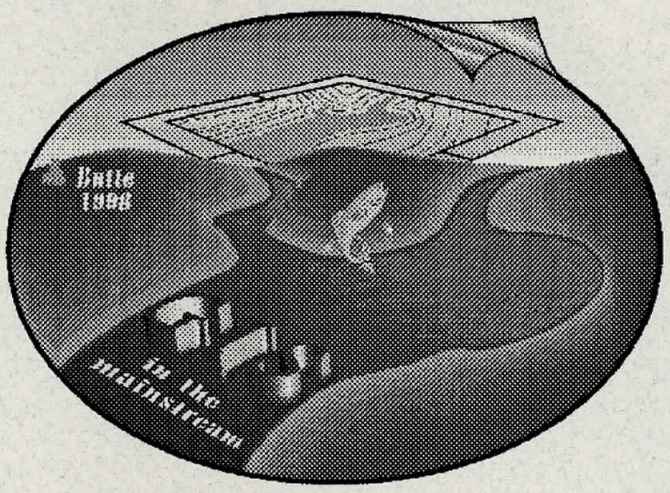
GIS in the Mainstream
1998 Montana/Idaho
GIS Conference Program

April 27-30, Butte, Montana



Sponsored by the Montana and Idaho GIS Users' Groups

and

The Northern Rockies Chapter of URISA

WELCOME

Welcome to Butte, Montana and to *GIS in the Mainstream*, the 10th Annual Conference of the Montana GIS Users' Group and the second year that the Montana and Idaho GIS Users' Groups have jointly sponsored the event. This year's conference charts the evolution in use of GIS from computer specialists to a diverse collection of data analysts in a variety of professions and fields of interest. GIS is becoming more diverse in its utility and application and more commonplace in many new fields. Concurrent sessions will focus on local government, natural resources, new technology, Native American issues, and education. Additional information about emerging technologies directed at a variety of uses will be presented in a separate "vendor track".

The Montana and Idaho GIS Users' Groups represent a consortium of government agencies, universities, businesses and educators involved with GIS technology. The conference is co-sponsored by the Montana and Idaho GIS Users' Groups, and the Northern Rockies Chapter of URISA (Urban and Regional Information Systems Association).

A special thanks is extended to Butte-Silver Bow City-County Government, Montana Tech College of Technology and the Montana Bureau of Mines and Geology for hosting and providing administrative and technical support for the conference program.

Be sure to attend Public Night (Monday) for poster presentations by 7th and 8th grade students from the Butte Middle School and the 6th grade class of the Washington Middle School in Missoula, under the sponsorship of the GIS K-12 Adopt-a-School Program. Music by the "Hot Tamales" will be featured at Tuesday evening's social and dance.

Stop by the Registration Desk for conference schedule updates and any other assistance you might need.

ACKNOWLEDGEMENTS

1998 Program Committee:

PRE AND POST CONFERENCE WORKSHOPS
Kris Larson, Natural Resource Information System, Montana State Library
Hans Zuuring, University of Montana, School of Forestry

CONFERENCE TRACT CHAIRS
Michael Sweet, University of Montana, School of Forestry
Margie Lubinski, Lolo National Forest

NATIVE AMERICAN TRACT
David Delsordo, GIS Analyst, Forestry Department,
Confederated Salish & Kootenai Tribes of the Flathead Nation
Andy Little, Power Engineers, Boise, Idaho

NATURAL RESOURCES TRACT
Larry Smith, Montana Bureau of Mines Geology, Montana Tech
Liza Fox, University of Idaho, College of Forestry and Range Sciences

LOCAL GOVERNMENT TRACT
Dan Jordan, GIS Coordinator, City of Missoula
Dave Williamson, Kootenai County Assessor's Office

NEW TECHNOLOGY TRACT
Steve Luft/Mike Frankovich, College of Technology
Baron Buchingham, Idaho Power

VENDOR TRACK
Stuart Blundell, Integrated GeoScience, Inc.

