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Welcome to the 2008 Intermountain GIS Conference
"Challenges for a Changing World"
Bozeman, Montana – April 19-23, 2010
Allen Armstrong, Conference Chair

"Challenges for a Changing World" - quite an appropriate title for today's challenging times! With some of us finding it challenging enough to even escape our busy world and enjoy a conference of this kind, others may find the challenge comes in learning and grasping the available technologies that are at hand today. As we are also being challenged to do more with less, we are being put to the challenge by a more knowledgeable audience familiar with GIS and becoming experienced users with the availability of prolific web based mapping applications.

On behalf of the Conference Planning Committee and the Montana Association of Geographic Information Professionals (MAGIP), we would like to welcome you to Bozeman for our 2010 Intermountain GIS Conference. The committee listened intently to your comments and assembled a schedule of outstanding presentations and presenters with the expertise to deliver.

A wide range of very affordable assorted workshops are featured this year that will offer something for the newer GIS users as well as the experienced. We will be joined this year by a large number of attendees currently involved in disciplines reaching far beyond the traditional GIS sciences. In addition to the active GIS users, this year we are teaming up to host several Mini-Conferences and concurrent tracks during the week with focuses on Snow Sciences, AmericaView, Fire Management, Local Government Issues, Utilities, Energy and Tribal Applications.

It has been a pleasure to work with the great talent we have here in Montana to be able to host your MAGIP conference in Bozeman. While we will not wander far from our roots in data and maps, in the coming years our profession will face exciting challenges and opportunities to ensure that geographic information is relevant to the citizens and decision-makers of Montana. A central focus of the conference is to share ideas and thoughts about the role of geographic information, our profession, and our professional organization in shaping the future of geographic information in Montana. Whatever your involvement in this science, we wish you the very best in keeping your "World" moving forward.

MAGIP
Montana Association of Geographic Information Professionals

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2010 Intermountain GIS Conference Planning Committee

The Conference Planning Committee is pleased to welcome you to Bozeman. This team has worked together since August of 2008 to present you this conference. The committee listened intently to your comments and assembled a conference program that is shaped by the needs of the Intermountain GIS community. The following committee members are listed along with the major tasks they were in charge of. All Committee members dedicated a substantial number of hours on too many small tasks to even begin to list, creating a worthwhile conference experience for 2010.

Allen Armstrong, Gallatin County GIS – Bozeman, MT--Conference Chair, Exhibitor and Vendor Coordinator, Plenary Session, Public Night, Student Projects, Museum Coordination, Publicity

Stuart Challender, Montana State University – Bozeman, MT--Workshop Chair, Awards Committee, Keynote Speaker Coordination, Poster Judging, Workshop Instructor

Lance Clampitt, United States Geological Survey – Bozeman, MT--Public Night, Federal Promotion, GPS Workshop, MSDI Stewardship Track Chair, Publicity

Jenny Connelley, Gallatin County GIS – Bozeman, MT--Facilities Coordinator, Publications and Graphics, Conference Food Coordinator, Fire Mini Conference Track Chair, Museum Coordination

Janet Cornish, Montana Tech – Butte, MT--Conference Coordinator, Registration, Exhibitor Registration, Track Chair Coordination, Workshop Instructor, Program Coordinator and Editor

Frank Dougher, Gallatin County GIS – Bozeman, MT--Audio Visual Equipment Chair, Poster Chair, Student Projects, Poster Judging, Facility Coordination

Jon Henderson, City of Bozeman GIS – Bozeman, MT--Local Government Focus Session, Graphic Production, Track Chair, Workshop Instructor, Signs and Maps

Alison Kennedy, Department of Revenue – Bozeman, MT-- Silent Auction and Raffle, Student Coordinator, Social Events

Duane Lund, Montana State Library – Helena, MT --Student Scholarships, Student Assignments

Lee Macholz, National Center for Landscape Fire Analysis – Missoula, MT-- Conference Webmaster and Designer, Registration

Diane Papineau, Montana State Library – Helena, MT--Schedule Coordinator, Track and Room Management, Entertainment and Socials, Track Chair, Workshop Instructor

Leo Pidgeon, Gallatin County Clerk and Recorder – Bozeman, MT-- Silent Auction and Raffle Coordinator

Van Shelhamer, GeoEssentials, Inc. – Bozeman, MT-- Workshops, GeoCache, Publicity, Workshop Instructor, Presenter, Educational Promotion

Carrie Shockley, City of Bozeman Water/Wastewater – Bozeman, MT--Track Chair, Autorunner Designer and Graphics, Signs and Maps, Workshop Instructor

Tony Thatcher, DTM Consulting – Bozeman, MT--Conference Treasurer, Posters and Judging, MAGIP Board Member Liaison, Income and Expenses, Keynote Speaker Coordination, Facility Coordination

We would like to also recognize the numerous Track Chairs that solicited speakers for their track and organized their own portion of the conference.

Conference Awards Program

At our lunch on Thursday, we will be presenting the 2010 MAGIP Awards. These awards recognize the outstanding contributions made to the GIS Community by our members. During the past ten years, we have been pleased to honor the following members at our Intermountain GIS Conferences:

2000	Kris Larson	Mike Sweet
2002	Gretchen Baldus	Gerry Daumiller
2004	Margie Lubinski	Duane Anderson
2006	Paul Wilson	Bryant Ralston
2008	Ken Wall	Stu Kirkpatrick

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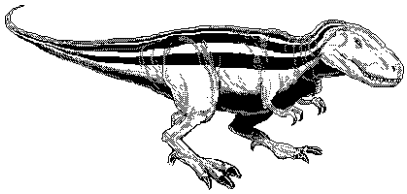

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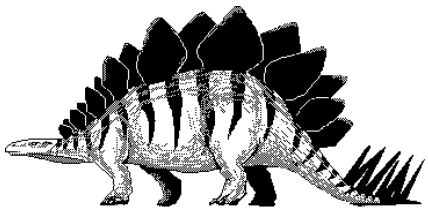

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Our Keynote Speaker – Wednesday Lunch

Dr. William Wyckoff

Dr. William Wyckoff—Biographical Sketch

A native Californian, Dr. William Wyckoff received his masters (1979) and doctoral (1982) degrees in geography from Syracuse University. With research interests in the cultural and historical geography of North America, Dr. Wyckoff has published The Developer's Frontier: The Making of the Western New York Landscape (Yale, 1988), The Mountainous West: Explorations in Historical Geography (co-edited with Larry M. Dilsaver) (Nebraska, 1995), Creating Colorado: The Making of a Western American Landscape, 1860-1940 (Yale, 1999), and On the Road Again: Montana's Changing Landscape (University of Washington Press, 2006). In addition, he has authored more than 35 peer-reviewed book chapters and journal articles, many of them dealing with the historical and cultural geography of the American West. Recently, he has also coauthored (with Rowntree, Lewis, and Price) Diversity Amid Globalization: World Regions, Environment, Development (Prentice Hall, 2006), an award-winning world regional geography textbook. Dr. Wyckoff has taught in the Department of Earth Sciences at Montana State University-Bozeman since 1986, and his research interests continue to be in the historical and cultural geography of the American West.

On the Road Again: Montana's Changing Landscape

In his book On the Road Again, Dr. Wyckoff explores Montana's changing physical and cultural landscape by pairing photographs taken by land surveyors and state highway engineers in the 1920s and 1930s with photographs taken at the same sites today. The older photographs, preserved in the archives of the Montana Historical Society, contain a wealth of information about the state's environment during the early decades of the twentieth century. To highlight landscape changes – and continuities – over more than eighty years, Dr. Wyckoff chose fifty-eight documented locations and traveled to each to photograph the exact same view. A close, thoughtful look at these photographs reveals how crops, fences, trees, and houses shape the everyday landscape, both in the first quarter of the twentieth century and in the present. The photographs offer an intimate view into Montana, into how Montana has changed in the past eighty years and how it may continue to change in the twenty-first century.

Keynote Address

Title: "On the Road Again: Rephotographing the Landscapes of Montana."

The author will provide a behind-the-scenes look at the process of finding and rephotographing dozens of different Montana localities from Whitefish to Ekalaka. He will identify several key themes of land use change and continuity apparent in the photo pairs. Finally, he'll also describe the people he met along the way and share some of the stories they told about Montana's changing landscape.

Dr. Sheila Wilson

Sheila Wilson, PhD, GISP – Special Guest Presenter – Tuesday

Dr. Wilson is the Executive Director of the GIS Certification Institute. She oversees the Institute and the GIS Professional (GISP) certification program. She has a doctorate in geology from the University of Tulsa. Dr. Wilson taught hydrogeology at the University of Tulsa for eight years. Previously, she was the Executive Director of the PODS Association in which she was involved in the relational data model standard for the pipeline industry. She has twelve years of experience in GIS with the past seven years in the pipeline industry. She received her GISP in 2008. Her greeting to us:

Hello MAGIP!

Congratulations! Montana is the sixth state to endorse the GIS Professional (GISP) certification program. You are leading the pack in establishing yourselves as a GIS state. Your accomplishment creates two important questions. First, how can the GIS Certification Institute (GISCI) help you? Second, how can we work together to help ourselves? If you have suggestions in how GISCI can help you, please email them to me at swilson@gisci.org. We can help ourselves by volunteering with GISCI, other GIS organizations, your local and regional groups like MAGIP, writing whitepapers, giving presentations, volunteering at your local schools, and more. Please contact me if you need ideas – I have many.

This is an exciting time for GISPs. We work in one of the most diverse and exciting fields available. Non-GIS people often ask why GIS is important. I enjoy sharing the importance of GIS by discussing different presentations that I've attended at conferences like this one. Some of the presentations included

crime mapping (serial robbers), disaster recovery (tornadoes, hurricanes, and earthquakes), energy (pipeline), stimulus funding (bridge repair), and more. I am also asked why the GISP certification is important. In 2003, the Department of Labor classified GIS as one of the top technology sectors. Several colleagues have provided more personal reasons for the importance of becoming a GISP:

- We have a profession to which we can belong.
- We have formal GIS titles.
- We have received changes in titles, promotions, raises, and/or new jobs because of the GISP rank.
- We can define and shape our profession through personal involvement in our profession.

You are the reason GIS is successful. You are the reason the GISP certification program is growing. Thank you for your help!

Sincerely,
Sheila
Sheila Wilson, PhD, GISP

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Our Student Scholarship Recipients

Presented by Duane Lund, NRIS Program, Montana State Library, Scholarship Program Chair

Duane Lund

At each Intermountain GIS Conference, MAGIP awards scholarships to student applicants. In return for their awards, students contribute their time to assist the conference committee in a variety of ways – serving at the registration desk, monitoring AV equipment and assisting presenters. Many also present posters and/or papers during the conference general sessions. This year's recipients are:

- **Black, Jordanna**, Montana State University, Land Resources and Environmental Sciences (Master's Candidate)
- **Bond, Pamela**, Idaho State University, Remote Sensing –Lidar/Landsat (graduate student)
- **Carr, Christina**, Montana State University, Earth Sciences (Master's candidate)
- **Chesley-Preston, Tara**, Montana State University, Earth Sciences/Snow and Avalanche (Master's candidate)
- **Guy, Zach**, Montana State University, Earth Sciences (Master's Candidate)
- **Hanson, Darci**, Idaho State University, Geospatial Science (Master's candidate)
- **Hedstrom, Jeff**, Montana State University-Northern, GIS/Planning
- Marienthal, Alex, Montana State University, Snow Science with a minor in Statistics (Bachelor's of Science)
- **Mancey, Jordan**, Montana State University, Physical Geography (Bachelor's of Science Degree)
- **Miller, Christine**, Montana State University, Land Resources/Environmental Sciences with a Minor in GIS (Junior in BS Program)
- **Millington, Seth**, St. Mary's, Minnesota, Natural Resource Management/Snow and Avalanche Science (graduate student)
- **Parillo, Elizabeth**, Montana State University, Ecological and Environmental Statistics (Master's candidate)
- **Rogers, Nate**, University of Montana, Geography (graduate student)
- **Schwab, Alex**, Montana State University, Physical Geography (Junior in BS program)
- **Shea, Cora**, University of Calgary, Applied Snow and Avalanche Research, Department of Geoscience (PhD Candidate)
- **Sheffield, Joseph**, Idaho State University, Geosciences (Master's candidate)
- **Swindell, Bryan**, Montana State University, Earth Sciences (Master's candidate)
- **Vetters, Justin**, Montana State University, Fire and Emergency Services
- Walter, Christopher, University of Montana, Biogeographer/Statistical Modeling (Master's candidate)
- **Walters, Adam**, Montana State University, Geography/GIS/Planning (Junior in BS Program)
- **Wetlaufer, Karl**, Montana State University, Snow Science (Senior in BS Program)

Conference Events and Social Activities

The Conference Committee is pleased to announce a variety of wonderful activities featured at this year's Intermountain GIS Conference:

Tuesday

- 10:00 AM. – Noon: **Morning Hike with the Gallatin Valley Land Trust,** Ted Lange, Gallatin Valley Land Trust. Interested participants will meet Ted at the registration desk, chat a bit about their programs and GIS use, then leave for the trail head (specific hike to be determined). Join the GVLT staff to hear about how they are using GIS in their land conservation and community trails programs as you hike part of the award winning community trail system. **Meet at the Registration Desk.**

- 5:00 – 6:00 pm: **New to GIS Mixer** sponsored by the MAGIP Professional Development committee. Having a hard time networking with other GIS users? Is it overwhelming to be in a room full of knowledgeable GIS Professionals and not know anyone? Is it difficult to make valuable connections at times? Join us just before Public Night and connect with others who are new to the field (and many seasoned veterans). Enjoy refreshments and meet other folks just getting started in the field. Seasoned veterans: Please plan to join us and welcome your new colleagues. **Tamarack Room, GranTree Inn**

- 5:30 – 9:00 pm: **Public Night and Vendor Reception** including USGS GPS Navigation seminars. **GranTree Inn**

Wednesday

- 12 noon – 1:30 pm: **Luncheon and Keynote address by Dr. William Wyckoff** on Montana's changing physical and cultural landscape**.** His recent book, On the Road Again: Montana's Changing Landscape, illustrates how our state has changed using historic 1920s and 1930s photographs paired with the same image today.

- 5:30 – 9:00 pm: **Banquet and Private Viewing at the Museum of the Rockies**, famous for its collection of dinosaur fossils and timely, relevant exhibits. **Museum of the Rockies (Transportation available)**

Thursday

- 12 noon – 1:30 pm: **MAGIP** Awards **Luncheon**

- 6:30 – 10:00 pm: **Swing dance Demo, Lesson, and Dancing at Beall Park** Demonstration of Lindy Hop, East Coast Swing, West Coast Swing, Country Jitterbug and more. Basic swing lesson (1 hour) followed by open dancing with members of Bozeman's hip and energetic swing dance community. **Beall Park**

MAGIP GIS MENTORING

MAGIP
Montana Association of Geographic Information Professionals

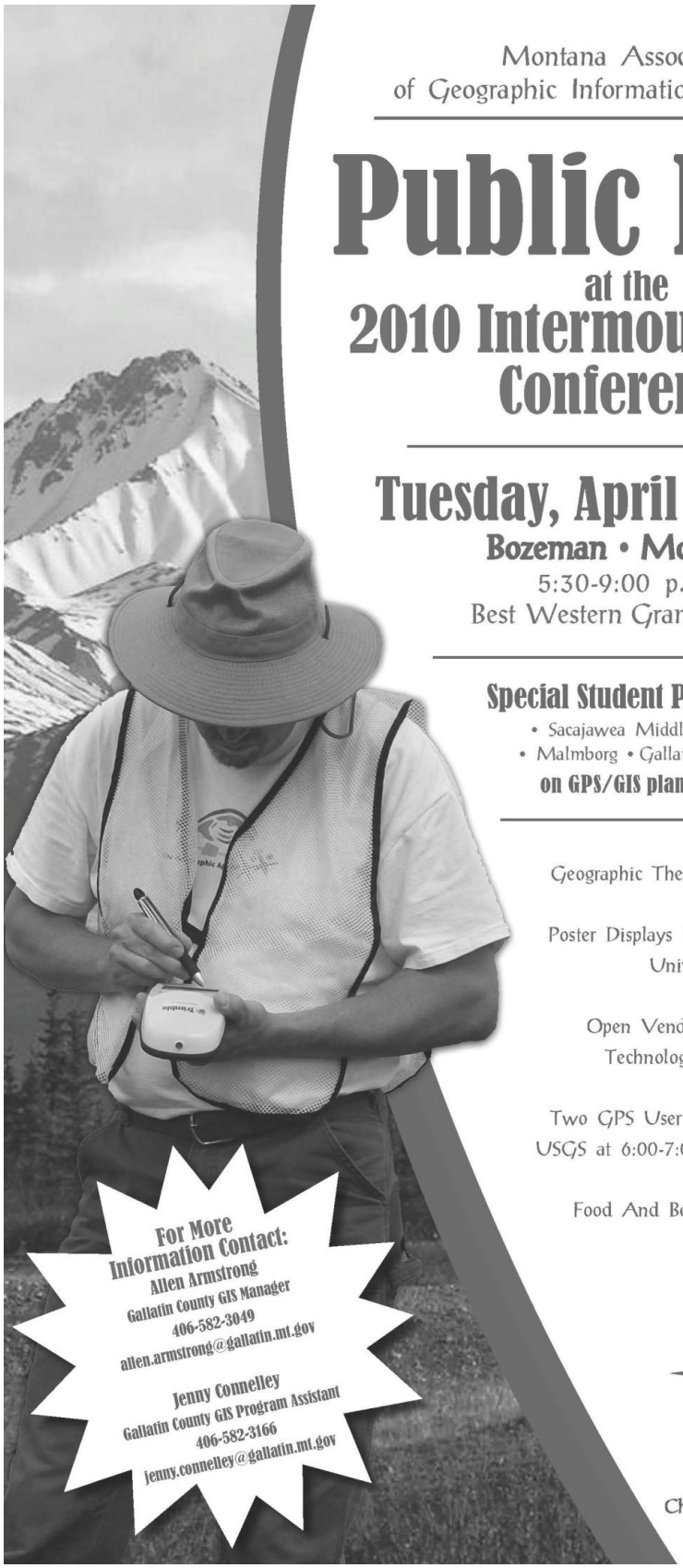
The Mentoring Committee will be hosting a MIXER on Tuesday the 20th of April at the 2010 Intermountain GIS Conference from 5:00 - 6:00 PM after the MAGIP Montana Summit and before Public Night.

For More information
Go to our website :
www.magip.org/mentoring

OR

Speak to a committee member:

Diane Papineau - Committee Chair
Jason Danielson
Wendy Thingelstad
Carrie Shockley
Bryant Ralston
Alison Kennedy
Gerry Daumiller



Montana Association
of Geographic Information Professionals

Public Night
at the 2010 Intermountain GIS Conference

Tuesday, April 20, 2010
Bozeman • Montana
5:30-9:00 p.m.
Best Western GranTree Inn

Special Student Presentations from
• Sacajawea Middle School • Monforton
• Malmborg • Gallatin Valley Homeschool
on GPS/GIS planning and mapping

Geographic Themed Games And Contests
•••
Poster Displays From Industry Experts And University Students
•••
Open Vendor Night Viewing Of Technology And Applications
•••
Two GPS User Classes Conducted by the USGS at 6:00-7:00 p.m. and 7:30-8:30 p.m.
•••
Food And Beverages Will Be Served

For More Information Contact:
Allen Armstrong
Gallatin County GIS Manager
406-582-3049
allen.armstrong@gallatin.mt.gov

Jenny Connelley
Gallatin County GIS Program Assistant
406-582-3166
jenny.connelley@gallatin.mt.gov

2010
Challenges for a Changing World

A NIGHT AT THE MUSEUM **Wednesday, April 22, 2010 5:30-9:00 p.m.**

Buffet Dinner and Exhibit Viewing

Dinosaurs under the Big Sky – Giant Jurassic sauropods, Early Cretaceous bird-like predators, and reptilian sea monsters from the mid-Cretaceous populate this newest addition to the Siebel Dinosaur Complex. Learn about the latest research in dinosaur growth and behavior, and see some of the rarest fossil samples in the world. This hall includes many species of dinosaurs that can only be seen at the Museum of the Rockies. In the Mesozoic Media Center, visitors are electronically and technologically immersed in the world of dinosaur paleontology. Large plasma screens deliver video and broadcast content, and smaller interactive stations provide access to paleontological activities and information. This high-tech hall brings the research of Jack Horner and the MOR Paleontology Department to the visitors' fingertips. Showcasing some of the only dinosaur embryos and nests in existence, a well-documented *Maiasaura* growth series, and other specimens from the Late Cretaceous, this hallway contains fossil evidence that has given scientists insight into how dinosaurs grew and lived. Dinosaur sculptures, sound effects, and hundreds of fossils bring the Late Cretaceous to life in the Hall of Horns and Teeth. Featuring the largest *Tyrannosaurus rex* skull in the world, the world's most complete *Triceratops* growth series, and a massive *Edmontosaurus* tail with fossilized skin impressions, this hall treats visitors to a look at Montana during the last great age of non-avian dinosaurs.

Survivor: Jamestown – Visit the award-winning changing exhibit, Survivor: Jamestown, where turning one corner in the maze can mean the difference between life or death. This interactive, immersive, and educational maze experience is set in the original 1607 Jamestown, Virginia colony. Presenting a glimpse into the struggles of the New World settlers, this exhibit engages visitors in a quest to survive the conditions that only 38 of the original 104 colonists were able to endure for one year. Melding historical accuracy and the complexities of real life and death decisions, Survivor: Jamestown delivers a truly unique and effective learning experience.

Francisco Goya "Los Caprichos" – This exhibition features a superb early edition of the complete set of eighty etchings by Spanish artist Francisco de Goya, published in 1799. One of four sets acquired directly from Goya by the Duke and Duchess of Osuna these enigmatic and controversial, "Los Caprichos," were created in times of social repression and economic crisis in

Spain. Goya's art is as moving and meaningful today as it was two centuries ago—both in technique and in the social consciousness of his subject matter.

Dinner – Dinner will be prepared by Steve Kuntz of Montana Epicurean. Montana Epicurean is devoted to providing healthy, sustainable food choices for the Gallatin Valley and beyond. Our goal is to create an unparalleled taste experience by showcasing local meats, cheeses, grains, and produce; introducing our friends and neighbors to a level of culinary enjoyment they may not have experienced in the past.

Chef/owner Steve Kuntz received his degree from Western Culinary Institute in Portland, Oregon. Refining his skills by working with renowned chefs in San Francisco before returning to his home in Montana; he brings a dedication to excellence that shines through his food.

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Transportation – Bus Shuttle Service by First Student, the school bus people, will be available to the Museum of the Rockies from the hotel immediately following the day's regular schedule. The shuttle will begin returning guests to the hotel at approximately 8:30. There will be two trips each by 2 buses both going to the museum and then returning to the hotel.

Discount Coupon - (good only from 7:00-9:00 p.m., April 21, 2010)

Montana Association of Geographic Information Professionals Special!

Tonight Only!
10% off any Museum Store purchase
Store Hours: 7-9pm

Gifts Galore at the MOR Store!

April 21, 2010

MUSEUM OF THE ROCKIES
touch history

SWING DANCE

Everyone is invited to join in for a fun-filled evening social event with the regular weekly dancers from the Bozeman Swing Club. The instructors will be providing a swing dancing demonstration and free swing dance lessons for the Intermountain Conference Attendees. This event will be at Beall Park in downtown Bozeman.

Join us for a great evening of Swing Dancing!

Thursday Night

6:30 p.m. to 10:00 p.m.

