

**The Proceedings of the First Annual**

**UW GIS SYMPOSIUM**



**Research Commons | Seattle, WA | May 25, 2017**

## Conference Committee

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**Miles Logsdon**, UW School of Oceanography

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**The First Annual UW GIS Symposium**  
**May 25, 2017**  
**Research Commons – Allen Library**  
**Seattle, WA**

**Schedule**

Welcome & Keynote	9 am – 10 am
Lightning Talks	10 am – 11 am
Poster Presentations	11 am – 12 pm

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## Preface from *Proceedings* Editors

The 1st Annual University of Washington (UW) GIS Symposium took place in Seattle, WA on May 25, 2017 at the UW Libraries' Research Commons. The UW GIS Symposium replaced UW's previous mid-November GIS Day event, which was held annually on the nationally-recognized GIS Day, beginning in 2011. The intent of this symposium was to create an interdisciplinary opportunity for faculty, student, and staff to come together and share their research.

The theme of this year's symposium was the importance of geospatial literacy and the transformational role Geographic Information Systems (GIS) and remote sensing technologies play at the UW and beyond. Sarah Battersby, a Senior Research Scientist at Tableau Research, kicked off the event with her informative and humorous keynote talk, "Geospatial Literacy & Some Other Stuff," that stressed the importance of the GIS community's responsibility to help everyone think critically about the maps that help us understand the world around us.

After the keynote, students and staff presented lightning talks and posters on a variety of topics, which included characterizing spotted owl habitat using LiDAR, evaluating Seattle's bike share program, and identifying possible river and ocean locations on Mars. A total of eight lightning talks and eight posters were reviewed and accepted by the conference committee out of 19 proposals submitted by faculty, students and staff from the UW's Seattle, Tacoma, and Bothell, WA campuses. Each lightning talk presenter delivered a five-minute oral presentation supported by visual slides and maps; each poster presenter attended the event and was on hand to answer audience questions. An open Q&A followed the lightning talk portion of the event. Abstracts from the lightning talks and posters are included in these *Proceedings* below.

This year's symposium was attended by approximately 50 people, including students, staff and faculty. We would like to thank everyone who contributed to the success of the UW GIS Symposium. Special thanks goes to the members for the symposium planning committee for their numerous contributions, the staff of the Research Commons for being gracious hosts, and to the UW Libraries for sponsoring refreshments.

*Proceedings* Editors

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UW Libraries

Miles Logsdon  
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## Lightning Talk Abstracts

### *Characterizing Spotted Owl Habitat with LiDAR*

Jonathan Kane, School of Environmental and Forest Sciences  
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We used LiDAR in four California national forests with Spotted Owl habitat studies to characterize the forests in Owl territories and contrast them with the overall landscape. We found that the owls select for high density of tall trees near their nest, and high cover and tall trees in their core area, but do not seem to select for forest structure in the rest of their territory.

### *Utilizing Data-Planet Datasets in ArcMap*

Kian Flynn, UW Libraries  
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This spring, the University of Washington Libraries acquired access to Data-Planet, the largest repository of standardized and structured statistical data. In addition to providing users with access to statistical data from a broad array of sources like the U.S. Census Bureau, National Science Foundation, United Nations, and Zillow Real Estate, Data-Planet lets users download shapefiles of any datasets in their database that have geospatial data. To demonstrate the type of analysis you can do with Data-Planet datasets in ArcMap, this lightning talk analyzed county level U.S. data on the poverty rate, SNAP participation rate, and 2016 election results. An analysis of the data showed a stark "social services gap"—a condition where the poverty rate is higher than the SNAP participation rate—exists in some counties in the United States. These counties tend to be in more rural parts—specifically in the Mountain and Heartland regions—of the county. The median population of counties with a "social services gap" is 36,523; the median population of counties without such a gap is 20,871. In addition, these "gap" counties tended to vote more Republican in 2016. On average, an analysis of the data found that for every 4 percent increase in the "gap", the Democratic presidential candidate's share of the vote dropped by 3 percent.

