/economic framework conveyed the most cost-effective set of service locations within North Dakota. Results: Compared to 134 existing services, an optimal set of 105 services (46 existing, 59 new) covered the entire state’s population within a 25-mile service area. Implementation costs include $132.4 M in fixed costs and $56.9 M in annual variable costs. An optimal solution could realize system savings of $67m in fixed costs and $33.5m in annual variable costs. Conclusions: Identifying gaps and overlapping coverage areas and proposing an efficient set of ambulance service locations demonstrates the potential for system-wide cost savings. This methodology can be used for state and regional strategic planning purposes.

Keywords: emergency medical services, ambulance, geographic disparities, access to care, costs, geographic information system

Composing and refining a learning progression for place

Thomas B. Larsen (1) and John A. Harrington Jr. (1)
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Abstract: Vidal de la Blache articulated that geography is “the science of places.” How do students gain a deeper understanding of the concept and character of place? Can they use place to assist in learning other complex concepts and ideas? What can teachers do to advance place-based knowledges? Herein we report on a recent project funded by NSF to address whether or not the use of place in K-12 education can be transformative. Initial efforts address our questions by composing and refining a learning progression (a cognitive “road map” to learning) for place. Like many scholarly topics in geography, the multifaceted nature of place makes it difficult to insert into linear sequences. Additionally, students’ prior learning and cultural backgrounds challenge a one-size-fits-all approach to learning about place. The research crossroads where place and learning progressions meet has the potential to transform how geography is taught, as well as how place is incorporated as a cross-cutting theme within the sciences, social sciences, and humanities.

Keywords: learning progression, place, transformative, geography education

Identifying prominent wildfire evacuation trigger points with reverse geocoding

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Abstract: Reverse geocoding uses a pair of geographic coordinates as the input and returns a nearby address or a place/feature name. Online reverse geocoding services have been widely used in various location-based services in urban areas. We present a novel application of online reverse geocoding in exurban environmental modeling—identifying prominent wildfire evacuation trigger points. Wildfire evacuation trigger points are prominent geographic features (e.g., rivers, roads, and ridge lines) that are used to facilitate communications during wildfire evacuation. When a fire crosses a trigger point, a predefined protective action will be issued to the threatened population. Specifically, the proposed method includes three steps: 1) generate a trigger buffer using fire spread modeling and geographic information systems (GIS); 2) use online reverse geocoding to retrieve features proximal to the buffer boundary; and 3) identify prominent features using viewshed analysis. A case study of Julian, California was used to evaluate the proposed method, and the results indicate that the method could help facilitate communications in wildfire evacuations. This work also sheds light on the potential use of online reverse geocoding in other environmental modeling applications.

Keywords: wildfire evacuation, trigger points, reverse geocoding, fire spread modeling, GIS, viewshed analysis
Comparing teaching methodologies in the American and Japanese education systems

Megan Maassel (1)
(1) Mayville State University

Abstract: An effective education system employs different methods to produce a more educated public. As an American, I have observed the different methods and evolution of my own education system. Recently, I was able to spend one month in Japan working as a participant observer in the Japanese system. This presentation explores as a case study the strengths and weaknesses of both systems. For example, the Japanese system includes more academic rigor as a part of their foundation. The focus is to academically push students to the next level from a very early age, while also producing moral upstanding citizens. Courses directly reflect these ideologies. In partial contrast, the American system has recently placed more emphasis on social-emotional learning. Overall, both systems showed areas of strength and possible improvement. This presentation concludes with how I intend to incorporate these results into my future teaching career.

Keywords: education, Japan, teaching methodologies

Habitat suitability analysis for mountain lions (*Puma concolor*) recolonization/reintroduction in Minnesota

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Abstract: Mountain lion range once extended throughout the state of Minnesota. The breeding population has greatly reduced due to housing developments, new roads and timber harvesting have broken large tracts of contiguous forest into isolated patches that are too small for mountain lions that made some parts of the land no longer suitable for a breeding population. The objective of this study is to use suitability analysis to determine the most habitat to conserve mountain lion populations threatened by habitat fragmentation. To attain our objective, we created three sub-models that contribute to the overarching goal of the suitability model. A habitat sub-model was developed for finding best habitat, a food sub-model for access to the maximum amount of food, and a security sub-model focusing on the distance from houses, roads, and urban development. Using the Weighted Sum tool, the three sub-models were combined to produce a suitability surface based on the tradeoff of the preferences of the goals represented by each sub-model. Our suitability model shows large areas of high-quality mountain lion habitat in the northeastern section of the state. These areas contain the favorable locations of mountain lion habitat such as forested land.
cover, low density populations, steep slopes, short distances to streams, and area unimpeded by major roads. The southern and western parts of the state are characterized by lower slopes, more agricultural land, grassland, developed land, and higher population density, which result in lower quality habitat, with the Twin Cities having the worst mountain lion habitat.