Beginner to Advanced

Beall Park - North Bozeman and East Villard

http://www.bozemanswing.com/Swing-Dancing-Photos.html

2010 Intermountain GIS Conference Plenary Session

The 2010 Intermountain GIS Conference will begin on Wednesday, April 21, with an opening plenary session to welcome all participants to the conference. The following plenary speakers will be featured for the opener from 8:30 a.m. to 10:00 a.m.

Earl Mathers, Gallatin County CAO – Bozeman, MT
Opening Welcome to Bozeman and Gallatin County

Linda Vance, Montana Natural Heritage Program – Helena, MT
MAGIP Business News
New MAGIP Website

Erin Geraghty, Base Map Service Center – Helena, MT
MAGIP Business News
MAGIP Boards and Committees

Robin Trenbeath, State of Montana GIO – Helena, MT
Geographic Information Coordination within Montana

Janet Cornish, GIS Summit Moderator – Butte, MT
Overview of 2008 Summit and Recent 2010 Summit

Kindra Serr, Idaho State University – Pocatello, ID
2011 Intermountain Conference Chair for Idaho
Conference Introduction and Events

Allen Armstrong, Gallatin County GIS – Bozeman, MT
Conference Chair
Recognitions and Announcements

Louis Adams, Confederated Salish and Kootenai Tribes, Pablo, MT
Tribal Welcome and Blessing

Conference Poster Abstracts

LiDAR classification of Sagebrush Communities

Poster Authors: Pamela Bond and Teki Sankey
Idaho State University - Boise

Sagebrush (*Artemisia* spp.) communities constitute the largest temperate semi-desert in North America and provide important rangelands for livestock and habitat for wildlife. Assessment of sagebrush communities can be costly, labor intensive, and time consuming due to their large areal extent, especially because most sagebrush studies are based on field measurements. This study used field and LiDAR data to estimate sagebrush steppe vegetation heights in five different communities at Reynolds Creek Experimental Watershed, southwestern Idaho: herbaceous-, low sagebrush (*Artemisia arbuscula*)-, mountain big sagebrush (*Artemisia tridentata vaseyana*)-, bitterbrush (*Purshia tridentata*)-, and tree-dominated vegetation communities. The objectives were to: 1) quantify the correlation between field-based and LiDAR-derived shrub heights, and 2) determine if LiDAR-derived mean vegetation heights can be used to classify the varying community types within a sagebrush steppe ecosystem. The correlation between field-based and LiDAR-derived shrub heights in shrub-dominated plots and across all five vegetation communities were significant, $R2 = 0.77$; p-value <0.001 and $R2 = 0.95$; p-value <0.002 respectively. Furthermore, an ANOVA test with all pair-wise post hoc comparisons indicated that LiDAR-derived vegetation heights were significantly different among all vegetation communities observed (all p-values <0.01), except for herbaceous-dominated communities compared to big sagebrush-dominated communities. Taken together, our results demonstrate that LiDAR data can be successfully used to estimate vegetation heights in varying communities in a sagebrush steppe. The resulting vegetation height estimates can be used to efficiently classify sagebrush communities, monitor environmental changes and their effects on these communities, and to model fuel-type and wildlife habitat.

Keywords: LiDAR, shrub height, sagebrush steppe

Wetland Assessment and Monitoring: An Example from the Milk and Marias Watersheds

Poster Authors: Meghan Burns, Catherine McIntyre and Karen Newlon
Montana Natural Heritage Program

The Montana Natural Heritage Program (MTNHP) is developing a statewide wetland and riparian digital spatial data layer to provide information on the type, location, and extent of wetlands. To address the status and condition of wetlands in Montana, we use digital wetland mapping to randomly select sample wetlands and conduct basin-wide wetland assessments at selected wetlands using a three-tiered approach. The first tier is a GIS-based landscape analysis that uses existing digital data layers to provide a preliminary assessment of wetlands

and their landscape context (Level 1) across the overall project area. A field-based rapid assessment (Level 2) is conducted at a subsample of wetlands to evaluate wetland condition, and an intensive field-based assessment (Level 3) is conducted concurrently at rapid assessment sites to validate Level 2 assessment results. We provide an example of our wetland mapping and assessment approach in the Milk and Marias watersheds.

Keywords: wetland, assessment, landscape, watershed

Terrain Analysis of Alluvial Fan Drainage Basins Along the Lemhi Range, ID

Poster Author: Christina Carr

Montana State University

Normal fault segmentation is a tectonic control on alluvial fan and fan drainage basin attributes and their spatial and temporal variations along an extensional range front. The findings of this study will be applicable to the prediction and interpretation of the distributions of these attributes of alluvial fan deposits in modern and ancient extensional basins. The GIS portion of the research focuses on fan drainage basin delineation and characterization as determined by terrain analysis.

Terrain analysis of fan drainage basins starts with digitizing alluvial fan heads (drainage basin outlets) as point features using digital orthophotos and field observations. Watershed polygons are then created using terrain analysis extensions in GIS with the drainage basin outlets and 30m digital elevation models (DEMs) as inputs. Finally, morphometric parameters are extracted from the DEMs for individual watersheds. Three primary areas of interest in characterizing drainage basins include: watershed shape parameters (area and elongation ratios), stream network parameters (number and length of streams), and stream longitudinal profile parameters. The results of the fan drainage basin morphometric analysis will later be incorporated into the larger project as one of the quantifications of along-strike variation along the Lemhi range front.

Keywords: terrain analysis, drainage basin, tectonics and sedimentation

Kenyan Agriculture: Soil to Markets

Poster Author: Kara Chelgren

Montana State University

Attempts of conservation agriculture have developed in Kenya over the last century as the result of international interaction. These interactions have not consistently left good reports or land managers throughout Kenya. The GIS approach is a non-physical approach to assisting with land management through analyzing information with the objective of providing a quality assessment for the interested public. The analysis is in raster format and uses the spatial analyst feature to derive a cost-weighted analysis of good agricultural lands and their accessibility to

roads and food markets. Good agricultural lands take into consideration soil composition, current land use, water resource, and topography. The methods do not include a ground base accuracy assessment which, with proper funding, would be very beneficial for the quality of the product. The results are shown using multiple maps with different cost-weighted analyses preferring closeness to markets or good agricultural lands with varying preferences for good agriculture lands. Another analysis was processed based on the current land management practices compared to a proposed land management inferred by the original assessment based on good agricultural lands and closeness to the food markets. This analysis will most likely be most beneficial to land managers who desire a sustainable management plan of their land in Kenya.

Keywords: Africa, GIS, agriculture, land management

GIS driven Ski-path Analysis Tool: Get-Set-go…

Poster Author: Dinesh Grover
Idaho State University - Idaho Falls

It's ingrained in human nature to climb ever evolving benchmarks in adventure sports. Skiing is one of the most exciting and challenging sports that require skills and enthusiasm. Add to this the technical finesse of Geographic Information System (GIS) and we have a perfectly blended sport that can motivate us to reach new heights and challenges.

Using open-source GIS product (MapWindow), it is possible to analyze the Ski-path trails in a cost effective way. The requirements to carry out this analysis include availability of Digital Elevation Model (DEM) and creation of possible ski-path trails using a poly-line shape file. The elevation files for most of the regions in United States are available as free download. A ski-path analysis tool can be built over the MapWindow components and both the input files, digital elevation file and poly-line shape file can be loaded and created respectively to the application. The elevation level along the Ski-path can be extracted and plotted in a graph. The analysis based on pre-defined metrics like slope, elevation difference, ski-path trail length and upward and downward trends can be assigned weights and the overall score depicting difficulty level of trail can be determined. Based on score the ski-trails can be categorized from easy to Expert level.

Ski-path analysis by extracting elevation data can prepare the ski-enthusiasts to possible adventure and challenge associated with the ski-path trail. Open source GIS technologies bring Ski-path analysis power to this sport and make a Ski-enthusiast get-set-go.

Keywords: ski-path, elevation, polyline

In a World Where Millions Don't Live

Poster Author: Jeff Hedstrom

Montana State University - Northern

This poster illustrates North Central Montana, an area where I grew up, and it's titled *In a World Where Millions Don't Live.* The main point of this poster is to demonstrate how this region in Montana is the 'best in the State' in producing wheat and is one of the most agricultural dependent regions in the entire Nation. Montana is 3rd in state wheat production, and North Central Montana is a major contributor to that fact. As I show in my analysis report, all the statistical breakdown, county by county and the top state productions represented by bushels harvested.

'Challenges for a Changing World' is a perfect theme for this conference. I came up with this poster idea that relates to a lot of different people, as food does come from that 80 acre wheat field south of Havre, Montana. Farms around Montana are very large and highly successful due to a lot of reasons, but it does tend to get tough every once in a while due to the uncontrollable factor of weather. So the next time you drive by all those wheat fields; think about all the hard work that Montana Farmers put into that product to make it grow and be successful.

Keywords: North Central Montana Region

Relationships between Nitrate Levels and Land Characteristics in Montana's Groundwater System

Poster Authors: Michael Jensen and Adam Sigler

Montana State University

Understanding relationships between nitrate and groundwater is important for human safety and health. Nitrate is a chemical constituent in ground water that is typically not found at concentrations above 4 mg/L from natural sources. Causes that elevate nitrate in ground water include: fertilizer application, livestock waste, and treatment of sewage. Nitrate poses a direct health risk when ingested by infants at concentrations greater than 10 mg/L. When nitrate reaches surface water it also contributes to eutrophication, which is the disruption of nutrient and oxygen dynamics in an aquatic ecosystem that can cause fish kills and is the cause of the dead zone in the Gulf of Mexico. Monitoring ground water quality, representing results on a map, correlating water quality issues to causes, and educating the public about how their actions can affect water resources are critical aspects of addressing issues of nitrate in ground water. The MSU Extension Water Quality (MSUEWQ) group has been administering the Well Educated Program across Montana to educate well owners and collect data since 2005. This project works closely with MSUEWQ and past data from the Well Educated Program to achieve the following objectives:

- Explore correlations between nitrate concentration, well characteristics, and land use.
- Explore ground water quality data for correlations between water quality parameters.
- Represent nitrate concentrations on maps along with other land attributes that may provide context for interpreting nitrate data.
- Assess nitrate data spatially by looking for problem areas, trends, or correlations between land attributes and nitrate concentrations.

Keywords: wells, groundwater, nitrate, land characteristics

A Web-based Application for Predicting Weed Occurrence

Poster Authors: Patrick Lawrence, Bruce Maxwell and Lisa Rew
Montana State University

Nonindigenous plant (NIS) management on public lands is often limited to subjective discovery, selection and control of populations (patches). Rew et al. (2005) proposed a predicted occurrence modeling methodology to assist land managers with the process of NIS detection and prioritization for management. The modeling approach makes predictions of NIS presence based on transect and environmental datasets. This project extended the current approach by creating a web-based application for land managers to upload NIS presence or presence/absence data and receive predictive maps in return. It also creates a hypothetical model of NIS colonization and dispersal when sampling of transects or patches is repeated over time.

The application was scripted in the Python programming language, drawing on Python's built-in library, the RPy extension, ArcGIS geoprocessing and ArcGIS Server. As inputs, it accepts transect shapefiles, transect text files, or point and polygon shapefiles documenting weed occurrence and the area surveyed. Processing tasks were designed to optimally run on text files, accessing a database of Arc ASCII GRID files for the entire Western US. As an output, the application displays a raster (map) with probabilities ranging from 0 to 1. Given time-series data, the application runs a Multi-State Markov Model fitting package in R and projects NIS patch locations for 20 years into the future.

While this application cannot accurately predict exact locations of NIS patches, it is hoped that it can focus the efforts of land managers on high-probability locations, and provide a rough prediction of future NIS dispersal.

Keywords: spatial modeling, python, web application, predictive mapping, invasive species

Modeling Post-Fire Erosion Potential in Bozeman City Watersheds

Poster Author: Christine Miller

Montana State University

Bozeman city water comes from several places: Sourdough and Hyalite Creeks in the Gallatin Mountains, and a small amount from Lyman Creek in the Bridger Mountains. Both the Sourdough and Hyalite Creek watersheds are susceptible to wildfire because of their old growth forest cover. A fire in or near one of these two watersheds would likely spread to the other. According to a report done by Western Groundwater Services a severe fire could result in "a complete shutdown of the City of Bozeman water treatment plant during runoff events" because of the enormous sediment load washing out into the single plant that treats water from both Hyalite and Sourdough Creeks. I intend to model the erosion potential of these watersheds following the event of a wildfire. Using ArcGIS, a model will be used to delineate areas of high and low soil loss potential. High potential areas would be places where pre and post event mitigation efforts could be focused as well as areas that could be targeted for fuel reduction projects.

Keywords: wildfire, erosion, modeling, watershed, soil

Analysis of Wind Farm Potential in Montana

Poster Author: Elizabeth Parillo

Montana State University

This study aimed to locate potential wind farm development areas for the state of Montana. A weighted spatial overlay of factors necessary for consideration when siting turbines can determine those regions potentially suitable for future wind farm development. GIS is an effective tool for turbine site suitability analysis because it has the capacity to model the necessary spatial components, and also combine different spatially related variables to determine areas for suitable for turbine development.

The goal of this study is not a site-specific investigation that aims to pinpoint locations for wind farm development. This is coarse analysis covering the state of Montana, hoping to highlight those general areas that satisfy certain wind farm development criteria. From this, one could determine those areas worthy of a more site-specific investigation for development.

Keywords: wind farm potential, suitability analysis

Where Have All The People Gone? Identifying Migration Fields for Geographically Isolated, Low Amenity Rural Areas

Poster Author: Nate Rogers and Ryan Arthun
University of Montana

Across many parts of the rural United States the population continues to decline as people move away to pursue higher education, better opportunities, or different experiences. Many of these communities face uncertain futures as their populations drop to unsustainable levels. As such, understanding the patterns of migration of residents leaving the community and more importantly of people moving into the community is important knowledge that communities can use in addressing this issue.

As part of a United States Department of Agriculture funded project studying outmigration from and return migration to geographically isolated, low-amenity rural communities, researchers visited 17 communities that met criteria for isolation, amenities, and population loss between 2000 and 2007. Interviews were conducted in order to understand how people who grow up in these areas choose where to live following high school graduation. This project adds a quantitative dimension to what has been uncovered about migration choices in those communities by analyzing U.S. Census Bureau county to county migration data.

Using flow mapping software, the project develops a systematic process for visually analyzing patterns of inward and outward moves from these communities between 1995 and 2000. The migration fields identified through flow mapping are then used to highlight significant population movements, regions of attraction, and can then be used to identify characteristics of the regions people are moving to or from. The application of these geographic techniques for visualization and analysis provides vital information that can inform economic development, migration, and policy efforts in rural area.

Keywords: rural community, in-migration, out-migration, desire lines

Mapping Vegetation Communities Across the Idaho National Laboratory Site

Poster Authors: Jeremy P. Shive, Amy D. Forman and Ken Aho
S.M. Stoller Corporation, Idaho State University

Orthorectified color-infrared imagery was acquired in 2007 at 1 m spatial resolution across the Idaho National Laboratory (INL) Site. We utilized the raw digital imagery (including 2004 NAIP imagery), image-derived data layers (e.g., NDVI and texture), and ancillary vector data (e.g., soils and fire boundaries) to manually delineate vegetation community boundaries within a GIS to implement and maintain polygon topology. We collected quantitative cover data at 313 vegetation plots in 2008, and analyzed those data using multivariate clustering algorithms to statistically classify vegetation communities present on the INL Site. During the summer of

2009, we collected independent map validation data at 534 sampling plot arrays which will be used to calculate the final map accuracy assessment this spring. Spectral signatures for vegetation communities on the INL Site overlap significantly and ground-based observations identified vegetation patterns that do not always correspond to patterns evident in the imagery. Absolute cover of many vegetation communities in arid landscapes tends to be low (typically less than 50%). The aerial sensor records the total energy reflected from the ground within a given pixel, which in this study area commonly represents surface features (e.g., lava or cinders) and soil characteristics rather than the vegetation growing on the surface. Supervised classification algorithms (including object-oriented algorithms) have been found to produce substantial mapping errors. Manual delineations from an experienced analyst are likely the most accurate mapping methods available, however, defining community boundaries is still a challenge and supplemental ground observations are a necessity.

Keywords: sagebrush steppe vegetation, remote sensing, Idaho National Laboratory Site

H1N1 Flu Vaccination Analysis

Poster Author: Eric Spangenberg

Lewis & Clark County

In 2009 the federal, state and local health agencies mounted a mass media campaign to combat the virulent H1N1 flu strain. The vaccinations for H1N1 were rushed to state and local officials, and as those officials received it they began the systematic process of providing it. High risk populations were the first to receive this vaccination, primarily the elderly, health care providers, and children. This was all a concerted effort by health departments across the country to control the spread of H1N1.

Lewis & Clark County and the Lewis & Clark City-County Health Department (LCCHD) were no different than the rest of the county. As LCCHD received the vaccine, free vaccination clinics were provided in various locations. Notifications of those clinics were announced on radio, in the newspaper, and posted in schools and public buildings.

With all the media play and free availability of the vaccine, the question was asked;

- With historical records showing lower socio-economic neighborhoods having lower regular flu vaccination, are we reaching this target group(s) with the H1N1?

Using the geocoding (address match) tools in GIS the database of vaccine recipients could easily be spatially enabled, and represented in a map exhibit. This spatial representation would quickly show locations of recipients and their relationship to specific neighborhoods, and clinic locations.

Keywords: flu, vaccination, H1N1

Spatio-Temporal Dynamics of Biomes in the Northwestern United States (9000 YBP to the Present)

Poster Author: Chris Stump
University of Montana

The goal of this study was to quantitatively analyze and map the vegetation composition of forest, grassland, and steppe ecosystems in the northwestern United States in the present and through the last 9,000 years. The modern analysis used canonical correspondence analysis (CCA) on pollen percentages from recent sediment cores reflecting modern vegetation assemblages and climates to evaluate the amount of influence of selected environmental variables on present species distributions. The fossil analysis used non-metric multi-dimensional scaling (NMDS) on a merged database containing relative pollen percentages from the last 9000 years. A predefined list of environmental parameters and floristically and ecologically important pollen percentages were used to measure the dissimilarity between modern and fossil pollen regimes over the region at specific time periods. The numeric values obtained from both statistical analyses were interpolated and mapped via Geographic Information Systems (GIS) to display major vegetation types throughout the northwestern United States through time, allowing visual assessment of changing environmental gradients.

Keywords: trajectory analysis, pollen analysis, climate & vegetation change, statistical ordination

Rae and Sourdough V.F.D Response Time Analysis

Poster Author: Justin Vetters
Montana State University

The ability of fire and emergency services to respond to a situation is a critical part of any community or urbanized area; particularly in areas that have a dense urban center with a very rural outlying community. Physical processes such as cellular respiration require that emergency responders are able to be on scene in four minutes which can prove difficult when responding to any of these outlying areas. The purpose of this analysis was to explore the response times of the Rae and Sourdough Volunteer Fire Departments, located in Bozeman, Gallatin County MT. Included within the scope of the analysis are both the city of Bozeman and selected portions of the outlying rural areas.

Keywords: emergency response, network analysis

Spatial Interactions between Watershed Geology, Hydrology and Fluvial Geomorphology in Headwater Streams in Shenandoah National Park, Virginia

Poster Authors: Christopher A. Walter, John A. Young, Craig D. Snyder and Mary T. Mandt University of Montana, US Geological Survey

Much research has addressed the relationships between geology, hydrology, and fluvial geomorphology in headwater streams. These studies have yielded relationships that range from broad, large scale classifications between these processes to the very fine scale. Little attention, however, has been paid to the inherent spatial patterns. This study was conducted to investigate possible spatial interactions between (i) the location of headwater stream channel features, (ii) the amount of discharge in headwater streams and (iii) watershed geology type. At the watershed scale, digital elevation models, flow accumulation models, and field global positioning systems allowed for to the quantification and comparison of these processes against three main geologic groupings in Shenandoah National Park—granitic, basaltic, and siliciclastic. An analysis of variance revealed a relationship between watershed area required to create a stream channel and geology type ($P < .05$). This result has implications for watershed classification and aiding in development of stream habitat models.

Keywords: geomorphology, hydrology, spatial analysis

Detection Thresholds for Rare, Spectrally Unique Targets within Semiarid Rangelands

Poster Authors: Keith T. Weber, Fang Chen and Bhushan Gokhale, Idaho State University

Many factors influence classification accuracy and this study assesses detection thresholds for various sub-pixel targets using Quickbird multispectral imagery. To accomplish this, six iterations of maximum-likelihood classification were used to determine classification accuracy for 100 spectrally unique targets randomly placed over a semiarid rangeland site. Error matrices were calculated using independent validation sites and producer's accuracy, overall accuracy, Kappa Index of Agreement, and transformed divergence were analyzed to compare the performance of each classification. Results indicate a strong relationship between target size and classification accuracy ($R^2 = 0.94$) as well as an increasingly prominent role played by training site selection as target sizes diminished. Strong spectral separability and classification accuracy was consistently achieved for targets exceeding 25% cover. Sub-pixel targets <25% in size were not detectable. This study highlights the effect of target size upon classification accuracy and has direct implications for invasive plant research and rare target detection.

Keywords: sub-pixel classification, Quickbird, cover detection threshold

Advances of GIS in Snow Hydrology

Poster Author: Karl Wetlaufer

Montana State University

Snow could possibly be single most important natural resource for the livelihood of the American West. Snowmelt runoff is the primary source of water for everything from municipal water supplies, to irrigation for agriculture and livestock. The well being of people, plants, and animals throughout the West can depend on the winter snowpack in drainage basins hundreds of miles away. It is essential to be able to make accurate estimates of the quantity and spatial distribution of winter snowpack and be able to effectively communicate this information to the people who need it most. GIS and remote sensing provide incredible opportunities to make these estimates, perform analysis, and convey the necessary information to an extremely wide audience. This poster explores ways in which GIS can be used in the field of snow hydrology to compile the most accurate and comprehensive data possible and effectively communicate that information to ultimately improve the lives of people throughout the West.

Keywords: GIS, snow, hydrology

The U.S. Geological Survey (USGS) serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life. The USGS has become a world leader in the natural sciences thanks to our scientific excellence and responsiveness to society's needs. As the Nation's largest water, earth, biological science and civilian mapping agency, the USGS collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues and problems. The USGS National Geospatial Program provides leadership for USGS geospatial coordination, production and service activities. The program engages partners to develop standards and produce consistent and accurate data through its Geospatial Liaison Network. USGS geospatial activities in Montana and the Northern Rockies are coordinated and managed by the Geospatial Liaison to Montana located at the Northern Rocky Mountain Science Center in Bozeman, Montana.