PUBLIC NIGHT
Janet Chaney, Bonneville County GIS
Kris Larson, Natural Resource Information System, Montana State Library
Ken Wall, Geodata Services, Missoula, MT

POSTERS
Sandi Samson, Boise Airport Authority and President of Idaho URISA
Hans Zuuring, University of Montana, School of Forestry

VENDORS
Catherine McCoy, ESRI, Inc.-Olympia
Andy Little, Power Engineers, Boise, Idaho

STUDENT COORDINATORS
Mike Frankovich, Montana Tech College of Technology
Karla Mitchell, Power Engineers, Boise, Idaho

REGISTRATION AND PROGRAM
Janet Cornish, Community Development Services of Montana

Montana GIS Users' Group Inc. Board of Directors:
Each year, the Montana GIS Users' Group has elections for new board members at the annual conference. In the past, board members have served 2-year terms. However, this year, there is amendment proposed to modify the by-laws, calling for four-year terms in order to maintain more continuity, since the conference is likely to be held in Idaho every other year. Montana Participants -- PLEASE VOTE! There is a ballot in your conference packet. The current board members are:

Hans Zuuring, President
University of Montana School of Forestry

Margie Lubinski, Vice President
Geometronics, Lolo National Forest

Catherine McCoy, Secretary
ESRI, Inc. – Olympia

Tom Tully, Treasurer
Butte-Silver Bow Planning Office,

Ken Wall, Past President
Geodata Services Inc.,

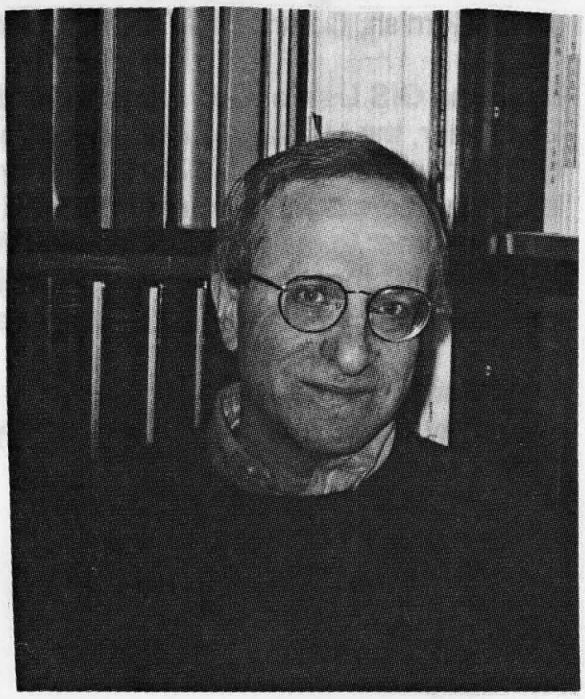
David Delsordo
GIS Analyst, Forestry Department Confederated Salish & Kootenai Tribes of the Flathead Nation

Kris Larson
Montana State Library, Natural Resource Information System

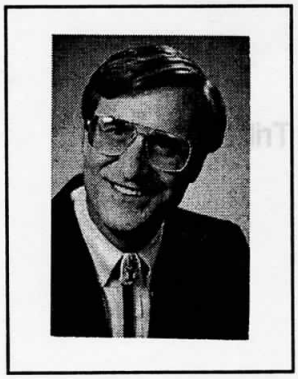
Gretchen Burton
Montana State University Geographic Information and Analysis Center