**Keywords:** suitability analysis, mountain lion, model builder, food model, security model, habitat model, raster transformation and reclassification

### Kansas tornados and climate change

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**Abstract:** Is global climate change affecting the frequency, magnitude, or seasonality of tornados in the state of Kansas? In this research project temperature, precipitation, and tornado data was used to analyze whether climate change since 1950 has affected tornadic activity. Data analysis was done with regards to the precipitation and temperature data to see if there is a change in Kansas climate. Tornado data was also collected from 1950-2016 and separated in to decadal increments. GIS mapping was used to show visual representation of the tornado data. While bar graphs and pivot tables were used to display data regarding frequency, seasonality, magnitude, precipitation, and temperature. The data collected on temperature and precipitation will be compared against the tornado data. This comparison is used to determine if there is a correlation between tornadic activity and the Kansas climate. When considering the tornado data assumptions in the data were considered. These assumptions include: technology change, population, popular culture, and null value data. When analyzed the findings suggested there needs to be 30 years or more of data collected before a definitive answer can be given.

**Keywords:** frequency, magnitude, seasonality, climate change, assumptions

### Noise mapping of an educational environment: A case study at South Dakota State University

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**Abstract:** Noise, or unwanted (mostly human caused) sound, is a type of pollution that has both direct and indirect negative impacts on humans, with significant implications for public health and well-being. Mapping the acoustic landscape (i.e., soundscape) using noise and sound provides important insights for evaluating and interpreting environmental noise. This research project aims to
collect, compile, analyze, interpret, and visualize the soundscape of South Dakota State University’s campus. GIS will be used to develop maps for both noise and sound to investigate spatial and temporal patterns. The results will be used to identify problem areas and propose possible solutions, which should be of considerable interest to the campus community in general and campus planners in particular. The results will also be used to raise awareness of the social, economic, environmental, and public health implications of noise pollution.

Keywords: noise mapping; sound mapping; soundscape; GIS; noise pollution

The complexities of documenting cultural change in rural Japan in film

Nick Peterson (1)
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Abstract: This presentation discusses my experiences producing a documentary film in rural Japan. For this project I used a prosumer camera and a camera-enabled Phantom 4 to explore cultural change in rural Japan. I was new to Japan and this was my first international filmmaking experience. This presentation covers cultural and linguistic differences, the negotiation of access to people and private property, legal issues, technical difficulties, and my struggles overcoming the physical and cultural environment of the mountainous region. Overall, the trip was a success as I was able to get the footage I needed, make new contacts in Japan, and manage to not break any international laws. The lessons learned while writing, filming, and editing an international documentary in rural Japan have exposed me to a considerably different culture and made me a better filmmaker.

Keywords: documentary film, Japan, rural change

Segregated Kansas City: Structural racism and contemporary identity

Kevin Romig (1)
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Abstract: Although not often thought of as a Southern US city, Kansas City ranks among the most segregated large cities in the USA. This paper traces the roots of structural racism using urban geography to reveal an astounding contemporary reality of Troost Avenue being a racial and economic dividing line separating the city’s east and west side. In addition, the presentation will include a transect photography project to highlight the proximity of the racial and economic divide.

Keywords: inequality, racism, urban
A geography of oil spills in North Dakota, 2014-2016

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Abstract: Major oil spills, and the potential for spills, have been the focus of several national news stories in recent years. In North Dakota, for example, the controversy over the siting of the Dakota Access Pipeline gained international attention. While discussions over preventing or mitigating the effects of large pipeline spills are important, one should note that the large majority of spills are small and the result of numerous factors. Our research seeks to understand the characteristics and geography of all oil spills in North Dakota for the period 2014-2016. Using data from the Environmental Health Section of the North Dakota Department of Health, we found that the total volume of the more than 2,000 reported oil spills during the study period was 1.95 million gallons, with an average per spill of 645 gallons. While pipeline spills occur infrequently, they do tend to be large. Most of the smaller spills are the result of equipment failure and machine error, and most occur on-site at the well pad rather than off-site during transportation. We developed a series of maps to illustrate the geography of oil spills in North Dakota.