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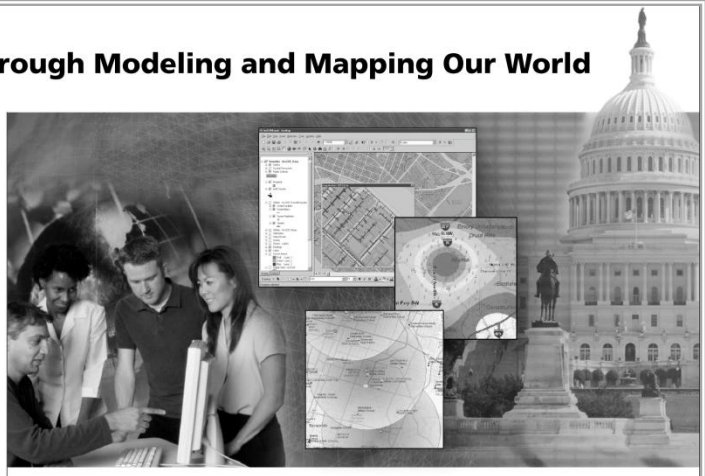

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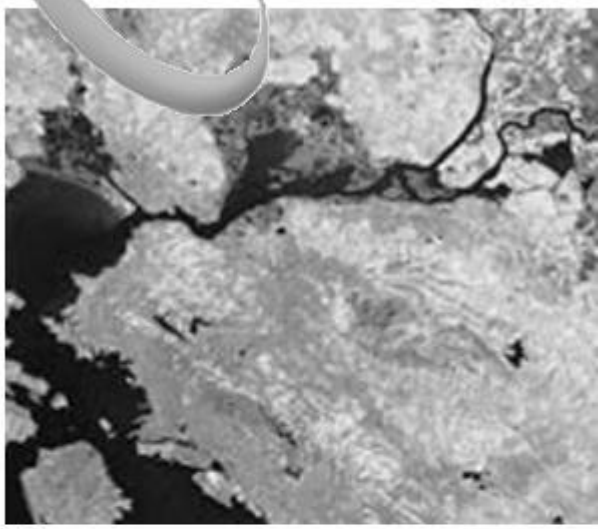

Topics to be Covered

AmericaView and the USGS

MontanaView: A consortium of universities, non-profit organizations and government agencies working within Montana to advance the availability and timely distribution of remotely sensed data

IdahoView: Remote sensing data acquisition and application in Idaho

WyomingView: Promoting remote sensing applications in Wyoming

Remote sensing and Emergency Response

Remote sensing research and education

Incorporated geospatial thinking and remote sensing

BandPop8-A multi-purpose, platform independent, population-based, unsupervised classification method

Building a satellite-based remote sensing monitoring system of vegetation in the riparian corridor to study the effects of dam removal and contruction

Spectral signature of vegetation and electrical conductivity signature of soil in response to surface CO_2 leakage

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Presentation Abstracts

America View

Cecere, Thomas H., USGS Land Remote Sensing Program, Reston, VA
Title: America View and the USGS

Abstract: The US Geological Survey has sponsored a grant activity over the past 10 years with the goal of promoting the science of Land Remote Sensing and making data (most notably Landsat satellite data) more readily usable to people within states and to academia as a whole. AmericaView has been the grant recipient since 2003 and the program has offered a number of successes as well as presented challenges as the world and the original paradigms are changing. This presentation will touch on the evolution of the relationship between the USGS and AmericaView and provide some insight into potential future directions.

Biography: Tom served in the Navy, mostly in the Pacific, in the early part of his career. There his positions included Navigator and Typhoon Duty Officer. In terms of remote sensing, weather and positioning were the main focus. He went on to the Naval Oceanographic Office at Stennis Space Center, MS where he utilized all source information including Landsat and SPOT imagery to inform personnel of coastal and riverine environmental considerations. From 1999 - 2004, he served in the Survey and Mapping Division as the GIS coordinator of the Pittsburgh office of the US Army Corps of Engineers, working mostly with high resolution aerial photography and differential GPS. He is currently at USGS headquarters in Reston, VA where he serves as the AmericaView Liaison and Requirements Lead in the Land Remote Sensing Program.

Gessler, Paul, IdahoView Coordinator
Title: IdahoView: a consortium for enhancing communication, partnerships, and cyber infrastructure for remote sensing data acquisition and application in Idaho

Abstract: This talk will provide an overview of the IdahoView project and coordination activities underway for the development of our IdahoView web site and broader consortium. Individual elements will be introduced for image data management and archiving, image data acquisition coordination, and training and application projects being coordinated by IdahoView partners. Discussion of IdahoView activities in relation to other regional and national initiatives will also be discussed. The Idaho LiDAR consortium will be introduced as a specific application being facilitated by IdahoView partners to coordinate acquisitions and processing of LiDAR data across the state of Idaho and broader region.

Biography: Paul Gessler is a Professor of Remote Sensing and Geospatial Ecology in the College of Natural Resources at the University of Idaho. He is co-director of the Geospatial Laboratory for Environmental Dynamics, the current IdahoView coordinator, and also leads a statewide cyber infrastructure-working group planning for development of image and geospatial data management to support science and technology across the state and region.

Kellogg, Christopher and Xiaobing Zhou, Department of Geophysical Engineering, Montana Tech of the University of Montana, Butte

Title: Building a Satellite-Based Remote Sensing Monitoring System of Vegetation in the Riparian Corridor to Study the Effects of Dam Removal and Construction

Abstract: A satellite-based remote sensing monitoring system is currently being built in an effort to study changes in vegetation in the riparian corridor as a result of recent dam removals/constructions. The two main areas of interest for this project are the Milltown Dam site on the Clark Fork River, in western Montana (removed March 2008) and the Three Gorges Dam site on the Yangtze River, in central China (completed construction October 2008.) Landsat Thematic Mapper (TM) and MODIS based images are being used to collect time-series of vegetative cover along riparian sections of interest, bracketing pre/post dam removal/construction. Changes in vegetative cover will be used as an indicator of how groundwater systems and soil moisture are being affected. Few large-scale dam removals have occurred in the past and it is unknown how the local hydrologic regime will react to such a change. Likewise; the effects on the hydrologic regime due to the construction of a hydroelectric project at a magnitude of the Three Gorges Dam is also unknown. Site specific variations in spectral vegetation reflectance will be studied using time series plots constructed from various band combinations (NDVI, LAI) using Landsat TM (biweekly temporal resolution; 30mx30m spatial resolution) and MODIS (daily temporal resolution; 250mx250m spatial resolution) imagery and ArcGIS. The results of this study will develop an approach for predicting the response of the local hydrologic regime at future dam removal/construction sites by monitoring changes in vegetative cover along the riparian corridor through the use of satellite remote sensing technology.

Biography: Kriss Kellogg graduated with a bachelor's degree in Geology, University of Montana in 2008. He is now a graduate student in the Geophysics Department at Montana Tech of The University of Montana. His main interests are in geophysics, remote sensing and GIS applications.

Klene, Anna E., Assistant Professor, Department of Geography, University of Montana, Missoula
Title: Remote Sensing Research and Education at the University of Montana

Abstract: Remote sensing is widely utilized throughout the University of Montana. Faculty and students are working on issues ranging from global estimates of net primary production to spatio-temporal analysis of return migration to small communities in the US Great Plains. Faculties from the Departments of Anthropology, Biology, Ecosystem and Conservation Sciences, Geography, Geosciences, Forest Management, and Society and Conservation, among others, are involved in analysis of aerial and satellite imagery. Several institutes, including the Flathead Lake Biological Station, National Center for Landscape Fire Analysis, Natural Heritage Program, and Numerical Terradynamic Simulation Group are heavy users and producers of remotely sensed information. In 2007, the College of Forestry and the College of Arts and Sciences introduced an interdisciplinary undergraduate Certificate in Geospatial Information Sciences and Technologies which requires at least one course in remote sensing and can be made up of a majority of imagery based classes. Over 40 students completed the program in its first two years from six different majors ranging from Anthropology to Wildlife Biology. This presentation will review ongoing research projects, educational opportunities, and resources available at the University.

Biography: Anna Klene has been an Assistant Professor in the Department of Geography at the University of Montana since 2004. She completed her Ph.D. in Climatology at the University of Delaware in 2005. Her MA and BS are in Geography. Current research projects include predicting rare plant habitat in the northern Rockies and continuing her masters and dissertation research on permafrost-climate interactions on the North Slope of Alaska as part of the CALM III project. She also serves on the Steering Committee for UM's new minor in Climate Change: Science, Society, and Solutions.

Lawrence, Rick, Professor and Director, Spatial Sciences Center, Land Resources and Environmental Sciences Department, Montana State University, Bozeman, and Christine Sommers-Austin, MontanaView State Coordinator, Spatial Sciences Center, Land Resources and Environmental Sciences Department, Montana State University, Bozeman
Title: Remote Sensing and Emergency Response: The Role of MontanaView and AmericaView

Abstract: Satellite and airborne remote sensing has become an increasingly important asset for emergency response, often providing the first accurate assessment of damage and providing first and subsequent responders with invaluable information. Organizations responsible for emergency response, however, often cannot afford to maintain staff experienced in processing remotely sensed imagery. University personnel and the private sector have often filled this

need on a temporary, urgent basis throughout the United States in recent years. A special case arises when the International Charter on Space and Major Disasters is invoked. The International Charter provides a system whereby authorized users can call on member remote sensing data providers throughout the world to provide imagery on an emergency basis. These data are often provided in unprocessed and unfamiliar formats that are even more problematic for responders without remote sensing expertise. These data are not released to the public, but are shared with emergency response coordinators. Several AmericaView member consortia have played a key role in supporting emergency response in recent years, prompting a national effort by AmericaView to prepare to support responders. This organizational effort has been lead by MontanaView, a consortium of university, agency, and private organizations in Montana, which has developed tools for collecting key information from members of the remote sensing community as to willingness and ability to provide volunteer support in the case of disaster response.

Biography: Rick Lawrence is Professor of Remote Sensing and Director of the Spatial Sciences Center at Montana State University. He has been Chairman of the Board of AmericaView since 2007 and Chair of the MontanaView consortium since 2005. His work focuses on the use and application of remote sensing technologies in managed and natural ecosystems. He holds a PhD (1998) and MS (1995) in forest resources from Oregon State University, a JD (1979) from Columbia University, and a BA (1976) from Claremont McKenna College.

Shelhammer, Van, Geoessentials, Inc. Bozeman

Title: Freshman Academy Incorporated Geospatial Thinking and Remote Sensing

Abstract: Teachers in the cross-curricular Freshman Academy at Lewistown High School are incorporating geospatial thinking and remote sensing instruction in to a number of their classes. Departments involved are Science, Math, English and Physical Education. Plant specimen and location coordinate gathering are conducted during physical education and science classes, while math and English classes conduct the calculations and mapping. English classes write hypotheses of how stream re-meandering has affected the riparian habitat in the Brewery Flats area of Big Spring Creek; which is located close to the High School in Lewistown, MT. State and National Education Standards for each discipline are addressed by the various educational activities.

During the instructional introduction to the project activities, students study satellite imagery and aerial photographs of Brewery Flats and Big Spring Creek during the months of May and August. Students make predictions about changes in spectrographic signatures of different plant life during different times of the year. Students begin their outdoor activities by mapping the trails, creek and areas of common plant species through Brewery flats using GPS units. GPS data are downloaded and converted to shapefiles and displayed as a layer in ArcMap over an

aerial photograph of Brewery Flats. Students learn how to calculate the area of different types of vegetation contained within the complex shapefiles.

Next, students study the interaction of plants and electromagnetic spectrum as they prepare to measure the spectral reflectance values of the major types of plant species. Students use the spectrographic readings of each of these plants to calculate an average RGB factor for each sample. These RGB factors are then used to identify different types of plants and their locations in and around Brewery Flats using aerial photographs and satellite images.

Students work in teams of 3 or 4 in order to identify, analyze and record information about each type of plant surveyed. They use an Excel to calculate and record the RGB factors for each plant specimen collected.

This paper is based on instruction that is occurring spring semester of 2010.

Sivanpillai, Ramesh Associate Research Scientist, Wyoming Geographic Information Science Center and Department of Botany, University of Wyoming, Laramie
Title: Promoting Remote Sensing Applications through WyomingView

Abstract: WyomingView aims to promote remote sensing applications in Wyoming through outreach, education and applied research activities. WyomingView is part of the AmericaView program funded by the USGS. WyomingView initiated a consortium of remote sensing data users and created an image archive providing free satellite images to any user. WyomingView conducts workshops for personnel in various agencies while many students are benefitting from its internship and training programs. Through the applied research program utility of Landsat and other moderate resolution satellite data are being tested for mapping natural resources leading to publications in peer-reviewed journals and presentations in conferences. This presentation will provide an overview of WyView activities highlighting the accomplishments and challenges faced along the way while initiating the consortium and conducting applied research projects.

Biography: Ramesh Sivanpillai is the principal investigator and has managed WyomingView since 2002. He graduated from Texas A&M University with a doctoral degree in Forestry specializing in remote sensing applications. At UW he teaches an applied remote sensing course and several short courses, and conducts remote sensing research in Wyoming, Central Asia, Russia, and Central America. He has been a member of the AmericaView Board of Directors since 2004 and has also served as the Secretary and Vice President. He has given numerous talks to various user groups throughout Wyoming on remote sensing applications for mapping and monitoring applications.

Zhou, Xiabing [a] and Venkata R. Lakkaraju[a], Martha Apple [b], Laura M. Dobeck [c], Kadie Gullickson [c], Al Cunningham [d], Lucian Wielopolski [e], Lee H. Spangler [c]

[a] Department of Geophysical Engineering, Montana Tech of The University of Montana, Butte, MT 9701

[b] Department of Biology, Montana Tech of The University of Montana, Butte, MT 59701

[c] Department of Chemistry and Biochemistry, Montana State University, Bozeman, MT 59717

[d] Department of Civil Engineering, Montana State University, Bozeman, MT 59717

[e] Environmental Sciences Department, Brookhaven National Laboratory, Upton, NY 11973

Title: Spectral signature of vegetation and electrical conductivity signature of soil in response to surface CO_2 leakage.

Abstract: During the summer (July 15 – August 12, 2009) CO_2 release experiment in 2009 to simulate CO_2 leakage of sequestrated CO_2 at the Zero Emission Research and Technology Center (ZERT) at Bozeman, Montana, the hyperspectral reflectance, soil electrical conductivity, soil moisture, soil temperature, and soil CO_2 concentration were monitored. Analyses of vegetation indices derived from the spectral reflectance show that with increased soil CO_2 concentration due to the surface CO_2 leakage, (1) the structural independent pigment index (SIPI) increased, indicating a high carotenoid to chlorophyll ratio; (2) the chlorophyll normalized difference vegetation index (Chl NDI) decreased, suggesting a decrease in chlorophyll content with time; (3) pigment specific simple ratios (both PSSR*a* and PSSR*b*) were reduced for stressed vegetation station compared to that at the control site, indicating a reduction in both chlorophyll *a* and chlorophyll *b*; and (4) Normalized-difference first derivative index (NFDI) decreased for the CO_2 stressed vegetation while it is almost constant at the control site. All four indices were found to be sensitive to stress in vegetation induced by high soil CO_2 concentration. Multivariate analyses of the observed time series of the soil data show that (1) the slope of the linear relationship between the bulk soil EC and soil moisture increases (from 2.067 to 4.982) with increase in the soil CO_2 concentration due to CO_2 leakage; (2) after the CO_2 release, the relationship between soil bulk EC and soil CO_2 concentration observes three modes: gas CO_2 decay mode, dissolved CO_2 decay mode, and natural gas CO_2 mode. Comparing the two decay modes, it is found that the dependence of EC on soil CO_2 concentration is weaker for the gas CO_2 decay mode than the dissolved CO_2 decay mode. Based on these observations, we surmise that it is possible to monitor CO_2 leakage of geologically sequestrated CO_2 using the vegetation indices in vegetated regions and the bulk soil EC method in both vegetated and bare regions.

Biography: Xiaobing Zhou received the B.S. degree in physics from Hunan Normal University in 1986, the M.S. degree in theoretical physics from Sichuan University in 1989, and the Ph.D. degree in geophysics, with specialization in remote sensing, from the University of Alaska Fairbanks, in 2002. He was with the Southwestern Institute of Physics, Chengdu, China as a research assistant professor in 1989 and a research associate professor in 1995; with the

University of California, San Diego, as a visiting scientist in 1997; with the University of Alaska, as a visiting scientist in 1998; with New Mexico Tech, Socorro, as a research assistant professor in hydrology from 2002 to 2005; and with the department of Geophysical Engineering, Montana Tech of the University of Montana, Butte, USA as an assistant professor in geophysics from 2005 to 2009. He has been an associate professor with Montana Tech of the University of Montana since 2009. His current research interests include remote sensing theories, algorithm development, and applications in earth and environmental sciences, applied geophysics, and CO2 sequestration. He has over 90 publications and presentations, including over 40 publications in peer-reviewed journals. His teaching interests include physics, electronics, applied geophysics, gravity and magnetic exploration, remote sensing, remote sensing and GIS applications.

Census and Demography

Castagneri, Jim, U.S. Census Bureau
Title: The 2010 Census and Beyond – Capitalizing on Census data and the ACS for GIS
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Abstract: The 2010 Census marks the third US decennial census using GIS technology as its foundation. The result is a rich, 3-decade history of block-level demographic data ripe for comparative analysis. Some major changes for 2010 include a short form only questionnaire, a handheld GPS device, and a monthly ACS to replace the long form. What do these changes mean to the data user? How can you be prepared for the first data release? How will annual ACS data releases affect your demographic analysis? This session will provide attendees the knowledge and skills to begin processing ACS and 2010 data as soon as it is released.

Biography: Jim has been a Geographer at the US Census Bureau since 1987 focusing on statistical programs and working with local governments on programs such as the Local Update of Census Addresses, the Participant Statistical Areas Program, TIGER enhancement and others. Currently, Jim manages the geography department of the Denver Regional office. He received his BA in Geography from the University of Colorado - Boulder in 1983.

Palm, Lorie, Census and Economic Information Center, Montana Department of Commerce
Title: Migration: Using Internal Revenue Service Returns Data to Examine a Changing Community (and They All Are A-Changin')

Abstract: From 2008 to 2009 Montana, like 46 other states, experienced growth in population. The Census Bureau in their annual estimates program tells us Montana grew by 6,954 people. In supplements to annual population estimates, the Census Bureau produces estimates of the components of change – births, deaths, and net migration, at the county level. What if more

information is needed? It could be useful to know where IN migrants are coming from and where OUT migrants are going. What is the scale of migration at the state level and the county level? How are the migration patterns changing over time? Internal Revenue Service (IRS) Migration files can help answer these questions.

The focus of this talk will not be an examination of patterns and results; rather, it's an exploration of the IRS Migration files as a source for analysis. Where are the data found? What types of information do the files contain? How can the information be used to better understand migration, population changes, and changes in composition affect a community?

Bio: Lorie Palm is the GIS Coordinator for the Census and Economic Information Center (CEIC) in the Montana Department of Commerce. Lorie has worked in the mapping and GIS field since 1996, for the U.S. Census Bureau, NorthWestern Energy, and the past 3.5 years for CEIC. Having spent the last two years promoting participation in the 2010 Census, she can't wait until all the forms are in and she can actually do GIS work again!

Sylvester, Jim, Director of Survey Operations, Bureau of Business and Economic Research, University of Montana-Missoula
Title: The Use of Cadastral and CAMA Data for Estimating Current Housing Stock

Abstract: The Census Bureau produces annual estimates of the population and housing stock for states, counties, and towns. These estimates are used by many businesses, governments and people. Decisions on allocation of funds or whether to make an investment all rely on these estimates. The current housing stock is used a control total for the American Community Survey housing data. All totals are controlled to the number of housing units in a geographic area such as a county. If the estimate of housing units is off; all data derived from the ACS are off. The control estimate used is the housing unit estimate published by the Census Bureau.
Building permits and mobile home shipments are used to determine changes in housing stock. This method works for geographies that require permits; however what do you do when permits are not required? This paper explores the use of cadastral and CAMA data for estimating the current housing stock.

Bio: Jim Sylvester is Director of Survey Operations and an economist at the Bureau of Business and Economic Research at the University of Montana-Missoula. His primary responsibilities are demographic analysis, forecasting and survey research. Born in Montana, he went to school in Montana, Idaho and Nevada. He returned to Montana after college. He has a Bachelor of Arts Degree in Economics from The University of Utah and a Master of Arts in Economics from the University of Montana. He has researched the Montana economy for the BBER since 1980. Mr. Sylvester's research interests are why people live in certain areas and why they migrate. In 2001, he conducted a major general household survey of Northern Plains residents for the Great

Plains Population Symposium held in Bismarck, specifically examining this topic. In addition, all surveys he conducts in Montana have a module asking about quality of life and migration potential. Mr. Sylvester just completed a contracted research project for the US Census Bureau on the potential of cadastral files on population estimation. Mr. Sylvester is presently the chairman of the Federal-State Cooperative for Population Estimates (FSCPE) methods committee and a member of the Census 2010 Review Committee. He is just starting his second term on the FSCPE steering committee.

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von Reichert, Christiane, Department of Geography, The University of Montana
Title: The Population of Montana: Patterns and Trends

Abstract: Population geographers and demographers strongly rely on data from the U.S. Bureau of the Census to identify population patterns and trends. Analysis of patterns involves comparisons across space (between regions), while analysis of trends allows for comparison across time (between years). This presentation draws on different sets of Census data to describe population dynamics in Montana. I will use population counts from the decennial Census of Population and Housing, annual data from the Census Estimates Program, and annual Components of Change Data to reveal how population scenarios differ across the State of Montana. Other data sources from the Census Bureau and their use in population analysis will be touched on as well.

Bio: Christiane von Reichert is a Professor of Geography at The University of Montana. She came to Montana in 1992 after completing a Ph.D. at the University of Idaho. Her research is in the fields of population and economic geography with focus on rural areas and rural communities. In her previous research she examined amenity migration in the Mountain West, population loss in the Northern Great Plains, and population change and return migration to Montana. She currently directs a national, USDA-funded study on return migration to geographically isolated rural communities. Her research employs quantitative as well as qualitative methodologies. In her teaching, Dr. von Reichert offers introductory courses in *Human Geography;* upper-division methods courses in *Community and Regional Analysis* as well as *Transport, Planning, and GIS*; upper-division and graduate courses on the *Economic Geography of Rural America*, *and Migration and Population Change.* Her teaching repertoire also includes *Research Methods/Research Design* and a *Workshop in Teaching Geography.* Christiane von Reichert was born and raised in Germany. She has traveled widely throughout Europe, Southeast and Southwest Asia, Oceania as well as Central and South America. She has lived and worked more than half of her life in the United States, mostly in Idaho and Montana.

Data Sharing and MSDI

MSDI Segment

Clampitt, Lance, USGS, Moderator/Presenter
Title: Montana Framework Data Panel Co-Presenters: Stewart Kirkpatrick, Keith Blount, Erin Geraghty, Evan Hammer, Tom Potter, Michael Fashoway, Joshua Dorris, Paul Thale, Linda Vance, Cathy Maynard, Meghan Burns, and RJ Zimmer Lance Clampitt, USGS
Title: MSDI / Stewardship / Framework Data Panel

Abstract: A Spatial Data Infrastructure (SDI) provides a basis for spatial data discovery, evaluation, and application for users and providers within all levels of government, the commercial sector, the non-profit sector, tribal, academia and by citizens in general. An SDI is not one thing or one person or place but is made up of components including data, technology, policy, institutional arrangements and of course people. Some highly recognizable benefits of an SDI include better data, standards, best practices, a method of maintaining data and a distribution portal. This presentation will describe the Montana Spatial Data Infrastructure, why we need it, how it has matured and what is needed for continued success. An important component of the SDI is the Framework Data component and the stewardship of this data. Framework Data Leads for each theme will provide brief summaries and interact with the audience during the Framework Data Panel Discussion.

Lance Clampitt Biography: Lance Clampitt is a Physical Scientist with the U.S. Geological Survey (USGS) and currently holds the position as USGS Geospatial Liaison to the state of Montana. Responsibilities include the management and programmatic guidance for USGS geospatial activities in the state of Montana and the Northern Rocky Mountain region of the U.S. Work experience includes survey field work in Colorado and Washington State, geospatial data production and management, production cartography and photogrammetry and the coordination and management of geospatial programs. Mr. Clampitt has over 23 years in the industry working for the USGS, the National Geospatial Intelligence Agency and the National Guard and U.S. Army Reserve. Mr. Clampitt received his Geographic Information Systems Professional (GISP) certification in 2009 and actively supports the Montana geospatial community as a board member of the MAGIP and as a Department of the Interior representative to the MLIAC.

Keith Blount Biography: Keith Blount currently works for the Montana Base Map Service Center, Information Technology Services Division of the Department of Administration. For the past seven years, he has served as the Database Coordinator for the Montana Cadastral Project. In addition to managing the Cadastral Database, he also maintains the statewide Conservation Easement layer. Mr. Blount has approximately 20 years of experience in GIS. He has previously worked for the Montana GAP Analysis Project, U.S Forest Service, Analytical Surveys Inc.,

Butte-Silver Bow County Government and the Washington State Department of Natural Resources.