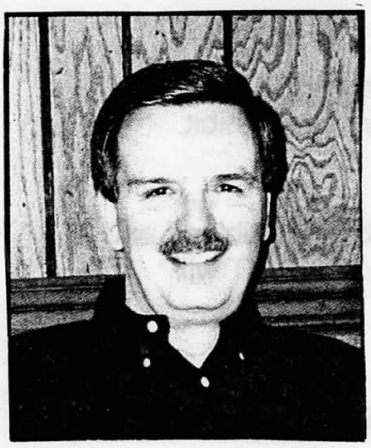
SPECIAL GUEST SPEAKERS

Earl Epstein is on the faculty of the School of Natural Resources at Ohio State University at Columbus. He has a Ph.D. in Physical Chemistry and a J.D., both from the University of Wisconsin at Madison. He has served on the Chemistry faculty at Colorado State University and on the Surveying Engineering faculty at the University of Maine as well as Ohio State University. Dr. Epstein currently teaches courses in environmental and resources law and policy as well as in his research area – Geographic System Institutions. This latter course considers the legal, economic, political and cultural forces that influence the development of geospatial information in public organizations. His research focuses on rights to public information, the control of these rights, under what conditions are these exercised and, ultimately, who can participate in land management decisions using this material.



Joseph K. Berry is a leading consultant and educator in the application of Geographic Information Systems (GIS) technology. He is the author of the "Beyond Mapping" column for GIS World magazine and the column "Inside the GIS Toolbox" for ag/INNOVATOR newsletter, and has written over two hundred papers on the analytic capabilities of GIS technology. He is the author of the popular books Beyond Mapping and Spatial Reasoning. Since 1976, he has presented workshops on GIS technology and map analysis concepts to thousands of professionals. Dr. Berry was an Associate Professor and the Associate Dean at Yale University's Graduate School of Forestry and Environmental Studies and is currently a Special Faculty member at Colorado State University. He holds a B.S. Degree in forestry, an M.B.A. in business management and a Ph.D. emphasizing remote sensing and land use planning.

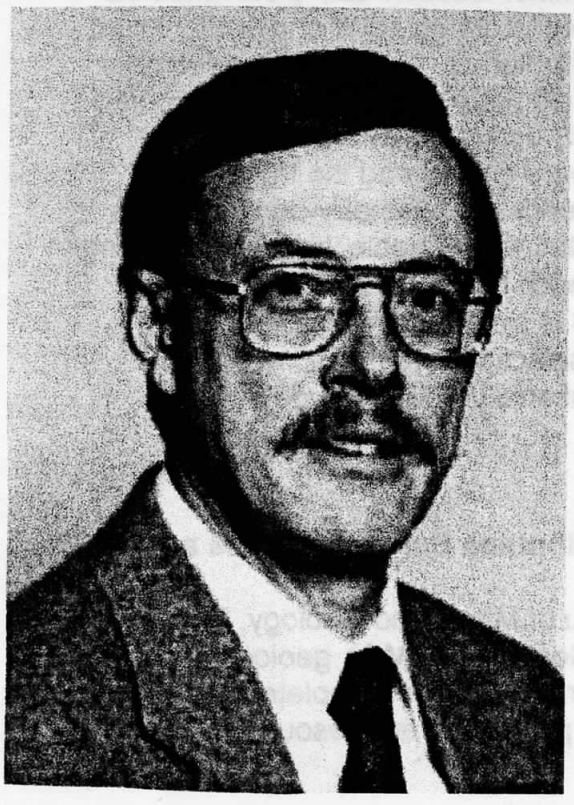




Roger Crystal is President of the American Society for Photogrammetry and Remote Sensing (ASPRS) and Senior Project Manager of Pacer Infotec., Inc., in Portland, Oregon and is responsible for new business development and operations for Geospatial Services Group. His other responsibilities include applications and development for remote sensing and GIS, development and coordination of standards and policy, and applications of current and future technology. He received his formal education from Eastern Montana College, Upper Iowa University, and the University of Utah.

Roger began his career in surveying and mapping in 1963 with Aero-Service Corp. in Salt Lake City. After receiving his degree in 1969, he joined the Washington State Department of Transportation as a photogrammetrist. Beginning in 1974 he worked with the Corps of Engineers in Seattle and in 1975 he transferred to the Middle East Division of the Corps in Saudi Arabia and Virginia. He became Chief of the Photogrammetry Branch for the Pacific Northwest Region of the Forest Service. After a varied career in the Forest Service, Roger joined the private sector in 1996. He has been an active member of ASPRS since 1975 .