Keywords: oil spills, North Dakota, technological hazard

Historical geography of the Minnesota Twins roster, 1901-2017

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Abstract: Earlier sport geography studies by Goudge, Rooney, et.al, have focused on the geography of baseball player origins (hometown/birthplace) at the Major League and collegiate baseball level. Little research has been conducted examining the historical roster(s) of a single team. The purpose of this project was to examine the geography of the Minnesota Twins historical roster of the 1,629 players that have played for the Minnesota Twins since their inception in 1901. Geocoding the team rosters was the first step. Once compiled this data was mapped at the city/state/country level by decades. In addition, the team success was examined to identify periods of high and low success. The resulting maps provide insight into the regionalization of athlete origins/production and team success. Thus, adding to the body of literature in sport geography.
Keywords: baseball, fan regions, sport geography

Estimate water temperature from the Landsat 8 TIR bands using the split window algorithm: A case study for Devils Lake

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Abstract: Water temperature is a key factor in studying lakes and reservoirs water quality. Remote sensing products of land surface temperature typically have a spatial scale of 1 km, which, however, is not applicable to small inland water bodies. The Landsat 8 sensor, which has two thermal infrared (TIR) bands at 10.6 – 11.19 and 11.5 – 12.51 μm, opens a new possibility to retrieve water surface temperature (WST) for small inland water bodies of sizes > 100 m. The aim of this study is to test the split window algorithm to retrieve WST from Landsat 8 TIR bands. The split window method requires atmospheric transmittance and water surface emissivity (WSE) for the Landsat 8 TIR bands to calculate WST. While the WSE can be considered more or less as a constant of value 0.98, the atmospheric transmittance in the spectral range of 10.6 – 12.51 μm is mainly affected by absorption of water vapor, which is highly variable. We use MODTRAN with contemporaneous MODIS atmospheric water vapor product (MOD05) to calculate atmospheric transmittance for the two Landsat 8 TIR bands. The calculated WST using 11 Landsat images showed $R^2 = 0.92$ and RMSE < 2.5°C agreement with situ water temperature measured by a buoy in Devils Lake, North Dakota. A python tool was developed to automate the process.

Keywords: Landsat 8, water temperature, split window algorithm, Devils Lake

Challenges and benefits of developing a geoscience careers course at community colleges

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Abstract: Community Colleges enroll almost half of U.S. undergraduates. Increasing participation at community colleges, which often have greater diversity than their four-year counterparts, is one approach to increasing diversity in STEM professions. Many of these students are first in their family to attend college and therefore, are more likely unfamiliar with the steps required to transfer to four-year universities, often lack knowledge of the importance of internship programs or awareness of such programs, and have little understanding of the variety of
STEM career opportunities available. Two federally funded programs, Geo-Launchpad and Bridges to Baccalaureate, were developed at Front Range Community College with the community college student in mind. These programs work to expose students to internships and research opportunities that assist in gaining postsecondary education or workforce employment. Geo-Launchpad, funded by the National Science Foundation, developed a careers course as part of its approach to building pathways for students to STEM focused careers. Geo 210: Careers/Research in the Geosciences has succeeded in introducing students to current research tools, techniques, internship opportunities, professions, and transfer programs in the geosciences. Early results show success in completing the program’s goals, especially by building confidence in students’ abilities and career awareness. A number of challenges exist in developing careers courses, however, some of which may be unique to community colleges. Further, difficulty persists in attracting students to the career course as transferability to four-year colleges is not guaranteed.