Michael Fashoway Biography: Michael is the Structures Framework & Address Data Coordinator at the Montana Base Map Service Center (BMSC). Since joining the BMSC in June of 2007, Mr. Fashoway has developed the Montana Structures Framework (formerly the Critical Infrastructure & Structures Framework) into database of primary structures in Montana, which is expected to be complete statewide later this year. Additional responsibilities include working with geographic names and the Orthoimagery Framework.

Evan Hammer Biography: Evan manages the Natural Resource Information System at the Montana State Library. He has a bachelor's and a master's degree in Geography from the University of North Carolina.

Stewart Kirkpatrick Biography: Stewart Kirkpatrick is the Montana State GIS Coordinator and Chief of the Montana Base Map Service Center, Information Technology Services Division, Montana Department of Administration.. For the past thirteen years he has also served as the Project Manager for the Montana Cadastral Database, one of the first statewide efforts aimed at creating a framework cadastral database. He now has general oversight over the Montana Transportation Framework database, Montana Critical Infrastructure/Structures database and digital boundary development. Mr. Kirkpatrick has over 20 years of GIS experience in Montana, previously working for the Montana State Library and serving as GIS Manager at Butte-Silver Bow County Government for 5 years. Mr. Kirkpatrick has been active in the Montana GIS community and is a past chair of the Montana GIS Users Group and past vice-chair of the Montana Local Government GIS Coalition. Regionally he is Montana's delegate to the Western Governors Association GI Council and has served on the Steering Committee of the past two WGA Cadastral Forums. He is Montana's delegated representative to the National States Geographic Information Council (NSGIC) and previously served two terms on the Executive Board of that organization. He also serves as the western states representative to the Federal Geographic Data Committee's (FGDC) cadastral subcommittee. Mr. Kirkpatrick received the NSGIC Outstanding Service Award in 2006 and the Distinguished Service Award from the Montana Association of Geographic Information Professionals in 2008.

Catherine Maynard Biography: NRCS State Geospatial Analyst with a Ph.D. in Land Resources and Environmental Science from Montana State University in 2003; an M.S. Soils and Forest Ecology, University of Montana in 1988; and a B.S. Plant Ecology and Environmental Science from Utah State University in 1977. Catherine has worked for the USDA Natural Resources Conservation Service in Bozeman, Montana since 1996 and specializes in using remote sensing for environmental analysis. Using satellite imagery and other geospatial data to model and evaluate resource conditions she provides support to statewide and local projects such as rangeland inventory and assessment, watershed planning, wetlands conservation, precision

agriculture, and land cover mapping. Catherine also serves as the NRCS liaison to the Montana State Library NRIS GIS clearinghouse and represents the NRCS on the Montana Land Information Advisory Council. From 1987 to 1996 Catherine worked for Region One of the USDA Forest Service as a soil scientist and ecologist where she was responsible for mapping local and regional soils and vegetation, developing models to predict erosion hazards, and developing landscape level analysis methods for mapping and classifying ecosystems.

Linda Vance Biography: Linda Vance is the Senior Ecologist at the Montana Natural Heritage Program (NHP) and is Director of the NHP Spatial Analysis Lab at the University of Montana. She holds a PhD in Conservation Ecology from UC Davis, an LL.M from York University and a J.D. from McGill University. Her work emphasizes classification, analysis and assessment of habitat for terrestrial and wetland species, and development of map products, methods and tools to help resource managers make informed conservation decisions. She is currently Vice-President of MAGIP.

RJ Zimmer Biography: RJ Zimmer is a professional land surveyor licensed in Oregon and Montana, and is the GIS Manager for DJ&A, PC, a small engineering and surveying company. Mr. Zimmer has more than 20 years of GIS experience managing and using GIS in local government and as a GIS consultant. He earned a B.Sc. in engineering-physics from Oregon State University, and he has published more than 50 articles on GIS and surveying in The American Surveyor magazine, the Professional Surveyor Magazine.

Paul Thale Biography: Montana Bureau of Mines & Geology (MBMG), GIS Specialist, MPA Montana State University, 2004. Paul has worked in Butte, MT for the MBMG since 1999. His work experience includes geologic data layer development, geospatial program coordination, technical support & training, in addition to system administration. Paul has over 15 years experience with GIS technology while working for the Montana Bureau of Mines & Geology, the Natural Resources Conservation Service, the U.S. Forest Service, & in environmental consulting.

Dorris, Joshua, State of Montana Base Map Service Center Title: Improving efficiency for loading disparate data into the Framework model

Abstract: How Safe Software's FME (Feature Manipulation Engine) was used to develop procedures for loading disparate datasets into the Transportation Framework model. The Framework is compiled of data from numerous sources with different schemas, varying qualities and intents. FME templates were developed so a native dataset could be imported into the workspace, relevant fields mapped to the Framework dataset, and then the values moved over. FME is also used for quality control and quality assurance processes.

Biography: Joshua Dorris is the Transportation Framework Theme Lead with the State of Montana's Base Map Service Center. Responsibilities include coordinating the updates, maintenance and dissemination of the dataset, developing services using the data, and providing outreach and assistance to local governments. Experience in the GIS vein includes over nine years working at the city, county and state levels. Responsibilities have included initial development of a GIS and data to data production and maintenance, analyses, cartography and managing the program. Joshua received his Geographic Information Systems Professional (GISP) certification in 2008.

Data Sharing and MSDI

Data Sharing Segment

Daumiller, Gerry, Montana State Library
Title: Publish Data You Have: The Montana GIS Portal

Abstract: The Montana GIS Portal (http://gisportal.msl.mt.gov) is Montana's primary catalog of GIS data, where all data providers in the state may publish the existence of their data and provide access to it. This presentation will introduce attendees to the resources that explain how to prepare the metadata required to publish data to the Portal and demonstrate the process of publishing one record.

Biography: Gerry has been a GIS Analyst with the Montana State Library since 1988, and he manages the Montana GIS Portal's metadata collection. He has a bachelor's degree in Geography from the University of Montana and studied cartography for three years in graduate school at the University of Wisconsin.

Hammer, Evan, Montana State Library
Title: Finding and Using MSDI Data

Abstract: This purpose of this session is to inform people of resources to help them get started with MSDI data. The first item highlighted will be the MSDI data discovery mechanism: The Montana GIS Portal. The second item presented will be the MSDI web presence: The MSDI Framework Web Pages. The final item discussed will be the primary MSDI data delivery mechanism: GIS Web Services.

Biography: Evan manages the Natural Resource Information System at the Montana State Library. He has a bachelor's and a master's degree in Geography from the University of North Carolina.

Ketterling, Ricki Ann, GISP,Montana Department of Environmental Quality, Remediation Division, MWC/FSS, GIS Database Coordinator

Title: Utilizing GIS to Store, Share and Communicate Data on Large Scale Remediation of the Clark Fork River.

Abstract: The Clark Fork River Operable Unit of the Milltown Reservoir/Clark Fork River Superfund Site GIS database is set up to be in compliance with the Record of Decision and support the Department of Environmental Quality, Remediation Division, Mine Waste Cleanup Bureau, Construction Services Program construction process. Furthermore, maintaining Montana's GIS data standards. The Clark Fork River Project is in a project folder with the same name. The folder structure is made up six main folders that determine type of data and about 40 subfolders that are specific to apart of the project. The major reason for the Clark Fork River project being set up in this format is because the project life could be up to 30 years long, allowing for growth, technology changes will insure stability and flexibility. All the data in these project folders are created to store data that is used the geodatabase, support metadata, store, and communicate with public, though out the state agencies and with consultants.

Biography: Ms. Ketterling has GIS and CADD experience related to civil, electrical power and environmental engineering. She has extensive experience in Arc Info, Arc Editor, Arc View, SDE/SQL, and GIS 3rd party network analysis software. She has extensive experience collecting field data with GPS equipment and has survey technician experience working with total stations and levels. She has written procedure documentation for the GIS mapping, CAD process and has experience with land parcels data, easement drawings and plat information, electrical models, hydro models, ground water monitoring, construction, storm water, waste water and drinking water models and vegetation mapping. She has created, tested, and managed numerous personal and enterprise geodatabases.

Education

Bachelor of Arts, Communications, Montana State University Billings, 2002

Associate of Applied Science, Design Drafting Technology, Billings College of Tech, 2000

Professional Registrations

Certified Geographic Information (GIS) Professional (GISP) 2009

Professional Affiliations

Montana Association of Geographic Information Professionals (MAGIP) 2007

Industry Tenure

Eight Years

Papineau, Diane, Montana State Library
Title: Find Data You Need: The Montana GIS Portal

Abstract: Montanans need one place where they can search for GIS data about the state. The Montana GIS Portal is that place. In this session, we will explore the new, simpler Montana GIS Portal website and learn about searching techniques for finding the data you need. We will also briefly discuss publishing data you have to the Montana GIS Portal.

Biography: Diane Papineau, a native of New Hampshire, has lived and worked in southern Montana and Yellowstone National Park since 1988. She earned a BS in Cinema and Photography at Ithaca College in New York and completed an MS in Earth Sciences at Montana State University in 2008. Her graduate work focused on GIS, remote sensing, and historical geography. She joined the Montana State Library's Natural Resource Information System (NRIS) as a GIS Analyst in August 2008. She is a MAGIP Board member and it's Mentoring Subcommittee Chair.

Historical GIS

Fockler, Matthew, Montana State University, Ph.D. Candidate
Title: Viewing Change: HGIS as a "Field Test."

Abstract: Historical geographers are charged with the combined tasks of reconstructing human and physical landscapes of the past and tying that reconstruction with associated forces to ultimately uncover the processes of geographic change. Historical GIS offers social scientists a new set of tools that can help in this process. For historical geographers, the implementation of a GIS can provide many benefits. It's proclivity to store spatial information is an obvious plus to geographers. A GIS can also allow historical geographers to "field test" their questions without having to be in the field. One of the key tenants of geographic study is that elements of the landscape are artifacts of human purpose. Landscape change serves as evidence of forces of change. These forces are difficult to map. Yet the resultant landscape change can be mapped. Therefore, a GIS can provide the historical geographer a look into a study area before he or she delves into the arduous task of archival and field research. This paper uses a case study of the Lewis and Clark National Forest to view if HGIS can indeed be a tool for pre-testing study areas.

Schwab, Alex, Student of Geography at MSU, and Billy Smith, Professor of History & Distinguished Professor of Letters and Science MSU; Paul Sivitz, PhD Candidate MSU; Stuart Challender, Adjunct Assistant Professor Department of Earth Sciences MSU; Tara Chesley-Preston, Graduate Student, Department of Earth Sciences MSU
Title: City Streets, City People: Mapping 1790 Philadelphia

Abstract: Philadelphia was the political, economic, social, and cultural capitol of the new United States in 1790. Three years earlier, fifty-five delegates had met there to write the United States Constitution. Between 1790 and 1800, Philadelphia housed the federal government. The City of Brotherly love also served as the nation's primary immigrant port. As the new immigrants joined American-born whites, slave and free blacks, and transient laborers of all stripes, Philadelphia's space reflected the presence of these disparate groups. To address the where of Philadelphia, GIS geocoding techniques were employed to spatially enable historical records including the first American census of 1790. The products of this labor will further investigations of the who, what, and why of America's most influential city.

Paul Sivitz Biography: Paul Sivitz is a PhD Candidate at Montana State University. His primary research interest is the transmission of knowledge via epistolary and print culture in Britain and America during the long-eighteenth century (1680-1820). Paul has presented his research at conferences in Philadelphia, Paris, and Lancaster, England. Paul has presented dozens of lectures throughout the United States on the natural, general, and social history of the Lewis & Clark Expedition, including two series for the National Endowment for the Humanities in 2004 and 2005.

Alex Schwab Biography: Alex is a student of Geography in the Earth Sciences Department at MSU. Currently a Junior, Alex has participated in GIS projects for local organizations like Hopa Mountain, Montana Storymakers and the Flathead Lakers. He was recently involved in an internship that combined GIS with history based inquiry.

Local Government

Balke, Kyle, Senior GIS Analyst, Geodata Services, Missoula
Title: The Perception and Role of 3-D Visualizations in Planning: Case Study of the Northwest Passage Scenic Byway's Viewshed Protection and Visualization Project

Abstract: The use of sophisticated visualization tools and methods, in particular 3-D modeling, has seen a considerable rise in planning throughout the last decade due to continued advancements in 3-D technology, computer hardware, and the internet. The rapid increase in the use of 3-D visualization is supported by the belief that visualizations which imitate human experience help relieve many of the communication problems that exist between experts and

lay persons during the planning process and help engage a broader cross-section of the public. This research provides a comprehensive investigation of stakeholder perceptions concerning the use of digitally altered photographs and fully interactive 3-D models in the Northwest Passage Scenic Byway's (NWPSB) Viewshed Protection and Visualization project. The results of this research show that 3-D visualization is an important component of the planning process that can ultimately enhance an individual's comprehension of a project and provide an improved means of communication between experts and stakeholders. Kyle will provide a review of the project, methods, examples, results, and recommendations regarding the use of 3-D visualizations in planning projects.

Biography: Kyle Balke is currently a Senior GIS Analyst with Geodata Services in Missoula, Montana. He has over six years of experience with GIS in both the public and private sectors. His professional experience includes work on projects in both Wisconsin and Montana including cadastral, broadband, and sanitary sewer mapping, E911, 3-D modeling and rendering. He has extensive experience with ArcGIS, Google SketchUp, Google Earth, CommunityViz and Kerkythea Rendering software which have allowed him to support a wide range of engineering applications including but not limited to hydrological, subdivision, transportation, natural resource, and environmental planning.

Berg, Richard, Montana Bureau of Mines and Geology, Montana Tech of the University of Montana

Title: Potential Sand and Gravel Resources – How to Get the Most from Geologic Maps without Going Out on a Limb

Abstract: Relatively detailed geologic maps provide a starting point in selecting those areas that have a potential for sand and gravel resources and maybe just as importantly rule out those areas that have little or no significant potential. The most useful geologic maps are those that show and describe different types of alluvium such as alluvium of modern channels and flood plains, alluvial fan deposits, glacial outwash deposits, and older terrace deposits that may be distant from present drainages. Ideally the geologist described the type of rock in the deposit such as granite, volcanic rock, etc. If the geologist did not provide this information, as is often the case, the investigator may go a step further by determining the bedrock source of the gravel as shown on the geologic map. In some cases this may be obvious as in an alluvial fan where the detritus was derived from material up gulch from the fan. If bedrock exposed up the gulch is durable rock such as granite and quartzite, both common in western Montana, the alluvium in the fan will be composed of this material. However if there are soft volcanic rocks exposed up the gulch this material will be incorporated in the alluvial fan deposit making it unsuitable for most uses. Also the geologic map will give an indication of the lateral extent of the sand and gravel. Obviously a one-acre deposit does not have the potential for development that a 100-acre deposit does. Evaluation of potential sand and gravel deposits requires extensive and well-

planned sampling and standardized physical tests of the material. The actual development of a sand and gravel deposit depends on a number of factors including markets, transportation, permitting requirements, and community acceptance.

Biography: Dick Berg earned a B.S. in geology at Beloit College in 1959 and a Ph.D. in geology at the University of Montana in 1964. After teaching geology for two years at the State University College at Plattsburgh, N.Y., he joined the Montana Bureau of Mines and Geology in 1966. While at the Montana Bureau of Mines and Geology he has published reports and articles on bentonite, common clays, building and decorative stone, talc, chlorite, barite, zeolites, vermiculite, and sapphires. During a year as a visiting geologist at the Illinois Geological Survey he published a report on tripoli in southern Illinois. In recent years he has authored or coauthored at least 20 geologic maps covering areas in central and western Montana as well serving as technical editor of a several publications. His current research interests are geology of the Helena area and the alluvial sapphire deposits of southwestern Montana. Dick has carefully avoided administrative obligations in favor of field studies. Currently he is a Senior Research Geologist and Curator of the Mineral Museum.

Bixby, Ken, Bureau of Indian Affairs – Rocky Mountain Regional Office
Title: Using GIS for Fuels Risk Assessment

Abstract: This topic involves GIS and LANDFIRE. I worked on this project with the Regional Assistant Fuels Specialist. We started the project back in the winter of 2006, and finished the project in the fall of 2008. My presentation will be focusing on editing rasters by using spatial analysis and extension tools such as Fire Behavior Analysis Tool (FBAT) and Area change tool; both tools where provided by LANDFIRE. LANDFIRE is also known as landscape fire and resource management tool. It's a five year, multi partner project producing consistent and comprehensive maps and data describing vegetation, wildland fuel, and fire regimes across the United States. We have used LANDFIRE for our risk assessment on all 7 reservations. But due to the LANDFIRE data not being accurate; and the regional fuels specialist and I have ground truth the data, and recreated the data for local use. Hope you enjoy the presentation. A'ho

Biography: My name is Ken Bixby; I work for the Bureau of Indian Affairs- Rocky Mountain Regional Office. My duties include assisting the Agencies in land management activities in such areas as: forestry and fire. In this respect, a Geographic Information System (GIS) Tech utilized to store and retrieve resource data for the Branch of Forestry and Fire. My assigned projects include: LANDFIRE analysis, SILVIS data inventory, data gathering, FIREMON monitoring on 6 of 7 agencies, production of maps for all Seven Agencies in the Rocky Mountain Region; also on an Incident Management Team as a GIS Lead with multiple qualifications in fire, and GIS training.

Gilbertson-Day, Julie
Title: Geospatial Data Uncertainty in a Wildfire Risk Model

Abstract: Widespread use of geospatial data in wildfire risk models and environmental decision making tools has called attention to questions of availability, quality, and currency of input data layers. In a time where wildfires are modeled with growing confidence and knowledge of how resources respond to fire is increasing, how do we manage the existing challenges of acquiring and using geospatial data representing resources of high concern and value in wildfire risk models? Researchers at the Rocky Mountain Research Station of the USDA Forest Service developed a set of geospatial data layers to represent a range of human and ecological values important in wildland fire management. These data serve as base line information useful in monitoring wildfire risk to Highly Valued Resources (HVR), as requested by various federal oversight agencies. While HVR data and wildfire model results provide preliminary understanding of the spatial distribution of fire risk, improvements are necessary and data uncertainties must be identified and implications understood before these results are applied to prioritize wildfire mitigation efforts. We apply a three step process to explore data uncertainty: (1) identify and describe; (2) assess and quantify impacts; and (3) recommend approaches for managing the uncertainty of applying results from these wildfire risk models.

Biography: Julie Gilbertson-Day is a GIS Analyst/Research Specialist for the College of Forestry & Conservation at the University of Montana. She is a cooperator with the National Fire Decision Support Center and researches data issues related to wildland fire and fuel management activities.

Henderson, Jon, GIS Manager – City of Bozeman, and Shockley, Carrie, GIS Water/Wastewater Specialist – City of Bozeman
Title: Bozeman Public Works: Managing our assets with GIS

Abstract: Jon Henderson & Carrie Shockley describe their approach to managing a variety of assets using GIS. After years of research and planning, the City of Bozeman now has a more accurate and efficient method of tracking work against features such as the water distribution and sewer collection systems as well as streets, trees and signs. Collaboration and hard work has allowed the City to benefit directly in many ways: both daily operations and year-end reporting have been improved. Come listen to an overview from past to present, including a few exiting (unexpected) achievements and future goals.

Henderson, Jon, GIS Manager – City of Bozeman, and Shockley, Carrie, GIS Water/Wastewater Specialist – City of Bozeman
Title: Local Government Round Table

Abstract: Participate in a lively discussion on the challenges and successes of local government GIS. From tightening budgets to increasing organizational needs, GIS at the local level can be very complex and rewarding. Jon Henderson, City of Bozeman GIS Manager, will facilitate a conversation among the leading managers and users over many topics including: Data Sharing/Coordination, Privacy, Funding, Addressing, Structures, Best Practices and much more. The format for this presentation will be casual with audience participation encouraged. Come prepared to take home new ideas and perhaps share your story!

Jon Henderson Biography: Jon Henderson is the GIS Manager for the City of Bozeman. He oversees the development and implementation of a wide variety of projects within each division. The GIS program has grown substantially during the past ten years, expanding into new technologies and services for the future. Prior to joining the City of Bozeman, Jon was the GIS Coordinator for Laidlaw Transit from 1995 - 2000. One of North America's leading transit providers, wonderful experience was gained through traveling the country and helping to build efficient vehicle routing solutions. Jon graduated from the University of Montana with a Bachelor of Arts (Geology) in 1997. He is a member of the Montana Association of GIS Professionals and also a certified GIS Professional (GISP).

Carrie R. Shockley Biography: Carrie Shockley is the GIS Water/Wastewater Specialist for the City of Bozeman. She is responsible for developing and maintaining the Geographic Information System, providing training and support for GIS solutions, and researching and recommending technology initiatives related to GIS needs for the Water/Sewer Department. Prior to joining the City of Bozeman Carrie was the GIS/Rural Addressing Manager for the City of Livingston and Park County from 2002 – 2006. While she was there she was responsible for creating and maintaining the GIS database for rural addressing and 911, developing policies, procedures and standards related to GIS system maintenance, operations, and services, participating in the development and administration of the GIS budget. Carrie graduated from Flathead Valley Community College with an Associates of Science in 2000 and from Montana State University with a Bachelor of Science in 2002. She is a member of the Montana Association of GIS Professionals.

Metesh, John J., Research Division Chief and Senior Research Hydrogeologist, Montana Bureau of Mines and Geology, Montana Tech of the University of Montana, Butte
Title: The New Sand and Gravel Mapping Program at the Montana Bureau of Mines and Geology (MBMG)

Abstract: The Montana Bureau of Mines and Geology is a non-regulatory state agency housed within the Montana University System at Montana Tech. As the state geological survey, the MBMG has established programs and projects related to nearly all of the earth science disciplines. Geologic mapping, mining, mineralogy, and hydrogeology are a few of the programs at the "Bureau". The geology of Montana has been mapped by various agencies and authors at scales ranging from 1:10,000 to 1:500,000; the emphasis has usually been on bedrock. The development of ground water and other resources, however, has warranted inclusion of more detailed information on the unconsolidated, valley fill deposits. In recent years, the demand for sand and gravel for construction has grown in direct response to the housing boom in many areas. Geologic deposits containing useful quantity and quality of sand and gravel are mapped, but not always identified as such. Conflicts between gravel companies and residents have increased because both usually reside in the same area of the valley. HB486, passed by the 61st Montana Legislature, amended MCA 6-1-601 to include "sand & gravel resources" in growth policies that will be written and established by individual counties in Montana. Meanwhile, SB297 established a sand and gravel mapping program and enables the Montana Bureau of Mines and Geology to evaluate and report on sand and gravel resources in Montana. The new program is intended to provide a much needed uniform set of information for MDEQ, individual counties, and sand and gravel operators. Permitting, planning, and resource evaluations should be greatly enhanced by this effort.

Biography: John Metesh has been a hydrogeologist for the past 20 years and is presently the Research Division Chief for the Montana Bureau of Mines and Geology. Metesh has a Master's degree in geological engineering and a doctorate in geology. Project work for the MBMG has included hydrogeology and geochemistry of the Butte mine flooding, assessment of abandoned mines, coal hydrology-coal bed methane modeling, and ground-water flow modeling of sites and basins throughout the state. He has over 40 publications and reports through both the MBMG and outside publications.