Hans Zuuring is President of the Montana GIS Users' Group and Professor, Biometrician, and Director of Quantitative Services at the University of Montana at Missoula. Hans was born in The Hague, Netherlands and immigrated to Canada in 1953. He attended the University of Toronto and obtained a B.Sc.F. degree in 1966 in Forest Management and then worked for the Canadian Forestry Service in Ottawa, Ontario, Canada for a period of three years as a research officer in the Biometrics Services section. He received his Ph.D. in Forest Biometry with a minor in Statistics on August 1975 from Iowa State University, Ames, Iowa. In 1986 he was promoted to a Full Professor and received tenure at the University of Montana.



POSTER EXHIBITS

Washington Middle School
In conjunction with Ken Wall of Geodata Services, Inc. and Mr. Toeynes, the 6th grade class at Washington Middle School in Missoula, MT will present a poster exhibit.

East Middle School
In conjunction with Tom Tully of Butte-Silver Bow and Ms. Alley, Ms. Youngblood and Mr. Konen, the 7th and 8th grade students at East Middle School in Butte, MT will present a map of Silver Bow Creek

The Use of GIS for Weed Mapping in Montana
Elizabeth Roberts, Montana Noxious Weed Survey and Mapping System, Montana State University
P.O. Box 17320, Bozeman, MT 59717-3120
Phone: 406-994-6211 Fax: 406-994-3933
Email: eroberts@montana.edu

Establishment and Accuracy Assessment of Fixed-Station Telemetry Systems with Global Positioning System Equipment
Randy Matchet, Dean Biggins and Jerry Godbey of the U.S. Fish and Wildlife Service in Lewiston, Idaho - Global positioning system (GPS) equipment was used to establish coordinates for telemetry station and reference transmitter location during black-footed ferret (Mustela nigripes) reintroduction efforts in Montana during 1994 and 1995. Fixed telemetry stations were used to collect data on black-footed ferret locations, movement and fate. Coordinates and error polygons based on telemetry azimuths were estimated for locations of test transmitters and compared to GPS-derived coordinates for those locations. Differentially corrected GPS coordinates were considered the true coordinates for the purpose of estimating linear differences of telemetry-derived coordinates. Accuracy of telemetry-derived coordinates was variable, largely depending on the location of test sites and inherent qualities of each telemetry station. On-site accuracy assessment of telemetry systems with GPS is simple, beneficial for subsequent analyses and necessary for habitat use/selection investigations.
U.S. Fish and Wildlife Service, Charles M. Russell national Wildlife Refuge
Box 110, Airport Road, Lewistown, MT 59457
Phone: 406-538-8706, ext. 227 Fax: 406-538-7521

Production and Use of Digital Geologic Maps at Montana Bureau of Mines and Geology
Karen W. Porter and Larry N. Smith, Montana Bureau of Mines and Geology, Montana Tech, Butte – At the Montana Bureau of Mines and Geology (MBMG), geologic maps are now being produced in digital form. Objectives are to achieve complete state coverage and to emphasize areas experiencing high population and resource-use pressures.

MBMG's techniques in digital map production have evolved since 1995, while maintaining close integration of the geologist with the GIS technical staff. Geologic maps produced prior to 1996 as hand-inked greenline mylars on topographical bases are being scanned, vectorized, and post-processed in Arc/Info. Newer geologic maps currently are being produced from scanned and tiled mylars of the geologist's 1:24,000-scale data, also in Arc/Info.

Arc/Info coverages include contacts, faults, folds, strikes and dips, and special aerial coverages such as paleosols and clinker beds. Essential to each map product is a metadata coverage giving history and technical limits of the data. GIS staff have written numerous applications to standardize the coverages, shorten the processing time, and integrate data types into an archival system to meet Bureau-wide program needs.