**Keywords:** curriculum, undergraduates, recruiting, diversity, careers, student learning, transferring, STEM

**Impacts of land use and land cover change on water quality in the Big Sioux River: 2006-2016**

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**Abstract:** The increased demands on ethanol and rises in the price of corn led to increment of corn acreage in South Dakota. Other driving forces such as crop insurance subsidies and disaster payments encouraged farmers to (1) convert pasture, fallow and grassland to corn acreage, and (2) shift from other crops such as wheat to corn. The increment on corn acreage and adjustments in crop rotation between corn and soybeans resulted in use of increased amount of industrial fertilizers. The excess nitrate runoff from agricultural land—that the crops could not completely consume, leach into the Big Sioux River. The river transports the nitrates downstream leading to an increased nitrogen from the headwaters to the lower basin. Nitrate increases in the river may be associated with increased areas and intensities of agriculture in the watershed. High concentrations (10 ppm) are associated with human health issues and are regulated by the United States Environmental Protection Agency (EPA). This research focuses on determining the extent to which the nitrogen compounds are present in the Big Sioux River, especially brought by the nitrogen leaching from corn cropland. The research uses the National Agricultural Statistic Service (NASS) Cropland Data Layer (CDL) to characterize and determine the rates of land use land cover (LULC) change, uses Mann-Kendall test to analyze the temporal and spatial trend of nitrogen levels, and determine whether there is a
correlation between LULC change and changes in nitrogen levels in the Big Sioux River.

**Keywords:** Big Sioux River basin, water quality, Mann-Kendall test, land use/land cover, East Dakota Water Development District (EDWDD)

**Clickers in the classroom: A tool for student engagement?**

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**Abstract:** This research reports on geography students’ perceptions of clickers in the classroom. The purpose was to gauge whether students believe clickers enhance their engagement and their achievement. A mixed-methods approach was used to collect information from undergraduate students enrolled in an introductory physical geography class. Results suggest a strong statistical association between student engagement and academic achievement, but both student engagement and academic achievement appear invariant to students’ perceptions of clickers. Overall, students expressed strong positive attitudes toward clickers, especially regarding their ability to improve the quality of their learning experience and to promote a more engaging learning environment. Thus, clickers are a valuable tool to engage undergraduate students, especially in large introductory classrooms, and improve their academic achievement. Moreover, clickers provide a valuable tool for instructors to enhance the effectiveness of their teaching.

**Keywords:** clickers, student response systems, student engagement, student achievement

**Malaria severity and access to health care in the Ngorongoro Conservation Area (NCA), Tanzania**

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Abstract: Although clinically over-diagnosed, malaria is the leading cause of health complaints with over 30% of the disease burden attributable to malaria in Tanzania. The Ngorongoro Conservation Area (NCA) in the Northern Highlands is home to over 70,000 people in an approximate area of 8,000 square kilometers, and Endulen Hospital is the sole hospital and one of only a few health facilities serving the region. Previous studies in Sub-Saharan Africa indicate that distance and the rainy season may delay the decision to seek health care and results in increased likelihood of severe disease diagnoses for hospital patients. In the NCA, the transportation options are limited and distances can be more than 40 kilometers to the hospital. In addition to disease seasonality, a consistently wet environment makes transport, even by foot, more challenging on unpaved roads. This study analyzed 14 years of Endulen Hospital inpatient records, along with monthly rainfall records and derived estimated distance to the village from the hospital to evaluate the relationship between severe malaria diagnoses and hospital access. Findings show that distance and wet season may contribute to increased malaria severity.

Keywords: malaria, Tanzania, health geography

Why Grand Forks recovered so effectively from the 1997 flood disaster: Multi-layered recovery, basic principles, and unique particulars

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Abstract: The recovery of Grand Forks, North Dakota, from the 1997 flood disaster is one of FEMA’s shining examples of successful long-term disaster recovery. The literature contains a paucity of case studies of long-term disaster recovery, and those few existing studies usually examine a single sector, and for a limited duration of time. Our interdisciplinary team has initiated a study of long-term flood recovery for Grand Forks. We posit that recovery is a multi-sectoral and multi-temporal phenomenon. Some sectors return to pre-disaster levels, some surpass pre-disaster levels, and some do not recover to pre-disaster levels. Furthermore, the timing of each sector recovery can follow different temporal lags from the initiating disaster event. We will compile a variety of metrics with a consistent set of covariates that encompass a range of financial, process, social, and public sector themes, as well as metrics that assess all forms of capital – economic, human, political, and social. The successful recovery at Grand Forks is attributed to a mix of successful application of basic disaster recovery principles, combined with a large dose of serendipity and good fortune, suggesting that all recoveries possess unique elements. We consider selected hazard themes – social vulnerability, community resilience, geographical scale, adequacy of resources, social amplification of disaster, flood...
mitigation, creative destruction, time compression, temporal contexts, media hypes, and social capital – and their role in the city’s successful long-term flood recovery.