Peterson, Michele, Planner I, Lewis and Clark County, Community Development and Planning Office
Title: Using GIS in the Planning Field: Lewis and Clark County's Road Cataloging Project

Abstract: If you were to walk into most planning offices they would be utilizing a GIS application. If you were to ask a planner what they use GIS for, many would answer "to make maps." However, as planners we do not have to stick to just maps, there are other ways for us

utilize the technology that is at our desk. In Lewis and Clark County our Planning Office has started to use GIS to help us sort and store important information used in our various planning activities. Our first project is to put the overwhelming amount of road records into a user-friendly GIS format. We have started to build a GIS historic transportation layer cataloging all the information we have about the roads in our county. When it is complete anyone should be able to click on a road and get a wealth of information: its dimensions; certificates of survey associated with it; adjustment/abandonment history; public or private status; and much more.

Biography: Michele Peterson has worked as a Planner with the Lewis and Clark County Community Development and Planning Department since April 2007. The Community Development and Planning Department is responsible for the coordination and guidance of growth and development through planning, zoning, subdivision review, parks, transportation and special districts. Prior to working with Lewis and Clark County, Michele, worked for the City of Warren, Michigan. During her time with the City of Warren she worked on projects with their Planning Department and with their special districts to further the economic development of the area. Michele received her B.A. degree in Urban Studies and Geography from Wayne State University and hopes to attend law school in upcoming years.

Rieck, Jon, University of Montana
Title: Structure Identification in Wildland Fire Decision Support

Abstract: Increased development within the wildland urban interface has been demonstrated to increase wildfire management costs. In the US, federal agencies with wildland fire management responsibilities need methods to demonstrate the value of suppression activities which consider long-term benefits of fire relative to short-term and long-term risks. A key component is rapid identification of structures relative to probable fire spread. Approximate structure locations can be mapped as specific point building cluster features using cadastral data records. This study assesses the accuracy and precision of building clusters relative to GPS structure locations and compares these results with area mapping of housing density using census based products. I will demonstrate that building clusters are reasonably accurate and precise approximations of structure locations and provide superior strategic information for wildland fire decision support compared to area density techniques. Real-time delivery of structure locations and other values-at-risk mapped relative to probable fire spread through the Wildland Fire Decision Support System (WFDSS) Rapid Assessment of Values At Risk (RAVAR) procedure supports development of wildland fire management strategies. Where probable fire spread is unlikely to intersect structures or other critical infrastructure less aggressive suppression may be appropriate resulting in lower risk to firefighters, lower costs, and improved wildland health.

Biography: Jon Rieck is a GIS Analyst employed by the University of Montana - College of Forestry and Conservation assigned to work at the USFS Rocky Mountain Research Station's

Forestry Sciences Lab. Jon has been in his current position for two years and has been in the field of GIS for over a decade. Jon holds a B.S. in Physical Geography from Montana State University. Jon's current research interest includes quantitative analysis of suppression effectiveness on large wildfires using spatial mapping techniques.

Spangenberg, Eric, GIS Coordinator, Lewis & Clark County / City of Helena
Title: Fire Protection Service Review Analysis – City of Helena

Abstract: In 2007 the City of Helena's fire chief requested assistance from the GIS Center to provide support for their Fire Service Planning Committee review of services. This support was primarily in the form of graphics representing the estimated response times for the two existing fire stations, as well as a proposed fire station. Using ArcGIS with the Network Analyst extension, four and five minute response times were calculated for both the existing and the proposed stations. The results of these analyses were provided to the Helena Fire Department to support their on-going fire protection service review. The presentation will demonstrate the steps taken to do this analysis; from road network preparation to setting up the Network analyst drive-time conditions. Results from the analysis will be shown as well as some tips for presenting the data. Our experiences in completing this work as well as lessons learned will be discussed. With time permitting we will also discuss how Network Analyst has provided support for other public safety (Fire Department) related needs. While the analyses and graphics provided supported the need for an additional station, the public safety mil was rejected by city voters. To this day the project results are still an integral and beneficial planning tool used by the Helena Fire department.

Biography: Eric joined the Lewis & Clark County / City of Helena GIS 'team' as a GIS Database Analyst in May 2005, approximately one year later, April 2006; he was offered the job as GIS Coordinator. In his various roles with Lewis & Clark County he has been responsible for the maintenance of core Enterprise GIS features as well as enterprise databases utilizing ArcSDE and SQL Server. His current role has him managing and supervising the GIS program, and coordinating the development, implementation, maintenance, support, and use of spatial information throughout the city and county enterprise. One of the projects he is most excited about for this year includes the rollout of the City/County GIS Web mapping application. Eric holds a Bachelor of Science (BS) in Urban Forestry/Resource Management from the University of Wisconsin-Stevens Point and a Masters in Landscape Architecture (MLA) from Ball State University. Eric's other work experience in GIS includes:

- 1.5 years as the GIS Coordinator for the City of Marshfield, Wisconsin.
- 6.5 years as the GIS Manager for Cascade County, Montana, and
- 1 year as a GIS Specialist for South Carolina Parks, Rec. & Tourism

Bruce Suenram, Deputy Chief, MT DNRC, Fire and Aviation Bureau; Elizabeth Hertz, GIS Specialist, MT DNRC, Fire and Aviation Bureau; and Karen Shelly, GIS Intern, University of Montana, MT DNRC, Fire and Aviation Bureau

Title: Montana Wildland Urban Interface - Mapping Community Wildfire Protection Plans

Abstract: The 2009 Montana State Legislature passed Senate Bill 131 (SB 131) requiring the Department of Natural Resources and Conservation to designate the Wildland Urban Interface (WUI) parcels in each county. This presentation will discuss DNRC's role in accomplishing SB 131's intent. The law will be discussed and related to the Community Wildfire Protection Plan (CWPP) and WUI definitions and history will be reviewed. An overview of the federal 2003 Healthy Forest Restoration Act (HFRA) will lead to the reasoning behind SB 131. In order to create a statewide WUI parcel map, county WUI data is being compiled. We will describe the diversity of county approaches to CWPP completion and WUI mapping. Some counties do not have a CWPP or a delineated WUI. Methods used in mapping draft WUI layers for these counties to amend and adopt will be discussed. Many GIS challenges are being faced while trying to create a meaningful statewide map that counties, fire fighters, resource managers and citizens will find useful. A discussion of the potential significance of this map layer to Montanans will be attempted.

Bruce Suenram Biography: Bruce Suenram has worked in the field of fire protection and prevention since 1969. He administers the preparedness activities of the Bureau such as training, fire prevention, fire investigation, GIS, assessments, information technology, and equipment development. Bruce served as Montana's State Fire Marshal (1992-1997), as chief of the Missoula Rural Fire District (1980-1992), and as the chief of the Kelseyville, CA, Fire Protection District (1974-1980). He and his wife, Karen own a fire protection consulting firm, Fire Logistics, Inc. located in Montana City, MT. Bruce was on the original code development committee for the Urban/Wildland Interface Code and on the International Fire Chief's Association Urban/Wildland Interface Committee. He acted as the liaison for the National Association of State Fire Marshals to the National Wildfire Coordinating Group's Urban/Wildland Interface Advisory Committee. In addition, Bruce has taught courses for the National Fire Academy, the Northern Training Center, the Montana Fire Services Training School and the Montana Law Enforcement Academy. He served as an Incident Commander for a Type II Incident Management Team for eight years. Bruce is also qualified as a Type 1 Planning Section Chief. Bruce received a bachelor's degree in biological sciences from California State College Stanislaus in 1973. Bruce is currently serving as the National Association of State Foresters representative to the International Association of Fire Chiefs Wildland Fire Policy Committee. Bruce is an ex officio member of the Board of Directors of FireSafe Montana. He is also the MT State Coordinator for the Montana Chapter of Farmers and Hunters Feeding the Hungry.

Elizabeth Hertz Biography: Elizabeth Hertz Graduated from the University of Montana in 2008 with a Master's of Art in Geography with an emphasis in GIS and Cartography. She has been working for the Department of Natural Resources and Conservation's, Fire and Aviation Management Bureau for 3 ½ years. She is presently on Poncin's Type 1 Fire Incident Management Team as a GIS Specialist.

Karen Shelly Biography: Karen Shelly is a graduate student in Geography. She is beginning her thesis work, which is to map the historic vegetation and land conditions of portions of the Bitterroot Valley using General Land Office field notes. Prior to moving to Montana, she was the Natural Areas Coordinator and Land Acquisition person for the Wildlife Division of the Missouri Department of Conservation.

Wacker, Miles, GIS Analyst, Montana Department of Transportation
Title: Montana Fuel Tax Allocation

Abstract: Each year the Montana Department of Transportation allocates state fuel taxes to all 127 Incorporated Cities, 54 Counties and two consolidated city-county governments as dictated by MCA 15-70-101. One of the variables determining fund allocation is road mileage considered open to public travel. Roads open to public travel are passable by a two-wheel drive passenger vehicle except during extreme weather or emergency conditions. Roads also must not contain restrictive gates or prohibitive signing. MDT determines road and street mileage through an annual certification process; where MDT distributes a packet of information to all the cities and counties containing two sets of maps and a certification form. Each government reviews the maps and makes the appropriate additions or deletions. The Road Inventory and Mapping (RIM) Section then reviews and approves all mileage changes. RIM also performs a field inventory and review to ensure a fair and equitable distribution of fuel tax allocation. The presentation covers how this process is carried out, what constitutes a fuel tax road, and how GIS Managers/Professionals can contribute to this process.

Biography: Miles Wacker is a GIS Analyst from the Montana Department of Transportation. Miles has been a GIS Professional for over five years and has worked in the public and private sectors. His GIS experience includes database management, internet applications, data development, cartography, GPS and remote sensing. The Fuel Tax Allocation process involves many of these techniques and Miles will discuss how MDT utilizes GIS in this business process. Miles can be contact at mwacker@mt.gov

Wicks, Jennifer, Mountain Water
Title: Using GIS to Access Water Sampling Plans and Schedules

Abstract: Quality Water – Many people take clean, safe drinking water for granted, especially if their water is supplied by a public water system. The average customer may not be aware of the rules and regulations in place to ensure quality, safe water is supplied to them. In accordance with these rules and regulations, water is sampled at various times and locations throughout the water system. Mountain Water Company's sampling plans as well as its sampling schedule are accessible to users of our GIS. This presentation will take a look at Mountain Water Company's water sampling plans and sampling schedules in accordance with state and federal rules and regulations.

Biography: I've been employed by Mountain Water Company in Missoula for 11 ½ years as a cartographer/GIS coordinator. I earned a MA in Geography with a cartography emphasis from the University of Montana in 2003. I enjoy horseback riding, playing ice hockey, participating in most any outdoor activity, beekeeping and making chocolate.

Public Health and GIS

Oser, Carrie, Montana Department of Health and Human Services
Title: State Surveillance Project

Abstract: GIS mapping has proven to be extremely helpful related to public health issues in Montana. Specifically, the Cardiovascular Health (CVH) Program at the Montana Department of Public Health and Human Services has utilized GIS mapping to determine areas of need related to the acute treatment of heart attack and stroke. The mapping was able to provide emergency drive and flight times to and from tertiary healthcare facilities as well as population density within the specified drive/flight times. GIS mapping assisted the CVH Program in determining where to place emergency two-way audio video telestroke units within emergency departments across Montana maximizing its reach and effectiveness.

Biography: Carrie Oser is the epidemiologist/evaluator for the Cardiovascular Health Program at the Montana Department of Public Health and Human services. Carrie has been working with this program for the last 7 years, and excels at developing significant collaborative projects and program evaluations. She received her Bachelor's of Science in Microbiology from Oregon State University and her Master's of Public Health in Epidemiology/Biostatistics from the University of California, Berkeley.

Lowell, Jennifer, Montana Department of Health and Human Services
Title: Rocky Mountain spotted fever in Montana: spatial models of elevated risk of human exposure to Rickettsia rickettsii.

Abstract: Rocky Mountain spotted fever is a highly virulent tick-borne zoonotic disease caused by the Gram-negative bacterium Rickettsia rickettsii. Identifying areas at high risk of human exposure to the etiological agent of Rocky Mountain spotted fever could provide a useful tool for targeting limited public health resources, raising the public's awareness of the disease, and for targeting tick-vector sampling for pathogen detection. We are currently creating logistic regression models to identify landscape features associated with areas where humans have acquired Rocky Mountain spotted fever from 2007 to 2009 in the state of Montana. Data generated by these models will be extrapolated within a geographical information system to predict where human Rocky Mountain spotted fever cases are likely to occur within MT. High risk areas will be classified by vegetation cover and elevation. The total percentage of land cover in MT most associated with human cases of Rocky Mountain spotted fever will be calculated.

Challender, Stuart, Reed Kempf, Shawn Jones, Jeremy Harwood and Dr. Laura Larsson
Title: Integration of Geospatial and Social Science Techniques in the Evaluation and Effectiveness of the Gallatin Valley Radon Testing Program, a Multidisciplinary Research Proposal

Abstract: Radon exposure is the second leading cause of lung cancer behind smoked tobacco and is accountable for an estimated 22,000 American lives lost each year (Environmental Protection Agency, 2010). Forty-nine of Montana's fifty-six counties including Gallatin have been designated as Zone 1 for radon. Zone 1 status indicates that the average indoor radon concentration will be greater than 4 picoCuries per liter—the EPA's recommended action level for reducing the risk of lung cancer. Gallatin County has operated a state-subsidized radon program for 15 years for which they have collected both the street address of the tested property and the indoor radon concentration. These data have been geocoded into a Geographic Information System (GIS) and test kit locations have been used to explore the association between radon values and other factors such as the physical properties of geology, soils, and various housing characteristics. Another purpose of this study is to explore associations in testing behavior with sociodemographic variables. The analysis of these data will guide outreach and communication efforts to high risk families as well as build a baseline for further research and case studies.

Biography: Stuart Challender is an Adjunct Assistant Professor with the Department of Earth Sciences at Montana State University. Stuart has over 25 years experience in GIS project work, project management, and teaching. He has been on the faculty in the Department of Earth

Sciences at MSU since 2002 where he has developed and taught GIS courses and the undergraduate and graduate level. Stuart also serves on graduate student committees as well as acts as faculty advisor for a variety of student GIS projects, including this project.

GIS Management and Policy
Sessions, Panels and Meetings

Arnold, James; Timothy Klein, DeLane Meier, Rudy Persaud and Curt Smith
Title: GPS – U.S. States and Local Government and Local Government Subcommitee (USSLS) (panel)

Abstract: The GPS Service Interface Committee (CGSIC) was established to identify civil GPS user needs (e.g., navigation, timing, and positioning) in support of the Department of Transportation's (DOT) Civil GPS service (CGS) program. The USSLS was established under this Committee with the objectives of:

- Providing an open forum for civil user information exchange concerning the use of GPS by state and local government organizations, and recommending appropriate action on those issues;
- Identifying the common needs of state and local governments for GPS information, responding to requests and concerns submitted by this user community, and forwarding issues to the full CGSIC;
- Identifying information requirements and methods to distribute this information to state and local government GPS users;
- Maintaining a list of active points of contact in state and local governments which support CGSIC activities;
- Conducting state and local government GPS information studies on civil user needs; and
- Supporting the CGSIC's role under the National Space-Based Positioning, Navigation, and Timing (PNT) Executive Committee.

The objectives of the panel discussion are three fold: 1) who/what is the CGSIC and USSLS, 2) provide an overview of what is going on with GPS from the national level, and 3) discuss what exciting things are happening in Idaho and Montana and what impact these projects might have on the local Idaho/Montana GIS community.

Title: Regional CORS Efforts and the NGS Online Positioning User Service (OPUS).

Abstract: Continuously operating reference stations (CORS) status in the Northwest with emphasis on Idaho and Montana using NGS's OPUS utility; status and functionality.

Title: National Civilian GPS Service Interface Committee (committee meeting)

Abstract: The Committee will hold a regional meeting at the conference. The agenda for that meeting will be posted at www.navcen.uscg.gov/cgsic/. Conference attendees are encouraged to attend and ask questions of the Committee.

James Arnold Biography: James Arnold, an Electronics Engineer with the Federal Highway Administration, Office of Operations R&D, has been working in research for over 25 years. For much of that time, he has worked in radionavigation and spectrum management, supporting many Departments and Agencies of the Federal government including Transportation and Defense. Beginning with an integrated Omega/TRANSIT/GPS receiver in the late 1980s, he has experience with most radionavigation systems, including those that no longer exist. Since coming to the Federal Highway Administration, he has worked to enhance the agencies use of radionavigation and improving the Federal government's use of GPS augmentation systems. His latest endeavors have helped to create the High Accuracy Nationwide Differential Global Positioning System (HA-NDGPS) concept and prepare it for deployment. He has also been actively involved in the Department of Transportation's Civil GPS Service Interface Committee (CGSIC) as Land Representative and past Chairperson for the State and Local Government Subcommittee. Finally, when he isn't busy with research, he helps develop documents for the Department, including the Federal Radionavigation Plan.

Timothy A. Klein Biography: Timothy A. Klein is the Senior Policy Advisor for the U.S. Department of Transportation's (DOT) Research and Innovative Technology Administration (RITA). He supports the RITA Administrator on multiple policy and program issues affecting RITA's missions:

- Advancing intermodal transportation research, development and deployment of innovative technologies;
- Leading university education and research in transportation and transportation-related fields; and
- Coordinating, facilitating, and reviewing the Department's research, development and technology programs and activities.

He serves as DOT's Program Manager for the Nationwide Differential GPS (NDGPS), a national positioning, navigation and timing (PNT) utility for multiple terrestrial applications; and is responsible for RITA's international, technical standards, and Ombudsman programs. He is active as RITA's representative to AASHTO Standing Committee on Research (SCOR) and Research Advisory Committee (RAC). Prior to joining DOT, Mr. Klein worked for 15 years in a progressively responsible series of program and project management positions at NASA's Goddard Space Flight Center.

DeLane R. Meier Biography: Delane is the Surveys & Photogrammetry Manager for the North Surveys & Photogrammetry Manager for the Surveys & Photogrammetry Section of the Design Division of the North Dakota Department of Transportation in Bismarck, ND. Her primary responsibilities include managing the surveys, photogrammetry, and right of way plat operations. As part of this program, she developed and implemented GIS in storing historic and current right of way plats for retrieval and use. Prior to that, she served as the Transportation Senior Manager and as the Data Processing Administrator for the Computer Automation Division.

Rudy Persaud Biography: Mr. Persaud is a Transportation Research Specialist for the U.S. Department of Transportation Federal Highway Administration, Office of Operations Research & Development. He has over 32 years of experience in the areas of transportation and strategic planning. He works in the area on GPS Augmentation systems, Rural IT'S, Environmental Investigations for the Nationwide Differential Global Positioning System, Road Weather Management System and Chair the Department of Transportation's U.S. States and Local Government Subcommittee (USSLS) of the Civil GPS Service Interface Committee (CGSIC). Prior joining the DOT/FHWA, Mr. Persaud worked 22 years for the South Dakota Department of Transportation, Office of Planning and Engineering. He developed and implemented a comprehensive GPS/GIS automated transportation management system. In 1998 Mr. Persaud was assigned to FHWA on an Intergovernmental Personal Act (IPA) conduct research for GPS/GIS applications for surface transportation nationwide.

Curt Smith Biography: Curt Smith is a geodesist with the National Geodetic Survey (NGS) serving as the Geodetic Advisor for Idaho and Montana. His 30 years of experience in geodetic surveying with NGS support his duties as State Geodetic Advisor which includes serving as liaison between NGS and other Federal, state, and local agencies as well as private sector surveying and GIS professionals providing information concerning coordinate systems, horizontal and vertical datums, and other NGS products and services.

Clark, Dick, State of Montana Chief Information Officer
Title: Role of GIS in the State Enterprise (Session)

Abstract: Over the last several years, GIS technology has become common place. Vehicle navigation systems, MapQuest, Google Earth, recreational GPS units, etc. have all, in their own way, introduced geospatial technology into our daily lives. Public expectations of how government information is to be delivered are being by these applications. The State recognizes has long recognized that GIS technologies are one of the fundamental building blocks of delivering timely, cost effective services to the public. However, making the leap between legacy systems and this new delivery methodology has its own unique set of challenges; from technology, to funding, to the historic 'culture' of State practices. The CIO will discuss his vision for GIS at the State and some of the hurdles that must be overcome to reach that goal.

Biography: Dick Clark was hired by Governor Brian Schweitzer on November 15, 2005, to be Montana's second State Chief Information Officer. Taking over the operation of information technology in December 2005, Clark is responsible for establishing, approving, and enforcing statewide Information Technology architecture, policies and standards for the executive branch and for working closely with the Courts, Legislature and University system to coordinate IT in Montana. He is a member of the Governor's cabinet and testifies regularly before Legislative committees on Information Technology. Dick Clark was selected to serve on the National Geospatial Advisory Committee in August 2008. In December 2009, he was honored for his service and contributions to the Geospatial Community as a charter member. Dick Clark previously served with the Montana Department of Transportation for 29 years in the fields of engineering and maintenance, and most recently as the Chief Information Officer where he was responsible for the Information Technology Planning and Management, which required him to provide agency wide leadership and direction in the management and operation of IT for the DOT. A native of Havre, Montana, Clark earned a BA in History from Northern Montana College and a MBA from the University of Montana.

Hilmer, Kyle
Title: Montana Cadastral Return on Investment (Session)

Abstract: All organizations must justify their investments in GIS infrastructure and applications, and the State of Montana is no exception. Mr. Hilmer recently completed an analysis that investigated the business impact of Montana's cadastral framework layer. The report, "Montana's Cadastral Layer Business Impact," outlines an extremely fast method for quantifying minimum business value. The presentation will cover the structure, methodology, and results of the study.

- Cadastral framework access and usage statistics
- Business processes that use the cadastral framework layer
- Standard method of business valuation
- Alternative methods of minimal valuation
- Annual and cumulative cadastral value in Montana
- Key findings and conclusions

Biography: Mr. Hilmer has a BS in mathematics and an MBA. He completed his PhD work in finance and operations research at the University of Wisconsin. Prior to joining the State of Montana he worked 14 years as a systems engineer, manager, and consultant for IBM; and spent 9 years as the IT director for a financial services firm. Mr. Hilmer is currently the Business Strategy Manager for the Department of Administration, Information Technology Services Division.

Sexton, Mary, Alan Peura, and Jim Reno
Title: Value of GIS in Fulfilling the Organizational Mission (panel)

Abstract: This session is a panel discussion of how GIS is a critical tool in fulfilling the diverse missions of three organizations. Mary Sexton, Director of the State Department of Natural Resources, will discuss the value of using geospatial tools in fulfilling their multifaceted natural resource mission. Department of Revenue Deputy Director Alan Peura will discuss the value of GIS in the agricultural land re-appraisal project. Yellowstone County Commissioner Jim Reno will discuss the value of GIS to local government and how GIS is one tool that can be used to improve communications between local government and the general public.

Alan Peura Biography: Alan Peura joined the Department of Revenue (DOR) on July 28, 2008 as Deputy Director. As deputy, Alan has a critical leadership role as DOR moves forward with its work in tax administration and liquor control, including the recently completed statewide property reappraisal process. Prior to joining DOR, Alan worked as a fiscal analyst for the Montana Legislative Fiscal Division. Prior top joining the State of Montana, Alan worked in Pennsylvania as Director of Graduate and Special Programs for Widener University School of Engineering. Alan graduated from the University of Wisconsin with a Bachelor of Arts degree in history and from Widener University with a Masters of Education degree.

Jim Reno Biography: Jim has a Masters Degree in Education from Eastern Montana College and has worked for 28 years as a teacher and administrator of the Adult Education Center for the Billings Public Schools. He is currently serving as Yellowstone County Commissioner (Elected in 1998 and re-elected November 2004.) He served four years in the United States Air Force.