Digital geologic map data are being integrated with other MBMG data bases within the Abandoned Mines, Ground-Water Characterization, earthquake epicenter, and coal resource programs at MBMG. Additionally, we are responding to expressed needs of federal and other state agencies for geologic data for their Montana-based projects.

Montana Bureau of Mines and Geology, Montana Tech
1300 West Park, Butte, MT 59701
Phone: 406-496-4327 Fax: 406-496-4451
Email: karen@mbmgsun.mtech.edu

Using Landsat Thematic Mapper and Digital Elevation Models to Map Avalanche Tracks in the Central Bitterroot Range, Montana

Stephen V. Stegman, Department of Geography, University of Montana -

The current study is using Thematic Mapper (TM) bands in the near to mid-infrared wavelength range to map avalanche tracks and runout zones using a combination of supervised and unsupervised classifications. To counter the effect of terrain shadows, the TM bands 3,4 and 5 were normalized by solar incidence angle at the time of satellite overpass. This was a significant improvement over the use of band ratios. The addition of DEM generated morphometrics as psuedo-bands gave some improvement to the classification. Used collectively, slope curvature, distance to stream channel, and terrain roughness produced a significant improvement over the terrain normalized bands 3,4, and 5.

It is hypothesized that avalanche track morphology will differ as a function of slope aspect. Initial investigation shows some preference of avalanche tracks for south facing slopes although they were found over a wide range of slope aspects. The only significant differences found as a function of aspect were slope and local relief. North- and northeast-facing tracks were found to be slightly higher with respect to these two morphometrics. Avalanche tracks occurred over a wide range of slope curvatures but were concentrated on concave slopes. No significant differences in slope curvature were found as a function of aspect.

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A Landscape Analysis of Idaho's Rocky Mountain Elk

L.K. Bomar, E.O. Garton, J.M. Scott, P. Zager and M. Gratson
Department of Wildlife Resources, University of Idaho
Moscow Idaho
IDFG, Lewistown, Idaho

Rocky Mountain Elk (*Cervus elaphus*) are distributed throughout Idaho from wilderness areas to the margins of intensively farmed agricultural lands. Understanding the changes which occur in elk demographics throughout these various habitats and at various spatial locations is critical for effective management. We are currently using exploratory data analysis to examine elk aerial survey data at four scales: aerial subunits, game management units, data analysis units, and Bailey's Ecoregions. After identifying and describing what patterns exist, we will use GIS to analyze correlations between these patterns and independent variables such as vegetation, geologic types, precipitation, fire, roads, predators, and harvest. Our goal is to develop a predictive model that combines elements of landscape ecology with metapopulation theory and can be used as a tool for evaluating alternative management strategies.

VENDOR DISPLAYS AND SPONSORS

Booths – Main Floor

Bonneville Blue Print Supply, Idaho Falls, ID - 18
Electronic Data Solutions, Jerome, ID - 1
Enabling Technologies, Inc., Richland, WA - 8
ESRI, Inc., Olympia, WA - 9
Geodata Services, Missoula, MT - 5
Geoline Positioning Systems, Spokane, WA - 7
Horizons, Inc., Rapid City, SD - 14
Integrated Geoscience, Inc., Helena, MT -20
Intergraph Corporation, San Francisco, CA - 19
Marshall and Associates, Olympia, WA - 4
Maxim Technologies, Inc., Helena, MT - 2
Mountain CAD, I.I.C., Missoula, MT - 10
NIES Mapping Group, Inc., Rapid City, SD - 3
Power Engineers, Boise, ID - 6
Selby's ESSCO, Billings, MT - 15
Spencer B. Gross, Inc., Eugene, OR - 17
USGS, National Mapping Division, Rocky Mountain Mapping Center, Denver, CO – 11

Booths – Balcony
GeoResearch, Inc., Billings, MT – U1
Pacer Infotech, Inc., Portland, OR – U2

Break Sponsors
Analytical Surveys, Inc. Englewood, CO - Tuesday Afternoon, 3:00 to 3:30 P.M.