**Keywords:** long-term disaster recovery, Grand Forks, flood mitigation, serendipity, social capital

Incorporating estimation uncertainty of American Community Survey micro-geography data into regression analysis using a Monte Carlo simulation approach

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**Abstract:** Micro-level geographic data, produced by the US Census Bureau, are an important source of data for myriad applications. The frequency of publication for many key socio-economic variables at the micro-geographic level (e.g. blockgroup) has moved from every ten years to rolling five-year estimates based on a limited sampling protocol through a program called the American Community Survey (ACS). ACS data estimates for all levels of geography, which are based on self-reporting, are also accompanied by a detailed margin of error (MOE) for each data point which can be highly acute for certain socio-economic variables in certain geographic areas. This makes using best estimates alone more challenging to incorporate into complex analysis. When appropriate, it is important to incorporate uncertainty, as expressed by MOE, into modeling and estimation processes as using the best estimates alone may produce unstable model results. This paper utilizes data from the ACS to create two regression models for poverty at the blockgroup level for the Fargo-Moorhead area. ACS poverty estimates are widely used in research and can show great variability in some locations. A Monte Carlo approach was developed in R to incorporate uncertainty from the ACS data to compare with a model based on best estimates alone. Spatial dependency is also tested. The results of this analysis demonstrate that model performance can be substantially different when incorporating the uncertainty of the best estimates directly into the modeling process. This has importance and application when using regression models to demonstrate spatial risk and/or inform policy.

**Keywords:** Monte Carlo simulation, US Census, spatial regression, uncertainty

Estimation of peak flood levels of the Red River of the North based on tree scar elevations near Grand Forks, North Dakota

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Abstract: During flood events, rivers often carry debris that impacts trees and other vegetation along the flood pathway. These impacts can leave abrasions or scars on a tree that can be used to determine both the timing and height of floods. The objective of this study was to determine the maximum elevation of flood scars on trees adjacent to the Red River of the North near Grand Forks, North Dakota, and compare these elevations to the maximum elevation of the 1997 flood. Trees within the riparian area of the Red River were investigated for flood scars. The maximum height of each flood scar was measured using a SUUNTO optical height meter and a Trimble GeoXT 6000 GPS. GPS elevations were differentially corrected. The tree species and diameter at breast height (DBH) was measured and recorded, and each scar was photographed. ArcGIS was used to analyze the elevation of the tree scars relative to areas flooded in 1997. A total of 30 trees were measured in October 5-12, 2015. Tree age estimated from DBH ranged from 45 to 158 years, with 29 cottonwood (Populus deltoids) and one green ash (Fraxinus pennsylvanica). Scar elevations ranged from 246.4 meters to 261.7 meters (mean sea level). The maximum flood elevation in 1997 at the Grand Forks gage was 254 m (16.57 m gage height). Inundation models based on the flood scar heights identified correctly 68.85% to 76.85% of the maximum area in Grand Forks covered by the 1997 floodwaters.

Keywords: flood modeling, tree scars, Red River of the North, North Dakota

Field reconnaissance to determine the feasibility of long-term monitoring of Helen Glacier in the Wind River Range, WY: Lessons learned

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Abstract: The Greater Yellowstone Ecosystem (GYE), centered on Yellowstone National Park in northwest Wyoming, covers 54,475 km² and includes the contiguous Federal Lands surrounding the park, which is jointly managed by the Greater Yellowstone Coordinating Committee (GYCC). Several mountain ranges within the GYE contain perennial snow fields, permanent ice patches, and alpine glaciers. These ranges include the Beartooth Range on the northeast side of Yellowstone National Park, the Absaroka Range south of Yellowstone, the Teton Range to the southwest, and the Wind River Range to the southeast. In total, there is more glacial mass in the GYE than in the famed Glacier National Park, and recent studies indicate that the glaciers are significant contributors to stream flow within the ecosystem, particularly during the late summer season. Despite their significant mass and importance, no long term monitoring programs of the
glaciers exists in the GYE. In May 2016 a glacier monitoring working group was created within the GYCC to determine the location of potential Index Glaciers for regular monitoring. Using remote sensing techniques for analysis, three glacial locations were identified as potential Index Glaciers with one location each existing in the Beartooth, Teton, and Wind River Ranges. In August 2017 three teams were tasked to travel to the chosen locations and analyze the feasibility of the sites as Index Glaciers for long term monitoring. This presentation provides the lessons learned in conducting this feasibility study, particularly for the research site located in the Wind River Range.