## ***Workflow of Shallow-Water Hydrographic Mapping: Acquisition to Post-Processing***

Regina Lionheart, Oceanography  
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This project focuses on the workflow used in shallow-water hydrographic mapping, from shipboard acquisition to post-processing techniques. Multibeam data was collected within the urban waters of Lake Washington and Puget Sound. During data acquisition, positional accuracy was uniform and variation in trackline overlaps were monitored. After acquisition, the raw data was then imported into Teledyne CARIS HIPS and SIPS for generation of several alternative workflows in the production of base surfaces and variations in cell size resolution. This investigation focused on workflow alternatives for data used in analytical techniques specifically for change detection of base surfaces over time. The information may serve as an aid to navigation, or data which produces final results from methods which are transparent and reproducible. Additionally, the workflow included the use of the ArcGIS software by ESRI for conversion of all base surfaces to raster data models of similar dimension, allowing for quantification of change using simple map algebra functions. Data product usability and reproducibility within a GIS environment were explored. Subtracting the swath angle layer from the more detailed CUBE layer created an entirely new surface that displayed the numeric as well as spatial pattern of differences between layers. The workflow process has resulted in an objective and quantified commentary on analytical techniques in shallow-water hydrographic surveying. In the race to document more of the coastal ocean, both visual and analytical outcomes of survey data are required. This work identifies useful methods to help insure that survey outcomes are both understandable by the public and reproducible by others.

***UW eScience Geohackweek***

Anthony Arendt, eScience Institute  
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In 2016 the UW eScience Institute hosted its first Geohackweek. The event offered participants training in open-source geospatial software, experience in collaborative project design, and opportunities for networking with academic and industry partners. This talk will review what we learned from our first event, and generate discussions for how to design future hackathons to serve the GIS community.

### ***The Conservation Value of Place-Based Subsistence Mapping in Northwest Alaska***

Victoria Buschman, School of Environmental and Forest Sciences  
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In the Northwest Arctic of Alaska, engagement and motivation around wildlife conservation and natural resource use is growing alongside the need to protect healthy population dynamics for key subsistence species. Over the millennia that Native communities have occupied this landscape, they have accumulated acutely accurate place-based natural history knowledge that complements the information collected by, and available to, natural resource managers and land use planners. The Northwest Arctic Borough Subsistence Mapping Project is a prime example of how geographic information systems can bridge Indigenous knowledge and western science in constructing models for species' distributions, migration patterns, and other ecosystem dynamics both spatially and temporally for use in conservation and land use planning.

### ***A Platform for Managing River Surveys in GIS***

Trevor Eakes, School of Environmental and Forest Sciences  
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Rivers are dynamic, linearly continuous systems with unique survey challenges. Referencing river survey information spatially is often necessary to ensure accuracy and allows for powerful spatial analysis. We integrate six continuous river surveys on the Olympic Peninsula, WA into a GIS environment and create a platform for managing, sharing, and visualizing the surveys. We show how GIS can enhance our ability to understand rivers as landscapes and allow us to easily share that understanding with a wider audience.

## ***Swarm ASV Drifters***

Benjamin Bosquet, Oceanography

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Swarm ASV drifters are environment-driven instruments that are designed to be independent of human interaction. They sample the surface water for temperature to understand patch and pattern evolution in estuarine and lake hydrodynamics. Using a GPS and a clock, data can be geo and time stamped to analyze spatial and temporal variability in temperature or other characteristics.

## ***Built Environment and Behavior: An Approach Based on Objective Data***

Phil Hurvitz, Urban Design and Planning

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Research has shown that behaviors and health outcomes are associated with built environment characteristics. However, the majority of research has relied on self-reported, rather than objective data. New approaches use objective methods for measuring physical activity behavior (accelerometry) and location (global positioning systems, GPS), coupled with objective built environment data from geographic information systems (GIS). Coupling accelerometry, GPS, and GIS, allows for investigation of the times and places where physical activity occurs, and quantitative estimation of the duration of exposure to features in the built environment. Brief results from three studies are presented, one that shows that transit users obtain approximately 15 additional minutes of walking physical activity per day on days when they take transit. A second study found that persons residing in neighborhoods with higher Walk Score (R) values engage in more bouts of walking. The third study showed that at locations very close to, or further from home, people obtain less physical activity than they do in locations near the home neighborhood. Combining these objective measurement methods promises to shed light on the complex interrelationships between environment and behavior.