ARCO – Environmental Remediation, Butte/Anaconda, Montana – Wednesday Morning, 10:00 to 10:30 A.M.

PRE-CONFERENCE WORKSHOPS ~ MONDAY, APRIL 27, 1998

(All workshops will be conducted at the College of Technology unless otherwise specified.)

Introduction to GIS: Basic Concepts [$35]
Anselmo Room, Copper King Inn, 9:00 A.M.–4:30 P.M.
Geographic Information Systems: Basic Concepts is a 6½ hour workshop designed for new or novice GIS users; those who want an introduction to the basic concepts. The workshop is NOT a software specific course. An overview and introduction to GIS as well as specifics related to cartography and cartographic data, database creation, and principles of spatial analysis and GIS functions will be presented. Registration includes workbook. Instructor: Allan Cox, GeoData Services, Inc. Maximum enrollment: 40.

Introductory GPS Mapping [$30]
Room 105, 8:30-11:30 A.M. This workshop will provide an introductory overview of the Global Positioning System. Its focus will include an explanation of the Global Positioning System (GPS); the status and monitoring of the GPS; and essential information affecting GPS accuracy. A panel of GPS users will be present to discuss GPS applications for GIS database population and to answer questions raised by course participants. Instructor: Joan Appell

Advanced GPS Mapping [$30]
Room 105 and field work, 1:00–4:00 P.M. This advanced course will provide participants the opportunity to use several GPS mapping systems for field data collection. It will focus upon pre-mission planning, GIS data collecting, data processing, and importing data into a GIS. The primary focus will be a discussion of data collection techniques designed to increase the speed and accuracy of data collection using GPS. Post processing and real-time data collection techniques will be addressed. Several grades of GPS resource receivers will be supplied for course participants to use. Ample time will be spent in the field and in the classroom to address questions. This workshop will provide the course participant valuable hands on experience with the latest GPS hardware and software. Participants in this workshop are required to complete the introductory mapping workshop or must possess a general understanding of GPS theory. Instructor: Joan Appell, Electronic Data Solutions. Maximum enrollment: 20.

Metadata and Clearinghouse: A Context for Advertising and Sharing Digital Spatial Data [free] Room 103, 8:00 A.M. - noon
In the four years since the development of the Content Standard for Digital Geospatial Metadata, metadata terms have been applied as a standard vocabulary to document organizational data holdings, to support catalog searches, and to provide detailed information for end-use of the digital data. This session will present an overview of the current metadata standard and the draft ISO standard as its successor. Organizational tips on appropriate collection of metadata, computing environments, and the support of Clearinghouse and other search and dissemination technologies to make data more

discoverable and accessible will be featured. Instructors: Doug Nebert, Federal Geographic Data Committee; Luke White, Idaho Water Resources; and Kris Larson, Natural Resource Information System. Maximum enrollment: 40.

Using GCDB to Build a Control Data Base, GCDB-Processing a Township with GMMI, Session-A [$15] Room 106, 8:00 A.M. - noon
The Geographic Coordinate Data Base (GCDB) was developed by the Bureau of Land Management (BLM). This session will demonstrate how to use the Geographic Measurement Management software suite (GMM) to process a standard township. Topics covered will include: abstracting the "RAW" survey data; GCDB point ID system; geodetic control, datums and reliability estimates; source ID or SID management; Automatic Proportion (APROP) features, section subdivision; least squares adjustment of data and interpretation of results; and exporting data to a GIS environment (Autocad, Arc/Info). Because of time restrictions, this session will be broad based but should provide the attendee with enough background to begin using GMM to process data. Instructors: Mark Dixon and Kathie Jewell, BLM; Rick Breckenridge, Flathead County and Craig Bacino, Lead Programmer Analyst and Digital Geographer, Information Services Division, Montana Department of Administration,. Maximum enrollment: 40.