Mary Sexton Biography: Originally from Great Falls, MT, Sexton has degrees from Stanford University and the University of Montana. She taught high school in Hamilton, MT and was administrator of The Nature Conservancy's Pine Butte Swamp Preserve, west of Choteau. She is involved with agriculture businesses, and Sexton has served on various land use planning, economic development, conservation, and Federal advisory boards. Sexton was a Teton County Commissioner from 1999-2004, and she chaired the MT Association of Counties IT committee. She is currently Director of the Department of Natural Resources and Conservation (DNRC). DNRC has been at the forefront of GIS utilization in natural resource management.

Trenbeath, Robin, Annette Cabrera, Jon Sesso, and Alex Philp
Title: Montana Land Information Act Council Panel

Abstract: This session is a brief report by MLIAC members representing the State, local government, Legislature and the private sector on the work being done by the Council. The panel will review opportunities for the GIS community to become involved, and how to submit

input directly to the Council. Members will discuss the GIS Federation and its impact on Montana GIS, results of the MSDI Theme Stewardship Workshop, the MLIA Land Plan and grant process, and have a brief discussion on the Council's MSDI funding proposal. The panel will afford the audience ample opportunity for participation and questions.

Annette Cabrera Biography: Ms. Annette Cabrera has been with the Yellowstone County GIS department for 16 years, the past 9 as GIS Manager. During those years she has been involved in several GIS organizations including the Montana Local Government GIS Coalition, the MTGIS User's group, the Montana Association of Geographic Information Professionals, and currently serves as a local government representative on the Montana Land Information Advisory Council. She has also been involved in special interest groups including the Transportation/Addressing Data Model group, the Disaster and Emergency GIS subcommittee, and the Cadastral working group.

Dr. Alex Philp Biography: Dr. Alex Philp is the Founder and President of GCS Research LLC, an award-winning, internationally recognized geospatial information technology company headquartered in Missoula, MT. GCS Research represents the commercialization of advanced concepts in distributed GIS (Geographic Information Systems), developed as a result of Dr. Philp's graduate research at the University of Montana – Missoula for NASA. While at the University, Dr. Philp developed a program to assist with the dissemination and utilization of geospatial data as derived from a variety of commercial and US Government satellite systems and ground-based data. Dr. Philp also founded and developed the National Lewis and Clark Education Center at the University of Montana, fostering a national education leadership center dedicated to the interdisciplinary analysis of change over time along the Lewis and Clark Trail. Prior to entering graduate studies, Dr. Philp worked as a biotechnician and GIS analyst on the Lewis and Clark National Forest. Before his work with the US Forest Service, Dr. Philp worked as a Park Ranger in Glacier National Park for five years. Currently, Dr. Philp serves as a volunteer Chairman of the Board for RMSC and its executive officer, is a member of the Board of Directors for the Montana Neuroscience Institute Foundation, lectures occasionally in the Dept. of Geography at the University of Montana as a Faculty Affiliate, and participates as private sector gubernatorial appointee on the State of Montana Land Information Council. Dr. Philp's graduate degrees are in Interdisciplinary Studies (1997, 2005), emphasis upon late-Pleistocene historical biogeography, and he received his undergraduate degrees from Seattle University in History and Philosophy (1990). Dr. Philp has received various awards in his field, lectures around the country on a variety of topics, and lives with his family in Missoula, MT.

Jon Sesso, State Representative, House District 76 (Butte) Biography: In his third term in the Montana House of Representatives from Butte, Jon serves as Chairman of the Appropriations Committee, and during the interim, sits on the Legislative Finance Committee. Other appointments include the Upper Clark Fork River Basin Steering Committee and the Montana Land Information Advisory Council. Since 1991, Jon has been the Director of the Planning Department in Butte-Silver Bow, a consolidated city-county government in Southwestern

Montana. He also coordinates environmental cleanup (Superfund) activities, including a number of successful brownfields redevelopment projects. Previously, Jon served as the Director of the Montana Natural Resource Information System at the Montana State Library in Helena, Montana, and as VP-Operations for the National Center for Appropriate Technology in Butte, working on a variety of conservation and renewable energy projects. Jon received a B.A. in Communications and a Master's Degree in Communications and Environmental Studies from the University of Wisconsin-Madison. Past appointments include the Board of Directors of the Montana Consensus Council, the Montana Association of Planners, the National Advisory Council for Environmental Policy and Technology (Superfund reauthorization issues) and the National Environmental Justice Advisory Council (facility siting issues).

Natural Resources

Backus, Dr. Vickie M.; Dr. Lisa J. Rew and Dr. Bruce D. Maxwell, Dept. Land Resources and Environmental Sciences, Montana State University, Bozeman
Title: GIS Tools for Successful Implementation of Adaptive Sampling Designs for Nonindigenous Plant Species Surveying and Mapping.

Abstract: Alternatives to conventional sampling that capitalize on the spatial clustering nature of many biological populations, known as adaptive sampling, have been introduced. Based on results of our past surveying and mapping nonindigenous plant (NIS) research in the Greater Yellowstone Ecosystem, we designed two adaptive sampling methods – one adaptive cluster and one adaptive web. The adaptive cluster method exploits the known spatial proximity individual plants or patches of a particular NIS have to each other. The adaptive web formulates and utilizes a linked network of local NIS habitat suitability. Applicability was explored both theoretically (simulation) and practically (pilot field study). In addition, a substantial amount of effort was devoted to developing user-friendly ArcPad GPS interfaces to facilitate field implementation of the designs. Unlike most GPS interfaces that focus on providing menus for easy and consistent collection of NIS-related data and background maps for navigation, the interfaces for these designs also provided decision support and controlled data collection workflow. Simulation results showed, in some instances, adaptive methods have the potential of creating more realistic predictive spatial distribution maps of particular NIS, than more conventional sampling designs. The ArcPad GPS interfaces will be demonstrated and the simulations results presented.
Keywords: adaptive sampling, mobile GIS tools, natural resource management, nonindigenous plant species, predictive spatial distribution maps

Biography: Vickie Backus has 15 years of experience relating to GIS, landscape-scale modeling, wildlife and natural resource management and conservation, and population modeling. She

received a master's degree in mathematics, with an emphasis on mathematical biology and dynamical systems, from the University of Utah. Her knowledge and experience as a modeler was expanded to include remote sensing and GIS when she entered the Geography Department as a doctoral student at the same University. Her doctoral dissertation, entitled, Comprehensive Conservation Modeling: A Spatially Explicit Individual-Based Approach Using Grizzly Bears as a Case Study, provides the first in-depth treatment of the uses of spatially explicit individual-based modeling for pragmatic grizzly bear conservation decision-making. Her primary research interest is developing realistic models of complex ecological phenomena that can guide species conservation and policy and natural resource management decision-making. In this context, she has used GIS to develop methods for capturing the complex nesting-foraging-post-fledging habitat and distance relationships between nest sites required to delineate goshawk habitat. Similarly, she used known species habitat relationships to delineate pine marten habitat. Also, she has investigated the use of individual-based modeling for black-tail prairie dog conservation. In addition to natural resource management, she has been involved in projects that use GIS to help inform local and state policy makers. For example, the Quality Growth Efficiency Tools project provided GIS support to the State of Utah's Governor's Office of Budget and Planning for forecasting population growth and urban sprawl along the Wasatch Front and predicting the associated consequences of such growth, and the GIS Development on the Mexico/US Border investigated using GIS to optimize the placement of emergency warning sirens. She currently works in the Department of Land Resources and Environmental Science at Montana State – Bozeman on developing adaptive sampling methods for surveying nonindigenous plant species and population dynamic models.

Bodenhamer, Hans and Students
Title: Bigfork High School Cave GIS

Abstract: Since 2005 Bigfork High School Students have worked as volunteers in Glacier National Park to map, monitor, and conserve resources in natural caves. Recently their project adopted a GIS component to help students manage data. Students use scans of detailed cave maps, which are "cleaned-up" and georeferenced on a topographic map as rasters. On top of rasters, a filled-in vector image of the cave map is included as a separate layer. Beyond raster and vector cave maps, a layer which provides general information is tied to each cave entrance. This includes entrance elevation, cave length, depth, in-cave temperatures, and overall classification of cave resources in comparison to caves throughout Montana. Classified resources include biology, mineralogy, paleontology, archeology, geology, meteorology, and hydrology. Individual cave resources in each cave are also located and described in the students GIS program. Layers for graffiti, mineralogy, biology, and photos are included. Points and polys for these layers are located relative to features on cave maps, and mineralogy and biology features are described and classified according to significance, fragility, condition, and

proposed management action. In January 2010 the students were awarded the Presidents Environmental Youth Award for their work in conservation and use of GIS.

Burns, Meghan
Title: Wetland Profiling

Abstract: A wetland profile provides a broad, landscape characterization of the wetlands within a study area at the subwatershed level. This overall impression of a region is a good first step for restoration and conservation planning purposes. Using the attributes associated with wetlands mapped to the National Wetland Inventory (NWI) standard, the wetlands can be categorized for display. Six metrics are routinely calculated in a wetland profile: overall sum of wetlands, percent of isolated wetlands, percent of rare wetland types, percent of altered wetlands, percent of wetlands not protected, and percent of wetland with high functional value for each of ten functions. The ten functions are water storage, streamflow maintenance, groundwater recharge, nutrient cycling, sediment retention, shoreline stabilization, native plant community maintenance, terrestrial habitat, aquatic habitat, and conservation of wetland biodiversity. Once the metrics have been calculated, maps are created for display purposes.

Biography: After receiving a B.S. in Biology and an M.S. in Geographic Information Science from Michigan State University, Meghan Burns worked as an Environmental Health Specialist at the Ingham County Health Department in Lansing, Michigan. She then returned to the Center for Global Change & Earth Observations at Michigan State University to study Buruli Ulcer, an emerging infectious disease. Additionally, Meghan was employed with the Michigan Natural Features Inventory, from 2002 – 2004, where she updated the database of threatened and endangered species. Currently, Meghan is with the Montana Natural Heritage Program where her work centers on the creation, management, utilization, and distribution of the statewide wetlands spatial data layer. Additionally, she created a conservation geodatabase for the Ruby Valley highlighting the wetland and riparian areas. She also co-authored two publications on wetland change, between the historic 1980s imagery and the 2005 NAIP, in the Flathead and Gallatin Valleys.

Colaiacomo, Erika
Title: GIS-based classification of stream ecological communities in Western Montana

Abstract: Effective conservation of aquatic biodiversity requires a system for identifying high quality aquatic species/communities and understanding the landscape habitat conditions that support them. As part of MT Fish, Wildlife and Parks Crucial Areas Assessment, a hierarchical framework of abiotic landscape variables was developed and analyzed with associated biological data to classify all lotic ecological systems within the Columbia River Basin of

Western Montana. Streams from the 1:100,000 NHDPlus were classified by seven abiotic variables—stream order, elevation, lithology, downstream and upstream connectivity, precipitation and gradient—and were truncated to produce 35 distinct aquatic ecological systems (AES). The added functionality of stream order and Value Added Attributes (VAAs) in the NHDPlus allowed for the straightforward classification of reaches. Concurrently, over 5,000 aquatic biological samples were analyzed for group associations and indicator species correlations within the abiotic classes to define 6 broader ecological systems encompassing the lotic aquatic community diversity of western MT. Mapping delineated stream classifications and their expected associated native species will enable aquatic scientists or land managers to develop an understanding of the aquatic resources at various spatial scales.

Biography: Erika Colaiacomo is an ecologist with the Montana Natural Heritage Program, where her work includes photinterpretation and mapping of wetlands and GIS analysis of aquatic data. She received a B.A. in Geology from Colgate University in 2007. Previous work included serving as a Student Conservation Association Intern at Craters of the Moon National Monument and Preserve, and providing GIS support to the PIBO Effectiveness Monitoring Program at the Rocky Mountain Research Station in Logan, Utah.

Hart, Melissa, Ute Langner, Linda Vance, and Barry Bollenbacher
Title: Ecosystem Management Decision Support (EMDS): a case study

Abstract: The Ecosystem Management Decision Support (EMDS) system uses GIS data to build logic-based models for evaluating ecosystem sustainability and decision models to identify priority areas for integrated landscape restoration and protection. The logic models provide a consistent, transparent, and reproducible approach to assessing watershed integrity, ecosystem and species diversity, social opportunities, and economic integrity are in good shape across a given area, and provide a repository for expert knowledge (corporate memory) that will support evaluation and management of ecosystem sustainability over time. The decision support models offer an efficient method for synthesizing the large amounts of information generated through the knowledge base. The new graphic interface allows users to display, query and analyze results in ArcGIS 9.3. In this presentation, we demonstrate the EMDS models that have been built to support regionally integrated restoration and protection strategies for the U.S. Forest Service's northern region. We focus on specific model elements addressing wildlife habitat, watershed condition, and recreation opportunities.

Melissa Hart Biography: Melissa is a GIS Analyst/Ecologist with the Montana Natural Heritage Program's Spatial Analysis Lab in Missoula. She earned an M.S. in Wildlife Biology from the University of Montana in 1991. For the past 15 years, she has worked at the Spatial Analysis Lab on a variety of wildlife-related projects, from passerine birds to wolverines. She

was project coordinator for Montana Gap Analysis, completed in 1998. Since 2006, she has been working on EMDS-related modeling and analysis.

Ute Langner Biography: Ute is a GIS Analyst/Ecologist with the Montana Natural Heritage Program's Spatial Analysis Lab in Missoula. She earned an M.S. in Biology from Kazan State University in the former USSR, and a M.S. in Earth Sciences from the University of Montana. In the past few years she has worked on a variety of wildlife, ecosystem and natural resource related projects at the Spatial Analysis Lab. She has been working on EMDS-related modleling and analysis since 2006

Linda Vance Biography: Linda is the senior Ecologist at the Montana Natural Heritage Program and Director of the Spatial Analysis Lab. She has a Ph.D in Conservation Ecology from the University of California at Davis. She is the lead for the MSDI Land Cover theme, and co-lead for the Wetland Theme, and currently serves as Vice-President of MAGIP. In addition to mapping and modeling projects, she has been developing a field guide to Montana's ecological systems.

Barry Bollenbacher Biography: Barry is the Regional Silviculturalist for the northern region of the Forest Service. He is the project manager for the region's EMDS-based Integrated Restoration and Protection Strategy.

Hess-Herbert, Janet

Title: Montana's Crucial Areas and Connectivity Assessment: An update and demonstration of the Crucial Areas Mapping Service

Abstract: Montana Fish, Wildlife and Parks (FWP) completed the Comprehensive Fish and Wildlife Conservation Strategy (CFWCS) in October 2005 as a landscape level plan to identify aquatic and terrestrial focus areas important to species and habitats of "Greatest Conservation Need". As implementation of the CFWCS began, FWP saw a need to refine the conservation scale and include terrestrial game and sport fish, FWP lands, and other recreational values into a Comprehensive Plan for Conservation. The "Crucial Areas and Connectivity Assessment" is an attempt to refine the conservation scale and identify important game and nongame fish and wildlife habitats, critical corridors, and valued recreational areas using a combination of empirical data, modeling based on these data, and expert opinion. The goal of this project is to identify and display critical and important habitats for fish and wildlife. Multiple benefits are perceived through achievement of this goal: increased efficiency in planning and commenting on development proposals, effective targeting and planning for the conservation of valued habitats, and increased opportunity for coordination with other agencies states. FWP spent the past year developing data layers, vetting the layers both internally and within the scientific community. Layers available to date include: game quality, game fish life history, watershed

integrity, species of concern, aquatic connectivity, angler use, terrestrial species richness, and core area index. In parallel, FWP has developed an interactive Crucial Areas Mapping Service (CAMS) that depicts these resource values and allows users to relate each resource value to risk factors including energy development, urbanization, and subdivision. As the project develops and nears completion, best management practices and policy related to critical habitats will be produced. In mid-March, we plan to release CAMS to the public as a pre-planning tool and comprehensive decision support system.

Biography: Janet Hess-Herbert is the Data Service Supervisor for the Strategic Planning and Data Services Bureau of Montana Fish, Wildlife and Parks. She has a BS in Biology from Ohio University and an MS in Environmental Studies from the University of Montana. Before joining FWP, she was a fisheries biologist conducting steam surveys across the state.

Love, Catherine and Brander, Linda
Title: Restoration Projects Map Application

Abstract: The Restoration Projects Map is an ArcGIS Server application that is a collection of information on state restoration projects in Montana. It can be used by agencies, businesses and citizens to search for specific restoration projects inquire about funding information for specific projects and find organizations working in a geographic area of interest. Data for the application is provided by participating state agency using a web-based administrative tool that allows users to upload tabular data and create point features representing restoration projects. Join us for demonstration and discussion about the restoration application, the administration tools and their development. The Restoration Project Map project is managed by the State Restoration Coordinator, Linda Brander, at Montana Department of Natural Resource Conservation (DNRC) and developed by CDM.

Catherine Love Biography: Catherine Love is a GIS Specialist and data manager for CDM in Helena, Montana. Prior to joining CDM, Catherine was the GIS Coordinate at the Department of Environmental Quality and the Water Information System Manager for the Natarual Resource Information System (NRIS) at the Montana State Library. Catherine as a B.A. in Anthropology from Vassar College and took geography and GIS coursework from the University of Montana. Catherine is a certified GIS Professional.

Linda Brander Biography: Linda Brander, program manager for the State Restoration Program, located at the Department of Natural Resources and Conservation, has the challenge and privilege of developing Montana's new and emerging restoration economy. The Restoration Program offers a vision of a prosperous Montana, one in which environmental and economic health are interdependent. The main goals of the Program are to develop an Internet clearinghouse to centralize the silos of information housed in several public sector databases,

work with and build coalitions to enhance coordination, create educational outreach campaigns, and address work force development needs. Linda Brander has extensive experience in developing new programs from a conceptual framework to a viable working program that has a sound infrastructure to support its longevity. Prior to working at the Department of Natural Resources, she worked for the Montana Department of Commerce as the program manager for the Montana Technology Innovation Partnership Program (MTIP). The mission of MTIP was to advance the research and development technologies of Montana companies to commercialization.

Maxwell, Bryce A. and Scott Mincemoyer
Title: Predictive modeling of Plant and Animal Species of Concern

Abstract: Models predicting spatial distribution and habitat suitability are critical for natural resource managers who often need to make decisions that impact species for which there is limited information. We created simple deductive models of animal and plant species associations with ecological systems in the 2009 Montana Land Cover Layer in order to allow resource managers to easily create summaries of the types and areas of ecological systems and predicted lists of species for administrative units such as public land survey sections and 6th code (12-digit) hydrologic unit code (HUC) watersheds. This allows resource managers to quickly identify ecological communities, plant, and animal species of concern in various planning units. We also created more complex inductive models with the more than 850,000 plant and animal observations housed at the Montana Natural Heritage Program and randomly distributed pseudo-absences on up to 18 state-wide environmental layers using program Maxent. The inductive model output includes: (1) continuous statewide outputs as a heuristic tool to identify variables that limit species' distributions and areas that need field surveys; (2) conservative binary outputs with low omission error rates that can be used to create lists of predicted species within administrative boundaries varying in size from the scale of forests and counties down to the level of a public land survey section; and, (3) where possible, outputs showing marginal, suitable, and optimal habitat classes at a landscape-level in order to further inform management decisions. Models identified opportunities to extend the known ranges of species, areas that support potentially isolated populations in need of conservation efforts, areas that are critical for maintaining landscape connectivity, areas that may provide the best habitat for reintroduction of species that have declined, and areas where exotic and nonindigenous species are most likely to become established. Appropriate applications of outputs of both the deductive and inductive models will be discussed.

Biography: Bryce Maxell is the Senior Zoologist and Interim Director of the Montana Natural Heritage Program. He has a Ph.D. in Fish and Wildlife Biology from the Wildlife Biology Program at the University of Montana, where he completed a state-wide assessment of status

and constructed predicted habitat models for Montana's amphibian and reptile species, as well as conducting research on the demography of Columbia Spotted Frogs.

Biography: Scott Mincemoyer is the Program Botanist with the Montana Natural Heritage Program. His work focuses on increasing the data content of botany program databases, improving spatial data accuracy and precision, reviewing species' ranks and rank criteria, improving data tracking methods and increasing efficiency of rare plant data entry. In the field, the focus has been on globally rare vascular plant species, including Silene spaldingii and Spiranthes diluvialis, and on plant Species of Concern in several large geographic areas with a focus on shrub and grassland systems of eastern and south-central Montana.

Newlon, Karen
Title: GIS-based riparian and wetland assessment

Abstract: Wetlands are increasingly at risk from human alteration of the landscape. Although site-specific activities like dredging, draining, ditching, filling, and plowing have the most direct and obvious impacts on wetland integrity, activities within the surrounding catchment can also lead to degradation by changing wetland hydrologic function, increasing nutrient and sediment loads, and providing a conduit for the spread of invasive and exotic species. GIS makes it possible to characterize large landscapes and identify potential stressors from existing datasets. Given that so much digital data are available, the U.S. Environmental Protection Agency has advocated the use of GIS-based landscape analysis to provide a preliminary assessment of wetland condition across a particular project area (Level 1 assessment), before conducting field-based rapid assessments (Level 2) and intensive assessments (Level 3). Many of the metrics used in Level 1 assessments are developed using best professional judgment and infer a cause-and-effect relationship between landscape stressors and wetland condition based on published studies and field data collected in other parts of the country. In 2008 and 2009, the Montana Natural Heritage Program collected multi-level data to evaluate, calibrate, and validate nationally recommended metrics. We found little to no correlation between Level 1 metrics and our Level 2 scores at all spatial scales across the state. Furthermore, there was little to no variability among Level 1 metrics across sites at all scales. This presentation discusses our research and the implications for GIS-based condition assessments.

Biography: Karen Newlon has an M.S. in Biology from Montana State University and a B.A. in Biology from Hiram College. She joined the Montana Natural Heritage Program in May 2008 as an Ecologist/Project Manager. She and other ecologists with the Heritage Program are working to refine and validate wetland assessment methodologies with the goal of developing a statewide rotating basin wetland assessment and monitoring program. Prior to coming to the Natural Heritage Program, she was an ecologist at Red Rock Lakes National Wildlife Refuge in southwest Montana.

Rea, Alan, PE: Hydrologist, USGS, Idaho Water Science Center
Title: Status update on the USGS StreamStats web application

Abstract: The ability to estimate streamflow statistics is important for water management, environmental protection, hazard mitigation, and other hydrologic applications. StreamStats is a partnership between the U.S. Geological Survey (USGS) and the Environmental Systems Research Institute (ESRI) to develop an online application that links USGS digital map data, streamflow statistics, and regression equations with ESRI's ArcHydro tools[1]. The application delineates the drainage basin above a user-selected point on a stream, calculates the basin characteristics (such as area, slope, elevation, and precipitation), and applies USGS regression equations to those characteristics to estimate a variety of low, mean, and peak streamflow statistics. StreamStats implementation involves extensive development of geospatial data sets, the application of existing regression equations, and, frequently, the development of new regression equations. Implementation is proceeding on a state-by-state basis. Development efforts are underway in more than half of all states. This session presents a description of StreamStats functionality and an update of the current implementation status.

Biography: Alan Rea received dual B.S. degrees in Agricultural Engineering and Soil Science from Oregon State University in 1986. He received an M.S. degree in Agricultural Engineering, with a minor in Statistics, from Oregon State University in 1988. He has worked as a hydrologist and geographic information systems specialist for the U.S. Geological Survey since 1989, and currently is located in Boise, Idaho. He is registered as a Professional Engineer in the State of Oklahoma.

Reddish, Marcus, Image Analyst, MTNHP Spatial Analysis Lab
Title: Using NAIP High-Res Imagery to Map Insect Outbreaks, Invasives, & Disease

Abstract: Insect outbreaks, invasive plants, and disease are changing Montana's forests, waterways, and wild lands. NAIP high-resolution infrared imagery can be used to map current infestations, as well as to create predictive models of vulnerable sites and potential future expansion. Early detection and mapping is fundamental to providing land managers with the ability to target specific infestations, protect areas of critical habitat, and manage species of concern. We will explore techniques useful in the detection, mapping, and biometric analysis of several prominent infestations.