## Poster Presentation Abstracts

### ***Trash Talk: Optimal Urban Waste Design***

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The Trash Talk poster will illustrate contemporary and emerging trash tracking and data analysis technology. Providing insight on the strengths and weaknesses of the available tools addressing storm water, street sweeping, and trash collection methods; the poster can aid in program improvement throughout different jurisdictions.

### ***GNSS Location Accuracy***

Kristen Biondo, Environmental Studies  
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Global Navigation Satellite Systems (GNSS)-based surveying methods are becoming more common. The GNSS methods of data collection have an inherent range of errors for determining geographic position. We used a Trimble Juno 3B unit to locate trees at a local level. This type of unit has a stated location accuracy of 3-5 meters after differential correction, but in difficult environments such as landscapes with dense canopies or tall buildings the accuracy decreases significantly because of multi-path trajectories of the signal. The Trimble Juno 3B collects global positioning system (GPS) data using code signals, which are less accurate at determining location than carrier signals. Code signals calculate the distance between a set base location and the receiver, using the difference between the signal from the base and the signal from the receiver. Carrier signals have variable reference points, reducing the amount of error in the location measurement. The study area is located north of Discovery Hall on the University of Washington Bothell campus. This area is characterized by high tree density, close proximity to buildings, and variable topography. To examine the amount in the variation between the Trimble Juno 3B and the correct geographic location, GPS and survey measurements of bearing and distance were taken from individual trees and then

mapped to compare locations and quantify errors using a root mean square error approach. The results of these comparisons were visually assessed using Light Detection and Ranging (LiDAR) data and summarized using location and distance error measurements. These data indicate the distances that should be accounted for when using this type of device to collect location information in areas that have many difficult characteristics.

### *Interactive Space Assessment in Tableau*

Maggie Faber, UW Libraries  
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Libraries need a tool for understanding observational space count data that's as flexible as the spaces they're trying to assess. Rows and rows of numbers are difficult to interrogate and understand with any degree of nuance – whether that's observing how one particular space is used compared to the whole, or how popular a particular kind of seating is by time of day.

Interactive visualization provides one possible solution to this problem. By building a map of the space and connecting it to the data, libraries are able to see patterns and query them on the fly. The ability to subdivide and cross-section your data allows you to answer the questions you're particularly interested in, and supports finding new answers to the questions you develop.

This poster presentation draws on examples from two Libraries: the University of Washington and University of British Columbia. At the University of Washington, space use data was collected in order to assist staff at Foster Business Library to test observations about under-utilized areas of the library and imagine ways to reconfigure these spaces, while at the University of British Columbia, renovations to the Student Union Building resulted in overcapacity and a need to maximize seating in overpopulated areas. Based on these two case studies, the poster will provide attendees with a list of key steps involved in building interactive space visualizations using Tableau. The poster presentation will also highlight ways to interpret and query results to reveal insights into space usage. Attendees will learn about various options for effectively visualizing space data and helping libraries staff work with results.

## ***210Pb Geochronology***

Khadijah Karrington Homolka, Earth and Space Sciences & Oceanography  
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With the rate of temperature rise on the Western Antarctic Peninsula (WAP) being six times higher than the global average, the effects of modern climate change on glacier dynamics and meltwater production hold particular significance for sediment accumulation rates. Little data exists for examining the subbasin variability of sediment accumulation in an individual fjord, where only 1-2 cores per fjord are available. In Andvord Bay, Antarctica, modern sediment accumulation rates were determined from 10 kasten cores, and 4 box cores collected throughout the fjord aboard the R/V Nathaniel B. Palmer. A relatively low circulation velocity, and numerous deep basins throughout the fjord created ideal conditions for sediment to accumulate, and to be easily cored. Sediment accumulation rates were determined using  $^{210}\text{Pb}$  geochronology, where excess  $^{210}\text{Pb}$  activity profiles reveal spatially variable sediment accumulation rates throughout the fjord that are on the order of millimeters of accumulation per year. These modern accumulation rates agree with previously determined accumulation rates in polar and subpolar fjords, and are significantly slower than those of temperate tidewater glaciers. These excess  $^{210}\text{Pb}$  activity profiles provide further insight into the small-scale spatial variability of sediment transport and accumulation in individual fjords, and contribute to the subpolar-polar sediment accumulation dataset that is imperative for understanding the effects of modern climate change on the dynamics of glaciers at polar latitudes.