Using GCDB to Build a Control Data Base, GCDB-Processing a Township with GMM II, Session-B [$15] Room 106, 1:00–3:00 P.M.
This session will discuss and demonstrate building a county GIS from the GCDB. Updating GCDB with county survey records, adding themes to depict information tied spatially to the Public Land Survey System (PLSS). Instructor: Rick Breckenridge, Flathead County. Maximum enrollment: 30.

Introduction to Spatial Statistics [$20]
Room 105, 1:00–4:00 P.M.
Spatial statistics have been used in the mining industry since the 1970s, but generally have not been included in GIS packages. Recent interest in error propagation in GIS has led to the rediscovery of spatial statistics. We will discuss interpolants and their utility, various landscape metrics and their utility, spatial autocorrelation, and neighborhood functions. Students will receive copies of selected publications illustrating the above concepts, lecture notes, and a bibliography. Instructors: Hans Zuuring and Lloyd Queen, University of Montana. Maximum enrollment: 30.

Principles of Thematic Mapping for GIS Users [$40]
Room 116, 8:00 am–5:00 P.M.
It is easy to create attractive maps with a GIS, but are they technically correct? This workshop is concerned with thematic mapping principles for generating correct maps including: choropleth maps, dot maps, proportional figure maps, flow maps, daisymetric maps and others. Production methods and design principles involving graphic limits, layout, lettering, legends, and other marginal information will be covered. Included will be exercises involving hands-on work with computer mapping software. Instructors: Dr. Paul Wilson, Dave Highness, Jennifer Wicks, Department of Geography, University of Montana. Maximum enrollment: 24.

Project Management: A Solid Foundation for Project Success [$100]
(This course, usually offered at $175–$225, is being sponsored by the Montana-Idaho GIS users' conference.)

URISA

http://URISA.org

Orphan Girl Room, Copper King Inn, 9:00 A.M.–4:00 P.M.
Sound project management is critical to the successful implementation of GIS in any organization. This workshop will focus on project management techniques useful for administrators, managers, and those leading or participating in GIS projects. The workshop will cover staffing, training, project planning, budgeting, contract negotiation, and project management issues, with a special focus on multi-participant projects. This is a full day workshop and will include a workbook for each participant. Instructors: Craig Gooch, Psomas and Associates, and Fred Gifford, Montana Natural Resource Information System. Maximum enrollment: 35.

GIS in Tribal Management [$45]
Room 107, 1:00–5:00 P.M.
Since GIS can be a helpful, though complex tool, native people need an opportunity to understand the fundamentals of a GIS in order to make informed decisions about implementing the technology. This workshop will familiarize tribal decision makers with the basics of GIS technology and implementation. Topics will include: defining and mapping space, explaining GIS data models, discussing the importance of the relational data base, outlining correct data base development tasks, and illustrating how GIS applications can be used to manage and protect native resources. The workshop will present technical subject matter using examples that are relevant to Native people. For example, a presentation will be made on how simple GIS display and quantification abilities have been used to support land claims litigation. Workshop participants will receive an honest portrayal of GIS implementation processes and become better prepared to deal with government representatives, consultants, and vendors on GIS implementation issues. Instructors: Brian Marozas, BIA Albuquerque Office, and John Goes in Centre, Innovative GIS Solutions of Colorado. Maximum enrollment: 50.