**Keywords:** glaciers, mass balance, climate change, field work

**Was the 2016 Presidential Election a realigning election?**

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**Abstract:** This paper focuses on identifying critical realignments of American presidential elections. The concept of critical realignments of presidential elections has a long history among scholars in political science, history and geography. Critical realignments identify when there are sharp, durable changes in the voting pattern of the electorate. An election that causes a realignment in the electorate is termed a critical or realigning election. After a critical realignment, the new geographic pattern of voting is maintained for several elections. These periods of maintaining elections are referred to as an electoral epoch or party system. Electoral epochs or party systems are useful in identifying the regional or sectional voting patterns during these elections and to examine the long-term voting trends over the study period. Previous research examining critical realignments used county-level Democratic voting returns. This study expands upon earlier work by focusing on county-level Republican voting returns. Republican voting returns were resampled to modern county boundaries to produce a consistent data set. This analysis uses a T-mode factor analysis to identify voting epochs or party systems for US presidential elections from 1872 to 2016. Our results will identify historical critical realignments and periods of voting stability (voting epochs) during the study period.

**Keywords:** voting, historical geography, United States
"Make America Great Again": Trump's populist rhetoric and central Wisconsin

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Abstract: Donald Trump’s 2016 victory surprised many political analysts, particularly because he managed to win Wisconsin, Michigan, and Pennsylvania, three states where Democratic presidential candidates have traditionally claimed victory. While many factors explain this turnaround, in some communities, Trump’s populist message neatly fit the historical and economic context. Wisconsin Rapids, Wisconsin and the surrounding towns of Port Edwards and Nekoosa, Wisconsin are three interconnected communities created from the paper industry more than a century ago. Though the twentieth century was marked by a period of excellent employment opportunities at the mill and a strong culture of welfare capitalism facilitated by the mill owners, in recent decades, the mills were sold to foreign paper companies, workforces were trimmed, and, in the case of Port Edwards, the facilities were shuttered. Donald Trump’s campaign promise to “Make America Great Again” and bring back manufacturing jobs found a receptive audience in a region that has struggled to replace the high paying wages from the paper mills. This paper will analyze both the historical geography of the region and voting data to examine this recent but important electoral shift.

Keywords: electoral geography, economic geography, welfare capitalism, historical geography

Nuclear accidents and environmental resilience: The case of Chernobyl

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Abstract: The environment around the Chernobyl nuclear power plant accident in 1986 has served as an open laboratory for more than 30 years. It provides insights into human impact on the natural environment and nature’s ability to recover. Nuclear radiation is devastating to organisms, but some species have demonstrated a remarkable resilience.

Keywords: nuclear contamination, environmental resilience
The role of cartography in the promotion of rail travel to Yellowstone National Park

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Abstract: For nearly seventy years, from the early 1880s through the 1940s, travel to Yellowstone National Park was primarily by passenger train to a park gateway town. Upon arrival, travelers would enter the park by stagecoach and later by touring buses and automobiles. The railroad’s gradual decline in the years following the Great Depression and World War II occurred with the rise of travel in the family car. During the heyday of rail travel to Yellowstone, maps played a vital role for both trip planning and navigation. The railroad network map was used by travelers to visualize rail system connections, stations, and hub cities. In these linear cartograms, railroad networks and connections were emphasized over true geographic accuracy. Another important type of map used by rail travelers was the destination map. Yellowstone served as a popular destination centerpiece for many creative and artistic brochures and booklets produced for railroads such as the Northern Pacific, the Union Pacific, and the Burlington Route (Chicago, Burlington and Quincy). Two Chicago-based publishing companies, Rand McNally and Poole Bros., created lavish works of art narrative and cartography designed to convince potential travelers to visit Yellowstone and arrive by rail. Poole Bros., in particular, created both simple rail network maps for timetables, as well as large-format birds-eye view maps of Yellowstone that were both enticing advertisements and useful navigation tools for park visitors. Today, we can see how important these colorful maps were to the overall experience of the visitor arriving to Yellowstone by rail.

Keywords: Yellowstone National Park, railroad, travel, cartography, advertising
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