## ***Evaluating the Expansion of Bike Share in Seattle***

Holly Jones, GIS for Sustainability Management  
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The geographical limitations of PRONTO was one of the main reasons for its failure. GIS and python can be utilized to explore expansion of "bike share zones" in Seattle based on locations (and data) for the now defunct PRONTO Cycle Share using Google Map API, this study focuses on expected travel times via bike, car and

bus between potential and existing bike share stations. Focusing expansion on the Urban Villages around Green Lake, where there is high potential for “destination rides” by local riders who do not own a bike and are likely more comfortable with the Seattle DOT’s Occasional Rider Routes could greatly strengthen the bike share network. The nearly 480 foot elevation change between Greenwood and South Lake Union provides ample opportunity for speedy one-way commutes and allows for trips of nearly 5 miles within the 30 minute allotted PRONTO borrowing period.

### ***Species Distribution and Land Use***

Alexandra Lange, Eleanor Smith, Marissa Wollbeck  
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In anticipation of changes in land use permissions on protected lands in light of House Joint Resolution 46, we investigate land use impacts on biodiversity, focusing on the known geographic ranges of five Washington State listed species. Using geostatistical analysis techniques at the county level we are able to compare the impacts of anthropogenic land use on state listed species. We examine the spatial distribution of species in relation to land use, overlaying the distribution of those species to find hot spots. Land use at the regional level is then quantified by percentage of land use in each county.

### ***Evaluating Video Documentation as a Method for Monitoring Ecosystem Change***

Malea Saul, Oceanography  
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The ability to conduct and communicate climate related environmental changes relies heavily on the tool used for documentation. A key benefit of video as a scientific tool can allow scientists to obtain uninterrupted documentation over all temporal scales that provide physical and structural evidence of change. We present a video system to be used for the acquisition of dual field of view angles and 360 degree mosaics that is easily deployed and compatible for use with both stationary and mobile data collection. The visual acquisition system focuses on providing physical change information for use in comparison of GIS-based change models.

Along with the video system, we present the protocol for its use and results from preliminary tests focused on measuring the accuracy and precision of the system. Additionally, a case study of a nearshore habitat, a system that experiences a significant amount of change from different climate and environmental forces, was conducted. Completion of such a system allows scientists to use video to monitor and collect visual data regarding ecosystem change over temporal and spatial scales, and provides a communication tool for education and outreach purposes.

### ***Marine GIS***

Julia Wallace, Oceanography  
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Using multibeam sonar technology and ArcGIS, I developed a method to monitor subtidal changes in bathymetry driven by shoreline restoration actions. Preliminary findings show that the method proves effective as a monitoring tool and can be useful as a time series in the future.

### ***Possible River and Ocean Locations on Mars' Surface***

Peiyu Wu, Earth and Space Sciences  
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Whether water once flowed on Mars is essential to prove the existence of life on the planet, because water is required by almost all known forms of life to live. In addition, water flows could help transfer substances from a cell to the cell's environment. A geographic information system (GIS) can be used to examine the elevation model of Mars and can create a hydrologic network based on the basic rules of gravity. In this project, a digital elevation model (DEM) of Mars surface downloaded from the USGS Planetary Interactive GIS-on-the Web Analyzable Database (PIGWAD) is examined to search for river valley-like features, and an area-restricted hydrologic network is created to enhance visual analysis on the Martian hydrologic system.