Biography: Marcus Reddish grew up camping, skiing, and canoeing around Montana. He received a BA in Anthropology at the University of Montana while studying human-environment interactions. After Wilderness EMT and Canadian Professional Avalanche

[1] Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

training, he returned to the U of M for an MS in Geography; specializing in remote sensing, cartography, and GIS. Professionally, he collected high-elevation fire scar data for the Rocky Mountain Research Station Forestry Sciences Lab and worked on a team developing airport and military GIS systems at GCS Research. More recently, Marcus joined the Montana Natural Heritage Program's Spatial Analysis Lab in 2007 and now happily makes vegetation maps from remotely sensed images while doing just enough field data collection to appreciate the optimal climate conditions of his cubicle.

Ritter, Joy
Title: Identifying high-quality habitat in Montana's Upper Clark Fork Basin Part 2: A Species Level Analysis

Abstract: Montana Fish Wildlife and Parks recently completed a terrestrial resource and prioritization assessment for the Upper Clark Fork River Basin. The concurrent timing of this project and the Crucial Areas Assessment provided an opportunity to examine the benefits of using structured survey data to improve the land cover map for the Upper Clark Fork Basin and to improve the layers used for the Crucial Areas Assessment. We used location data for 4 bird species, each with different habitat preferences, to look at changes in both inductive and deductive predictive distribution models. Our results showed that structured data and a more accurate vegetation layer influenced the predicted distributions differently depending on species preferences and areas surveyed. Overall, we found that pre-planning data collection surveys benefits habitat mapping at all levels.

Biography: Joy Ritter earned an M.S. in Wildlife Biology from the University of Alaska Fairbanks where she developed predictive distribution models for grizzly bear, wolves, moose and caribou in Denali National Park. She completed a GIS internship with American Wildlands and used models to examine the influence of climate change on fire regimes and sagebrush cover. She is currently mapping important wildlife corridors as Wildlife Information Specialist with Montana Fish Wildlife and Parks

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Sweet, Michael
Title: Visualizing Climate Data

Abstract: This presentation will explore concepts and ideas for integrating Montana climate data into a geographical context for decision making and analysis. Climate data includes static representations, such as "mean annual precipitation", as well distributions, confidence intervals, and trends. In this context, climate data is not unlike other multi-dimensional geographic data. While current work is only conceptual, this presentation will cover

background on some of the challenges, provide examples of possible approaches and implementations, and discuss near-term products for Montana.

Biography: Michael Sweet is GIS Manager for the College of Forestry and Conservation, and recently accepted responsibility as GIS Analyst for the Montana Climate Office. Michael has been a member of the Montana GIS community since 1984, participates in advancing statewide technical and policy level interests, and enjoys delving into many of the challenges of serving a user community.

Tobalske, Claudine
Title: Identifying high-quality habitat in Montana's Upper Clark Fork Basin, Part 1

Abstract: Aquatic and terrestrial habitat in Montana's Upper Clark Fork River basin was heavily impacted by decades of mining activities. As part of an overall restoration strategy, Montana Fish Wildlife and Parks asked the Montana Natural Heritage Program's Spatial Analysis to evaluate the accuracy of land cover mapping in the area, update the classifications as necessary, and produce a map of potential high integrity sage steppe, grasslands, and riparian areas in the basin. With a combination of ancillary GIS layers, models, and field data, we were able to make measurable and significant improvements in land cover classification accuracy. We then built a landscape integrity model that identifies areas least affected by human activities. In this presentation, we will look at ways to evaluate and improve the accuracy of land cover mapping, and how Spatial Analyst can be used to build quick models for assessing habitat condition across large landscapes.

Biography: Claudine Tobalske earned her Ph.D at the University of Montana, where she also worked on the original Gap Analysis. From 1999 to 2008, she was a GIS analyst at the Oregon Natural Heritage Information Center, developing vegetation maps and predictive distribution models for wildlife habitat and rare plants. She is currently an ecologist/GIS analyst for the Montana Natural Heritage Program's Spatial Analysis Lab in Missoula.

Vance, Linda
Title: Prioritizing local conservation targets with GIS

Abstract: Decision support systems based on regional and statewide resource characterization can lead to better and more informed land management decisions at the state and federal level. At the county and local level, simplified decision support systems can help identify areas that can be targeted for voluntary conservation efforts, open spaces protection and acquisition, and other special designations. However, one of the challenges that has to be overcome is a lack of GIS expertise and/or software. This presentation will discuss two recent local efforts to build

comprehensive resource characterization projects, and the challenges we faced and addressed in communication results to a broad audience.

Vanderzanden, Dave
Title: USDA Forest Service Region 1 Existing Vegetation and Mapping project for the Custer, Lewis and Clark, Gallatin, Helena National Forests

Abstract: The Region 1 Vegetation Mapping Project (R1-VMap) maps existing vegetation across all National Forest System lands in the Northern Region. R1-VMap has been designed to produce a geospatial database from which mid-level map products are constructed and published. Although the direction is to construct a mid-level map product, primarily for Forest Plan Revision, the field units want a product that is accurate enough for use in landscape analyses and project level support. This presentation will present the methodologies involved to complete the R1-Map for the latest round of National Forests (the Custer, Helena, Lewis and Clark, and Gallatin National Forests), the accuracies of these data, and the delivery mechanisms of these data to the Forests.

Biography: Dave graduated from Oregon State 1985 in Forest Management. From 1990-1996 he worked at Pacific Meridian Resources (a firm that mapped Oldgrowth and vegetation for Region 6 of the Forest Service) as a remote sensing and GIS specialist. Between 1997 and 1998, he was a Research Assistant at Northern Arizona Universiy, School of Forestry, and Ecological Restoration Program. He assisted in research to reestablish historic Forest Service timber surveys (plots dating to 1905) for Forest Restoration studies. From 1998 to 2001, Dave was a Remote Sensing Specialist for the Forest Service Remote Sensing Applications Center. He worked on Remote Sensing demonstration projects and assistant training coordinater for Training and Technology awareness program and from 2003-2005, he was a Remote Sensing Specialist with Forest Service Region 6. Since 2006, Dave has been the Remote Sensing Coordinator for Region 1.

Wall, Ken and Dan Rogers
Title: Decision Support with GIS for Montana Forest Stewardship and DNRC

Abstract: A presentation on the DNRC Forest Stewardship GIS decision support systems for managers and policy makers using GIS and collaborative process. This decision support system was designed to guide DNRC managers with long and short term decisions regarding Montana forest stewardship, and assist in farm bill granting applications. Over 100 GIS layers, and all Montana framework layers were incorporated into 3 national themes and 11 objectives and applied to all public and private lands in Montana. The weighted sum models are leveraged by on the fly weighting by managers for near real time scenario modeling and "what-if analysis".

These tools and techniques facilitate decision support for both strategic and tactical management decisions for natural resource, and built environments, and can be scaled from small project areas to regional or statewide project areas. Ken will demonstrate the practical applications of leveraging GIS with web 2.0 tools, web map services, wikis, online surveys, web enabled conference calls, and collaborative decision support techniques. These are built on a solid scientific foundation of analytical hierarchical process, inductive modeling, and dynamic simulation. Ken will show examples and a live demonstration of these techniques.

Biography: Ken Wall is president of Geodata Services, Inc., in Missoula Montana since 1993. He has 21 years experience with GIS beginning as a GIS research specialist and consultant. His professional experience includes hundreds of GIS projects in Montana and throughout the US, Canada and Australia. Ken and Geodata Services has been a business partner with ESRI and was awarded new partner of the year in 2000 and founding partner of the year for 2008 at the International ESRI Business Partner Conference. Ken served as an instructor on more than 50 short courses and training sessions in GIS and is an authorized GIS instructor. He is one of the leading experts in the world in CommunityViz and GIS as decision support software for community planning and visualization.

Weldon, Heather, Remote Sensing Analyst; Don Patterson – Geospatial Program Leader; Dave Vanderzanden – Regional Remote Sensing Coordinator; Steve Brown – Remote Sensing Analyst; Tim Horn – Remote Sensing Analyst: A.J. Johnson – Remote Sensing Analyst

Title: USFS Region 1 Change Detection Methods for Determining Relative Overstory Canopy Cover Loss

Abstract: Changes throughout our Regional forests are inevitable. These "changes" can result due to the following factors: fire disturbance, timber activity, insect and disease, and many more. Although all types of change are important, this study keyed in on rapidly changing vegetation due to insects, such as Mountain Pine Beetle, Doug Fir Beetle, and Spruce Budworm. In order to address these needs, the Region 1 Geospatial Group evaluated four different techniques in order to identify the most effective method to classify this change. The methods evaluated were unsupervised classification, eCognition, Random Forest, and RAVIG. This presentation will briefly discuss each technique evaluated. The technique that provides the most accurate results will assist Region 1 in addressing vegetation changes due to these events.

Heather Weldon Biography: Heather Weldon has a Bachelors of Science Degree in Biology from Dickinson State University and a Masters of Arts in Geography from the University of Montana. Since 2008 she has been a Remote Sensing Analyst, Geospatials Group for Region 1.

Tribal Issues

Adams, Louis, Confederated Salish-Kootenai Tribe: I was lucky enough to talk a very dear friend Louis Adams into coming and giving the opening prayer for the Tribal session. He is a true Leader and Elder of our tribes. He is a former Tribal Council Member, and currently sits on the Elders Committee for the Salish-Pend d'Oreille Culture Committee. Everyone is welcome to attend. (Provided by Mickey Fisher)

Vendor Track

Jackson Beighle, GIS-GPS Specialist, Electronic Data Solutions
Title: Technologies for Field Data Collection

Abstract: This presentation from Electronic Data Solutions focuses on bringing established technologies together to improve the efficiency of field data collection. We will look at products from industry leaders Trimble Navigation, ESRI, CartoPac Field Solutions, Laser Technologies, Juniper Systems and Ricoh. This is a perfect opportunity to learn more about GPS-enabled solutions that will ultimately save your projects time and money.

Biography: Jackson Beighle is a GIS-GPS Specialist for Electronic Data Solutions. He graduated from the University of Montana in 1994 with a Geography degree and from Oregon State University in 1996 with a graduate degree in Geography and GIS. Jackson has over 14 years of experience working with a wide range of customers in the GIS industry. He lives in Missoula with his wife Traci and three children, Sam, Finn and Cole.

Beltz, Mike and Waterman, John, GCS Research
Title: Server Based GIS

Abstract: Learn what organizations are doing to effectively leverage their data investments with Server-based GIS. GCS will demonstrate how ESRI's ArcGIS Server to can be used to share mapping services and applications across the Web. This presentation will provide a brief overview of ArcGIS Server implementations for State, County, Tribal Governments and private industry.

John Waterman Biography: John Waterman, VP of Geospatial Solutions, facilitates, manages, and implements consulting projects at GCS Research. John has worked for over 10 years with GIS server technologies. He has a MS from the University of Montana.

Company Biography: As the GIS world expands with new technologies and upgrades, GCS Research stays on the vanguard of solutions to increasingly complex geographic data problems. Our diverse client base demands innovation, boldness, and great skill to create the best GIS. When customers want high-quality, stress tested, customized systems to meet their exacting standards for GIS, they come to GCS. GCS Research solutions consist of connected "smart" applications and data systems, progressive extensions for industry-leading core platforms, and extensible, integrated Web services. GCS Research delivers intelligent human interfaces for geospatial analysis, simplifying access and control of scattered geographical information. By building upon the software and data technologies of our strategic partners in the industry, GCS Research cultivates end-to-end geospatial solutions at the height of GIS evolution. GCS clients use distributed GIS for decision support, planning, real-time analysis, intelligence gathering, commerce, and monitoring of complex data-capturing systems. Using Service-Oriented Architecture (SOA) and Web service protocols, our clients easily access and share geographic and related content across distributed networks, removing historical barriers to decision-making, analysis, and collaboration.

Perry, Brian, GIS Specialist, DJ&A
Title: GIS Services and Support

Abstract: DJ&A, P.C. is a multidisciplinary engineering firm headquartered in Missoula, Montana. Since 1973 DJ&A has been providing professional services throughout the Western United States. One of our strong suites is our surveying and data collection expertise. Our staff includes 5 licensed surveyors, including a Certified Federal Surveyor, 8 licensed engineers, graphic design specialist, CAD operators, planners, inspectors, and professional interns (surveying and engineering). Our GIS office is located in Helena, Montana. Directed by Mr. Rj Zimmer, a professional land surveyor, we undertake a wide variety of GIS projects. Recent project examples include database updates and cartographic products for the Helena South Hills Trail Network for the Prickly Pear Land Trust; database development and cartographic products for The Legacy Project for the Nature Conservancy; CAD to GIS database conversion and cartography of dam flood inundation maps for PPL Montana; CAD to GIS conversion of critical infrastructure data for the Montana Army National Guard; database updates and mapping with GIS of environmental remediation efforts for the Atlantic Richfield Company; analysis and surveying of GCDB accuracy enhancement projects for the State of Montana; and many more. With our engineering and surveying expertise we specialize in facility and infrastructure data capture, CAD to GIS data conversion, and technical mapping needs. No matter what your project requirements may be, DJ&A is ready to help you meet your project goals.

Biography: Mr. Brian Perry has been with DJ&A as a GIS specialist for 3 ½ years. During this time he has worked on geodatabase management and map production for environmental

remediation projects, multiple CAD to GIS projects, and the Montana GCDB Accuracy Enhancement Project. Prior to his GIS work, Brian served as an instrument operator on survey crews working throughout Montana and Idaho. A University of Montana graduate, Brian has lived in Montana since 1997. He enjoys hiking, camping, and traveling with his wife Christine.

Rombough, Rob, Fugro Horizons
Title: Today's LiDAR Technologies and Their Applications

Abstract: LiDAR (Light Detection and Ranging) has changed the way we map the Earth's surface. This discussion will explore the basics of LiDAR, different LiDAR technologies and their applications.

Biography: Rob Rombough is a Regional Sales Manager at Fugro Horizons, Inc. of Rapid City, South Dakota with 11 years of experience. Rob brings a specialized education background designed to promote high proficiency within the administrative aspects in technical fields. Rob has a B.S. (Interdisciplinary Sciences, Business Applications in Science and Technology, Minor in Business Administration) from the South Dakota School of Mines & Technology. His specialized business degree combined with the completion of interdisciplinary engineering and geological coursework provides Rob with a thorough comprehension regarding both the business and technical facets of the mapping industry. Rob is a member of the American Society for Photogrammetry & Remote Sensing.

Smith, Nathalie, ESRI
Title: ESRI's Community Maps Program

Abstract: This session will outline the Community Maps Program; the key benefits to participating agencies, and how you can participate in the program.

Earlier this year, ESRI launched the Community Maps Program. Through the Community Maps program, your organization can contribute its geographic data to become part of a community map that ESRI publishes and hosts online. The Community Map is compiled to uniform cartography and authored at multiple scale levels down to approximately 1:1,000 scale using best available local government data sources from city, county, state and other appropriate agencies. The Community Map is published as an online map service hosted by ESRI for access by the City, County or participating agency, and other users via the Internet. The Community Map is integrated in the World Topographic Map hosted by ESRI as part of its ArcGIS Online maps and freely accessible by the participating Cities or counties for their own applications.

Biography: Nathalie Smith is a 22 year veteran of ESRI where she has held various positions. As Software Release Manager, she was responsible for bringing the ArcInfo product to market on multiple supported platforms both in the US and Internationally. As the Online Support and Service centers manager she was responsible for the initial design, implementation, and launch of the support.esri.com and service.esri.com sites. After moving to the Northwest in 2005, Nathalie managed the Northwest State and Local sales team for 4 years. She is currently ESRI's Regional Manager for the Northwest.

Special ESRI Workshops

Spangrud, Damian
Title: What's Coming in Arcgis Desktop 10

Abstract: Come learn what is coming in ArcGIS Desktop 10. This session will provide an overview of the changes coming in the ArcGIS Desktop 10 release and how these changes make ArcGIS easier, faster, and more powerful. There will be an opportunity for Q&A at the end of the session.

Biography: Damian Spangrud is the Senior ArcGIS Product Manager at ESRI. In this role Damian has helped direct the product releases around ESRI's ArcGIS product line for the last 15 years. Damian has a MSc in Earth Science from Montana State University, and has participated in numerous design, analysis and cartographic projects around the globe. His vision and insight on the direction of geospatial technology is well recognized throughout the industry.

Moore, Scott
Title: What's Coming in ArcGIS Server 10
Abstract: Come learn what is coming in ArcGIS Server 10. ArcGIS Server 10 includes many enhancements to caching workflows, access to data throughout your organization, and powerful web-based editing. ArcGIS Server 10 provides support for a wide range of clients. Web browsers, mobile devices, smart phones, desktops and Microsoft Sharepoint can all leverage ArcGIS Server 10. Topics also include publishing and querying temporal map services, a new, out-of-the-box configurable Web mapping application for ArcGIS Server, and leveraging ArcGIS Mobile technology for Windows and Windows Mobile without programming.

Biography: Scott Moore is a Solutions Engineer with ESRI and currently works in the Olympia regional office. He earned a bachelor's degree in Geography with a focus on GIS from the University of Washington in Seattle in 1998. Prior to joining ESRI, he was a Senior GIS Analyst and GIS Manager for the City of Chandler, Arizona.

Geographic Information Services (GIS) in Fire and Emergency Services

A One day mini-conference scheduled to be held in conjunction with the 2010 Intermountain GIS Conference in Bozeman, MT

April 22, 2010

Best Western GranTree Inn

Cost: $90 for MAGIP members
$110 for non-members

Time: 9:00-5:00 Lunch is included

Morning Discussion to be lead by a panel of Local Fire, Search & Rescue, Sheriff, DES and 911 and GIS Professionals, moderated by Central Valley Fire Lieutenant Bill Schmitz

A.M. Topics to Include:

- What does GIS mean to you?
- How Are You and Your Department/Agency Using GIS?
- What Can GIS do for You?
- What Can You do for GIS?
- GIS Best Practices
- Computer Aided Dispatch and cell phones
- How is GIS being used in Mobile Command
- Tour of Gallatin County's New Mobile Command Unit and the Incident Command Post Trailer

P.M. Topics to Feature:

- GIS in Wildland Fire Management
- Student Presentations on Fire Behavior Analysis
- Presentation: Montana WUI Mapping: Communities Wildland Fire Protection Plan
- Presentation: Park County's Interactive Fire Risk Assessment Tool

You'll have an opportunity to visit with vendors and network with other Fire, SAR, EMS and GIS users.

There are additional workshops offered throughout the week, including an Introduction to ARCGIS workshop on Friday. For more conference information, go to: http://www.magip.org/Intermountain or contact Jenny Connelley at jenny.connelley@gallatin.mt.gov, 406-582-3166.

Register today at www.magip.org/Intermountain

Fire Mini-Conference

Fry, Bob, Mark Richards and Erica Hoffman
Title: Park County's Interactive Fire Risk Assessment Tool

Bob Fry Biography: Bob is the District III representative for Montana Disaster and Emergency Services. Bob has been active in all hazards Incident Management development nationally, working with the National Emergency Management Association and has developed task books for local type III all hazard teams. Bob has been involved locally for over 20 years as volunteer Park County Chief and Fire warden. He is presently on McNitt's Type II team as a Type II Deputy IC and has served as an IC, Operations and Plans Section Chief with teams over the past 12 years. He has worked as an instructor and exercise facilitator for DES & DNRC for the past 22 years and with Northern Rockies Training Center for 16 years. Bob's experience ranges from working as a representative in Emergency Operations Centers for major events such as floods, blizzards, tornadoes, and civil disturbances in the 70s with the Ohio Highway Patrol to many of the large wildfires over the past 20 years. In addition to his team duties, Bob has worked large floods, hazardous material incidents, hurricanes, hostage/standoff incidents, and special events. Some of the recent all hazard deployments have included 5 weeks at the World Trade Center for the City of New York, 3 weeks managing the Columbia Space Shuttle recovery, 3 weeks in LA for Katrina and Rita hurricanes.

Marc Richards Biography: Marc is the GIS/IT Manager for Park County Montana. He graduated from Hillsdale College in 1988 with a B.S. in Natural Resources Management, Minor in Computer Science. He then graduated from University College, University of Denver in 2007 with a Professional Certificate in GIS. Marc has been working in GIS for over 20 years. His specialty is geographic information systems in relation to natural resources management. He is a MAGIP member and SAF member.

Erica Hoffman Biography: Erica is currently Park County's GIS/IT Tech. She graduated with a degree in Geography from Montana State University in 2002. Before becoming a GIS tech Erica was a wildland firefighter for the Bozeman Ranger District, Yellowstone National Park and Hawaii Volcanoes National Park. She has worked in fire for over 10 years and has fought fires in California, Texas, Montana and Hawaii. She has been working as a GIS technician for about 3 years now and is enjoying new challenges and learning new skills.

Tom Kohley , GIS Consultant and John Trapp
Title: Carbon County's Geo-Atlas

Tom Kohley Biography: is a GIS consultant operating out of Red Lodge who provides mapping services to city and county governments. He works closely with the Carbon County DES and Red Lodge Fire & Rescue to provide mapping services in the areas of rural addressing, E911

system deployment, wildland fire mapping and production of custom map products to assist emergency responders. Prior to consulting, Tom co-founded, owned and operated myTopo.com which produces custom topographic and aerial maps throughout the United States and Canada. Tom received his mastMrs degree in geography with an emphasis in natural resource management and geo-spatial technologies from the University of Wyoming. He has over 20 years of GIS/GPS experience and is certified as a GISP in addition to being qualified as a GISS under the National Wildfire Coordinating Group.

Opperman, Todd
Title: Using Google Earth to Develop a Common Operating Picture for Wildland Fire Management

Biography: Todd Opperman is currently the East Zone Assistant Fire Management Officer of the Gallatin National Forest. His job is supervising the fire crews of the Gardiner, Livingston, and Big Timber ranger districts and helping to manage wildland fire over a million acres of Forest Service land. From Michigan Tech University, he received a degree in forestry. After trying out grad studies in remote sensing and not liking statistics, he dropped grad studies and started a 15 year career in wildland fire. Todd has worked for Grand Canyon National Park, Kaibab National Forest, and Bitterroot National Forest and spent a year in New Zealand doing fire research. He was introduced to using Google Earth for fire management in the summer of 2009 after working with a national fire management team experimentally using it for operational incident status and planning. Not having strong GIS skills, he found Google Earth a user friendly system to create a one stop shopping cart for a wide variety of GIS information, resource management decisions, weather information and mapping for the Gallatin National Forest.

Schmitz, Bill, Moderator, Lieutenant, Central Valley Fire District/Begrade City Fire Department; Co-Presenters: Fred Cady, Patrick Lonergan, Bill Oberhofer, Jason Jarrett, Don Wilson, Chris Kent
Title: GIS Panel

Fred Cady Biography: Fred recently retired from his position as Chief of the Fort Ellis Fire Service Area. He currently serves as a Situation Unit Leader for an IMT2 Team and as Chair of the Gallatin County Fire Council Communications Committee.

Jason Jarrett Biography: Jason is currently in his 25th year of Law Enforcement and 23rd year in the Montana Fire Service which began in Yellowstone National Park working at Old Faithful and the West District. Jason is employed by the Gallatin County Sheriff's Office where his duties include Patrol, Investigations, Special Events, Training and Supervision. Jason currently

serves as the Sergeant of (Special) Stuff in the Support Services Division which includes an Intel section and as the SAR (Search and Rescue) Commander.

Chris Kent Biography: With 31 years of experience, Chris is the "Godfather" of Gallatin County Search and Rescue. He is the operations boss of most searches and is usually among the first to respond to a page. From the field command post (his 4x4 Chevy Diesel truck) he orchestrates searches. When hunters lose their bearings while following animal trails, its Kent's knowledge of these trends and familiarity with the country that are key elements to bringing searches to successful conclusions.

Patrick Lonergan Biography: currently serves as Captain with Bozeman Fire assigned as Gallatin County Emergency Manager. He was previously an Emergency Manager in Chelan County, WA. Patrick has spent the past 14 years in the various Emergency Services (Fire, Law, SAR, and DES). Patrick is a graduate of Washington State University. Patrick has experience with Mobile Data, Incident Mapping (Incident Management Teams and SAR; Computer Aided Dispatch (including deployment of Closest Available Units); and Plan Development and Public Education with GIS.

Jim Oberhofer Biography: Jim has served seven years as undersheriff for Gallatin County. He spent 9 years working for the State of Montana as the POST Director (Peace Officers Standards and Training) and taught classes for a number of years at MLEA (Montana Law Enforcement Academy). Jim worked 25 years with Missoula Police retiring as the Chief of Police.

Bill Schmitz Biography: is a lieutenant with Central Valley Fire District/Belgrade City Fire Department. In this role, Schmitz functions as a command officer, instructor/coach, and responder, serving all aspects of the fire department including fire, rescue, hazmat and EMS. Schmitz has 15 years experience as an emergency responder. He is certified as a Fire Officer and EMT. Schmitz has 25 years experience as a business owner with supervisory responsibilities of 40 personnel and 3 locations. Schmitz has an extensive background in many outdoor recreational activities including hiking, skiing, snowmobiling, biking, sailing, fishing and motorcycling.

Don Wilson Biography: Don is currently serving as Chairman of the Gallatin County Search and Rescue. His expertise and years of experience as a member of the Gallatin Ham Radio Club make him a valuable asset to Search and Rescue. Don is regularly called upon to assist the Sheriff in all areas of emergency communications and GPS-based electronic mapping to help manage emergencies and provide maps and a communications network upon which emergency workers can rely.

Suenram, Bruce
Title: Wildfire Incident Mapping

Bruce Suenram Biography: Bruce Suenram has worked in the field of fire protection and prevention since 1969. He administers the preparedness activities of the Bureau such as training, fire prevention, fire investigation, GIS, assessments, information technology, and equipment development. Bruce served as Montana's State Fire Marshal (1992-1997), as chief of the Missoula Rural Fire District (1980-1992), and as the chief of the Kelseyville, CA, Fire Protection District (1974-1980). He and his wife, Karen own a fire protection consulting firm, Fire Logistics, Inc. located in Montana City, MT. Bruce was on the original code development committee for the Urban/Wildland Interface Code and on the International Fire Chief's Association Urban/Wildland Interface Committee. He acted as the liaison for the National Association of State Fire Marshals to the National Wildfire Coordinating Group's Urban/Wildland Interface Advisory Committee. In addition, Bruce has taught courses for the National Fire Academy, the Northern Training Center, the Montana Fire Services Training School and the Montana Law Enforcement Academy. He served as an Incident Commander for a Type II Incident Management Team for eight years. Bruce is also qualified as a Type 1 Planning Section Chief. Bruce received a bachelor's degree in biological sciences from California State College Stanislaus in 1973. Bruce is currently serving as the National Association of State Foresters representative to the International Association of Fire Chiefs Wildland Fire Policy Committee. Bruce is an ex officio member of the Board of Directors of FireSafe Montana. He is also the MT State Coordinator for the Montana Chapter of Farmers and Hunters Feeding the Hungry.

Trapp, John Captain / Technical Specialist Red Lodge Fire Rescue
Title: GIS-Assisted Home Assessments in the Wildland Urban Interface; Evaluation of Structures within the WUI

Abstract: As more homes are being built in the Wildland Urban Interface (WUI), fire managers need to explore tools that assist in determining the threat a wildland fire may pose in that area. The Red Lodge Fire Department is using Redzone software to assist in integrating field-collected data with existing GIS layers. Field crews with handheld PDAs and GPS units can gather detailed and useful information in a short period. By assigning a point value to important variables such as roofing material and surrounding vegetation type, a structure can be rated as to its likelihood of ignition during a wildfire event. In addition to determining a home's hazard rating, Redzone can generate a report which can be shared with the homeowner.

Biography: Jon Trapp is a Captain for Red Lodge Fire Rescue and serves a firefighter, paramedic and GIS technician. Jon has been using GIS software for the last 12 years with

applications ranging from F-16 targeting to wolf den site selection. He is currently utilizing GIS applications to map Wildland Urban Interface (WUI) – specifically focusing on the evaluation of structures within the WUI. Structures are evaluated by field crews using handheld PDAs and GPS. This data is then transferred into GIS software that calculates ignition risk and creates a color-coded shape file that can be used by fire managers. Jon is also updating county-wide data that will assist emergency responders and help with the transition to E911.

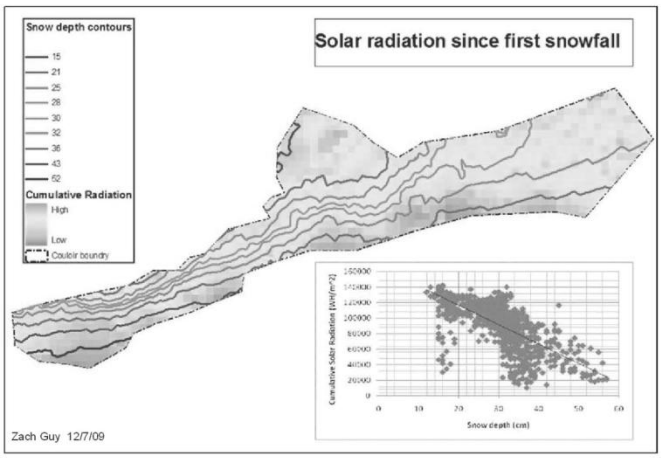
Vetters, Justin
Title: Rae and Sourdough V.F.D. Response Time Analysis

Biography: Justin Vetters was born and raised in Colorado, prior to becoming a Montana resident in 2006. A senior in MSU's physical geography program, Justin has taken the full array of GIS, GPS, and Remote Sensing courses offered at MSU. Like most other Bozeman residents, he enjoys spending free time outside in the local mountains climbing, skiing and cycling.

The Use of Geographical Information Sciences (GIS) in *Snow and Avalanche Sciences*

A one-day mini-conference held during the 2010 Intermountain GIS Conference in Bozeman, Montana

April 22nd, 2010



Presentations Include:

Open Source GIS

Avalanche Runout Probability

Surface/Snowpack Energy Modeling

Avalanche Atlas Creation

Forecasting

Visualization of Snowpack Conditions

Modeling Spatial Patterns in Couloirs

Avalanche Path Statistics

Analyzing Surface Hoar Distribution

Round Table Discussion

Tour of the MSU Subzero Science and Engineering Research Facility
http://www.coe.montana.edu/ce/subzero/

Registration and additional information can be found at:
http://www.magip.org/Intermountain

The cost for the one-day registration is $90 for students and Montana Association of Geographic Information Professional (MAGIP) members and $110 for non-members.
Contact Tara Chesley-Preston at tara.chesley@gmail.com with questions

Thursday Morning's Continental Breakfast Generously Sponsored By:

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american avalanche association

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Snow Science Mini-Conference Presentation Abstracts

Adams, Edward E. and Ladean M. McKittrick, Montana State University, Department of Civil Engineering

Title: A GIS approach to modeling snow metamorphism in complex terrain

Abstract: In topographically complex terrain, the thermal state of the snowcover is strongly influenced by the landscape. A first principles energy balance model that accounts for topography is used to spatially calculate the snow temperature and metamorphism. For a particular location, a terrain model is defined from a digital elevation map (DEM). This landscape model is composed of an assemblage of surface elements which overlay subsurface nodes. Each element is specified as an appropriate terrain type (e.g. snow, rock, grass, trees, etc.) to which thermal properties are assigned. A hemispherical array of rays emanating from each surface element are defined, then, employing enclosure theory, geometric view factors with respect to all other surfaces and the sky are calculated. Meteorological data is applied and a 1-D energy balance is calculated for each element. Conduction, convection, radiation and latent heat are accounted for in the model; however, its unique strength is the radiation component. Taking into account topography, global position and time, insolation relative to each facet at each time step is calculated, as are short wave reflection and long wave radiation exchange with the sky or other terrain surfaces. Surface temperature, temperature profiles and surface mass fluxes are calculated for each element.

Biography: Ed Adams is a Professor of Engineering Mechanics at Montana State University. His research is in the area of snow and ice with a particular focus on avalanche phenomena. His fascination with avalanches initially developed as a prerequisite for safe backcountry skiing. Specifically his research includes snow metamorphism, avalanche dynamics. Additionally, he has conducted research into thermal processes involved in highway icing and chemical anti-icing, and describing the physical habitat necessary for sustaining microbial life within Antarctic ice. In addition to seasonal field research in the mountain west and midwest he has spent five seasons conducting field research in the Antarctic. Currently, he is the Director of the newly developed Sub Zero Science and Engineering Research Facility. This facility features a suite of low temperature laboratories geared toward multidisciplinary research focused on the cold environment. He has worked at the Shinjo Branch of Snow and Ice Studies of the Japanese National Research Institute for Earth Science and Disaster Prevention, as an invited scientific specialist and with the WSL Swiss Institute for Snow and Avalanche Research, SLF in Davos. As outreach, his research have been featured in National Geographic Explorer, National Geographic Extreme Explorer, National Geographic Adventure People Magazine, New York Times – Science Times, the Discovery Channel, the History Channel, Discovery Channel Canada, with live appearances on Good Morning America, CNN's AC 360, World News Tonight, on various regional and national news casts, featured in an upcoming exhibit at the Museum of Science And Industry in Chicago.

Name: Borish, Matthew, Montana State University
Title: Assessing and mapping snow surface spatial variability in the Chilkat and Takhinsha Mountains of southeast Alaska

Abstract: Snowpack spatial variability poses a challenge to avalanche forecasters across multiple scales. Therefore, gaining a better understanding of the processes which dictate snowpack spatial variability is a crucial step towards increasing the accuracy of avalanche forecasts. As part of master's thesis, characteristics of the snow surface were mapped and assessed by a team of helicopter skiing guides across the Chilkat and Takhinsha Mountains of southeast Alaska during two ski seasons. The incorporation of a Geographic Information System (GIS) proved to be a valuable tool for managing and visualizing observations. Additionally, ESRI ArcMap© Spatial Statistics Tools were employed to look for patterns and spatial relationships in the data resulting from variables such as slope steepness and elevation.

Biography: Matthew graduated in 2005 from the University of Montana with a B.S. in Natural Resource Conservation and a Minor in Geology. As an undergraduate, he was introduced to GIS and completed a project that highlighted premium ski terrain in the Rattlesnake Mountains near Missoula, Montana. The desire to be near bigger mountains and deeper snow led Matthew to Haines, Alaska where he has been working as a heli-skiing guide since 2006. The exciting opportunity to blend heli-ski guiding with snow research as a graduate student led Matt to Bozeman where he began working on a Geography Master's Degree in 2008 at Montana State University.

Name: Chesley-Preston, Tara L., Montana State University, Department of Earth Sciences
Title: Spatially Correlating Patterns of Natural Avalanche Activity to Observed and Derived Weather Variables

Abstract: Avalanche forecasters and recreationists alike have long understood that there is a relationship between new snow, wind direction, wind speed and avalanches. This work attempts to better understand, quantify, and view these relationships using the query and mapping tools available through GIS techniques. This work has been done using an all-natural avalanche dataset from Gothic, Colorado, and is located four miles north of Mount Crested Butte. One individual has been collecting these data along with new snow depth and snow water equivalent (SWE) since the 1975-1976 winter season. These data were combined with daily average NCEP upper atmospheric free air wind direction and speed data to create a massive weather and avalanche database. Using the query functions within a GIS, the probability of a natural avalanche occurring at different starting zone aspects with different upper atmospheric wind directions was calculated and projected spatially. These maps allow for a visual comparison of possible locations for wind loaded snow to accumulate in different avalanche starting zones and grouped starting zone aspects as well as the associated avalanche

hazard. This work provides evidence that derived upper atmospheric wind data can be used to assist in remote avalanche forecasting.

Biography: Tara Chesley-Preston is a graduate student in the Department of Earth Sciences at Montana State University as well as a student employee with the USGS. Her graduate research involves studying the relationship between natural avalanches and the weather conditions leading up to the avalanche event. When she is not busy working or trying to finish up her thesis she can be found either playing outside, ideally in the snow or cooking up a feast.

Name: Guy, Zach Montana State University
Title: Spatial Variability of Snow in Steep Couloirs

Abstract: Characterizing the spatial variability of the snowpack in couloirs is critical for avalanche prediction and mitigation in steep, alpine terrain. In this study, depth and stratigraphy of the snowpack are reconstructed in several couloirs for future correlation with terrain parameters, such as aspect, angle, curvature, and proximity to outcrops or trees. Primary study locations are near Big Sky, MT and Jackson, WY. Snowpack measurements are collected from probing and mapped in a GIS with LiDAR data of terrain. A better understanding of the spatial patterns of the snowpack and weak layers in couloirs will help save lives in the future of snow sports.

Biography: Zach Guy is in his first year of graduate studies at Montana State University. He is working under the counsel of Karl Birkeland and Steve Custer studying the spatial variability of snow in steep terrain. Zach grew up in Colorado, graduated with a geology degree from Western Washington University, and spent the last two years of his life playing in the snow in Jackson, WY.

Hendrikx, Jordy, National Institute of Water & Atmospheric Research Ltd. (NIWA), Christchurch, New Zealand
Title: GIS tools used in avalanche risk management in New Zealand

Abstract: Avalanches threaten alpine communities, infrastructure, industrial operations and recreational areas in mountainous regions throughout the world. In New Zealand, while people do not generally live in avalanche prone regions, locals and tourists work, recreate and travel through these areas. Geographic Information Sciences (GIS) is being increasingly used to better manage the risks. This presentation will provide a state-of-the art overview of the current use of GIS in avalanche risk management and zoning in New Zealand. An overview of avalanche activity in New Zealand is presented and the different GIS based approaches used to manage the risk is outlined. Examples will be provided that span a range of options from; A fully

interactive GIS tool for managing and understanding avalanches on the Milford Road; to a GIS developed avalanche atlas; through to an avalanche zoning approach for workers in a remote, data sparse, region of Fiordland.

Biography: Jordy Hendrikx is a Snow and Ice Scientist working for the National Institute of Water & Atmospheric Research Ltd. (NIWA), in Christchurch, New Zealand. He has undertaken research on snow, glaciers, avalanches, GIS, risk management and climate change in New Zealand, USA, Europe and Antarctica. Before working for NIWA he spent time working as a researcher at the Swiss Federal Institute for Snow and Avalanche Research, and on the Milford Road NZ as an avalanche scientist. While at NIWA Jordy has mapped new avalanche areas and developed a number of GIS tools for avalanche risk management in New Zealand. He is also leading a number of key cryosphere projects at NIWA including; the design and development of a National Snow and Ice Monitoring Network and is leading a large multi-year project aimed at modeling future New Zealand climate and its downstream impacts.

Marienthal, Alex and Jordan Mancey, Montana State University
Title: Statistical modeling of maximum snow avalanche runout distance in Glacier National Park, U.S.A., an inter-regional application of derived statistical runout models.

Abstract: Assessment of snow avalanche hazard is a critical safety measure as the numbers of people visiting, living, and recreating in alpine areas continues to increase. Defining the areas of avalanche path runout zones is useful to avoid placement of roads or structures in areas where they are subject to snow avalanches. Observing avalanche deposits over a long time period is the best way to know the runout distance for an avalanche path. However, in many regions there has not been observed avalanches over a long time period, so statistical and dynamic models are used to predict snow avalanche runout distance based on the known behavior of snow avalanches in regions where avalanches have been observed for a long time. In this study, a statistical regression model is found to predict runout distance for avalanche paths along Going-to-the-Sun-Road (GTSR) in Glacier National Park, USA. The model derived from avalanche paths on GTSR was applied to predict runout distances of avalanche paths in John F. Steven's Canyon (JFSC), and the predicted runout distances were compared to observed runout distances based on vegetation damage in the field and vegetation boundaries on aerial imagery. Models derived in a given region are statistically only applicable to that region and avalanche paths with similar terrain. Therefore, the model derived from GTSR avalanche paths consistently under-predicted runout distance on JFSC paths.

Alex Marienthal Biography: Alex Marienthal was born and raised in Gold Hill, Colorado, a small community in the mountains west of Boulder, CO. His surroundings garnered a love for the mountains and snow from a young age. While attending Boulder High School, he worked part-time at the local ski hill, Eldora Mountain Resort. While attending Montana State University and pursuing a degree in Snow Science through the Dept. of Earth Sciences, Alex

earned his EMT certification and volunteered part-time at Big Sky Resort. While working towards his college degree he spent countless hours skiing in the backcountry of southwest Montana and has climbed and skied many of the peaks in the area. Alex earned his Bachelor's degree with honors in Snow Science and a minor in Statistics in December 2009 and is currently enjoying skiing everyday at Bridger Bowl or in the mountains of southwest Montana.

Jordan Mancey Biography: Jordan Mancey was born in Ontario, Canada, and raised in Littleton, Colorado. Jordan found his passion for the mountains and all that exists in them when he began whitewater kayaking, climbing, and skiing in the Rocky Mountains of Colorado. While discovering the secrets of the world during his completion of a Bachelors degree in Physical Geography at Montana State University he skied off summits, kayaked class 5 whitewater, and climbed world-class ice and rock in the mountains of southwest Montana.

Marienthal, Alex, Jordan Mancey, Zach Guy, F. Aaron Rains, and Alex Schwab, Montana State University

Title: Geospatial science and snow avalanche research (Panel)

Abstract: Geographic information systems (GIS) and spatial sciences have been used in the field of snow science since the mid 1900s. With advancement in technology and an increase in computer literate researchers and practitioners the use of spatial sciences has allowed for rapid developments in snow and avalanche research. Mapping locations of avalanche paths and keeping detailed records of avalanche events was an initial step for snow science in the spatial realm. Satellite and remote sensing technology and improved resolution of both spatial and temporal data has recently contributed to groundbreaking research in snow science. This presentation reviews work from the past two decades (or more for some topics) to get an idea of the history and current work with snow in the spatial realm. The broad topic of snow and spatial science was stratified into five sub-topics: Avalanche path mapping, geospatial analysis of snow distribution, water as it relates to the snow pack and wet avalanches, spatial variability of snow, and avalanche forecasting. While some of these sub-topics have a long history and a well developed importance in the field of snow science, such as avalanche path mapping and forecasting, others are relatively young and have just recently shown potential to aid in the understanding of snow related phenomena. Robust and comprehensive databases have been developed in more regions with more recorded variables due to the efficiency and ease of use provided by modern GIS and spatial sciences technology. Combination of expert knowledge with historic records of phenomena relating to snow will likely contribute to a more advanced knowledge of the global field of snow science as well as allow for better local and regional forecasts and hazard assessments.

Zach Guy Biography: Zach is in his first year of graduate studies at Montana State University. He is working under the counsel of Karl Birkeland and Steve Custer studying the spatial variability of snow in steep terrain. Zach grew up in Colorado, graduated with a geology degree from Western Washington University.

F. Aaron Rains Biography: Aaron is a full time ski patroller at Big Sky Resort, and a Graduate student at Montana State University.

(**Alex Marienthal and Jordan Mancey's Biographies are above)**

Peitzsch, Erich H. and Daniel B. Fagre, USGS Northern Rocky Mountain Science Center
Title: Using GIS for the Creation of the Going-To-The-Sun Road Avalanche Atlas, Glacier National Park, Montana

Abstract: Snow avalanche paths are key geomorphologic features in Glacier National Park (GNP), Montana, and an important component of mountain ecosystems: they are isolated within a larger ecosystem, they are continuously disturbed, and they contain unique physical characteristics (Malanson and Butler, 1984). Avalanches impact subalpine forest structure and function, as well as overall biodiversity (Bebi et al., 2009). Because avalanches area a dynamic phenomena, avalanche path geometry and spatial extent depend upon climatic regimes. The USGS/GNP Avalanche Program formally began in 2003 as an avalanche forecasting program for the spring opening of the ever-popular Going-to-the-Sun Road (GTSR), which crosses through 37 identified avalanche paths. Avalanche safety and forecasting is a necessary part of the GTSR spring opening procedures. An avalanche atlas detailing topographic parameters and oblique photographs was completed for the Going-to-the-Sun Road corridor in response to a request from GNP personnel for planning and resource management. Using ArcMap 9.2 GIS software, polygons were created for every avalanche path affecting the GTSR using aerial imagery, field-based observations, and gps measurements of sub-meter accuracy. Spatial attributes for each path were derived within the GIS. Resulting products include an avalanche atlas book for operational use, a geoPDF of the atlas, and a Google Earth flyover illustrating each path and associated photographs. The avalanche atlas aids park management in worker safety, infrastructure planning, and natural resource protection by identifying avalanche path patterns and location. The atlas was created for operational and planning purposes and is also used as a foundation for research such as avalanche ecology projects and avalanche path runout modeling.

Biography: Erich Peitzsch is a physical scientist and avalanche specialist with the USGS Northern Rocky Mountain Science Center in West Glacier, MT. Part of his work includes avalanche forecasting for the Going-to-the-Sun Road in Glacier National Park. His research

includes such topics as avalanche mechanics, avalanche ecology, snow hydrology, and climate change effects in mountain ecosystems.

Shea, Cora, University of Calgary
Title: Sensationally Spatial: Using GRASS to Take Near-Surface Snowpack Warming From Eight Points to Many

Abstract: Near-surface warming of snow affects its deformation rate, and warming is a probable contributor to many avalanche accidents. In 2006, Laura Bakermans of ASARC developed SWarm, a near-surface snow warming prediction model. SWarm runs on eight points -- the cardinal directions and their midpoints -- and varies by cloud cover, albedo, slope angle, and day-of-year. This talk will describe the adaptation of the SWarm model to a 40 m spatial visualization grid using the free open source GIS called GRASS. The talk will cover technical details, including a general overview of GRASS, color palette selection and design, batch scripting, and methods of creating output from raw data. It will also cover the more philosophical side of the implementation, including scaling and spatial limitations, algorithm selection, and the role of GIS output in snow visualization and education.

Biography: Cora is in her second year in the Geophysics PhD program at the University of Calgary. Her research involves predictively mapping the formation of surface hoar over terrain. Previously, she has worked in aerospace, computer security, and outdoor education.

Wetlaufer, Karl, Montana State University, Department of Earth Sciences
Title: Advances of GIS in Snow Hydrology

Abstract: Snow could possibly be single most important natural resource for the livelihood of the American West. Snowmelt runoff is the primary source of water for everything from municipal water supplies, to irrigation for agriculture and livestock. The well being of people, plants, and animals throughout the West can depend on the winter snowpack in drainage basins hundreds of miles away. It is essential to be able to make accurate estimates of the quantity and spatial distribution of winter snowpack and be able to effectively communicate this information to the people who need it most. GIS and remote sensing provide incredible opportunities to make these estimates, perform analysis, and convey the necessary information to an extremely wide audience. This paper explores ways in which GIS can be used in the field of snow hydrology to compile the most accurate and comprehensive data possible and effectively communicate that information to ultimately improve the lives of people throughout the West.

Biography: Karl Wetlaufer was born and raised in Western Colorado where he grew up with a strong interest in skiing as well as an awareness of the importance of snow as a water resource for the American West. The combination of these factors led to him moving to Bozeman in 2005 to pursue a degree in Snow Science at Montana State University. He will be graduating in May 2010 with a B.S. in Snow Science and a minor in GIS.

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