GIS Modeling and Application Issues [$50]
Badger, Kelly, Mt. Con Rooms, Ramada Inn Copper King, 8:30 A.M. – 5:00 P.M. This intermediate level workshop presents the basic concepts, procedures and applications of GIS modeling with emphasis in natural resources and environmental management. The concepts presented are reinforced through several practical exercises. Initially, the workshop will establish "Maps as Data" by introducing the fundamentals of spatial statistics and map-ematics will be established. Then the focus will turn to the analytical capabilities of GIS and discuss individual operations that are used in modeling spatial relationships such as: shape/pattern indexes, effective distance, optimal path connectivity, visual exposure, and roving windows. Finally the spatial modeling discussion will identify procedures involved in constructing sound application models and the future directions of GIS technology. Completion of an introductory workshop or

prior GIS experience is recommended. Instructor, Joseph Berry, Berry and Associates, national columnist for *ag/INNOVATOR* newsletter and *GIS World*.

Web-based Information Sharing and Data Access for Geographic Data [free]
Room 103, 1:00-5:00 P.M.
As geographic data have become easier to acquire and use the problems associated with managing a geographic data collection as an effective resource have increased dramatically. With the rise of general purpose, network-based information sharing facilities, potential users of data collections have come to expect the contents of a collection to be described electronically in a manner than can be easily browsed and queried. In this workshop, leaders from the Federal Geographic Data Committee, the Montana State Library, the USGS, and the State of Idaho will share their experiences, knowledge, and latest trends in web-based information sharing and data acess.
Instructors: Mike Sweet, The University of Montana; Doug Nebert and Barbara Ray, USGS; Gerry Daumiller, the Natural Resource Information System; and Hans Zuuring, the University of Montana. Maximum enrollment: 40.
*Please note that Barbara Ray has replaced Jean Parcher. Jean Parcher was listed as the USGS contact in the Pre-conference Flyer.

Spatial Database Engine [$20]
Room 122, 1:00–5:00 P.M.
Spatial data serving enables multiple users to simultaneously query and update a data base containing enterprise-wide spatial and attribute data. This method overcomes problems with data maintenance, management, and query inherent in a file-based system. Learn what data base technology is all about and how it can be used to manage up-to-date spatial data as a shared asset of your entire organization.
Instructor: Jack Horton, ESRI. Maximum enrollment: 30.

ArcView Extensions [$20]
Room 122, 8:00 A.M. – noon Arcview GIS has a proliferation of new extensions that make it the Swiss Army Knife of GIS softwares! In this half-day workshop, you will see 3-D visualization, real-time tracking, raster data analysis, statistical analysis, image analysis, pathfinding, business territory analysis,
database connectivity, menus, and lots more. Instructor: Jack Horton, ESRI. Maximum enrollment: 45.

PUBLIC NIGHT ~ MONDAY, APRIL 27, 1998

6:30–9:00 P.M., Ramada Inn Copper King
Students from local area schools will showcase the GIS projects they have developed in the GIS K-12 Adopt-a-School Program. Sponsored by the Natural Resource Information System (NRIS) at the Montana State Library, through a partnership with Environmental Systems Research Institute, Inc. (ESRI), the Adopt-a-School Program is an innovative project designed to help libraries increase public access to geographic data and learn about GIS. The project brings ESRI's ArcView software to libraries and classrooms to provide graphic access to GIS databases, and provides hands-on training and projects for students and teachers. There will be activity booths and prizes for students that did not have an opportunity to do a GIS project in their classrooms. Please come and support our local schools and libraries.
Adult activities are scheduled as well. Demonstrations will be set up, primarily for local officials to see innovative ways that city and county government workers can use GIS in their work. There will be a one-hour session as an introduction to geographic positioning systems (GPS), emphasizing recreational grade GPS units, those that sell for $200–$300. Topics covered will include: the limits of the technology, what you can do with the units, and a discussion of the GPS system. All Public Night activities are free and open to anyone who would like to attend.

Special Public Night Workshop: Inexpensive GPS for Work and Play
by Ken Wall, Geodata Services, Inc.

Ken Wall, a GIS consultant with Geodata Services, Inc. in Missoula, Montana, will give a free hour and a half workshop on Public Night at this year's GIS conference on the use of recreational GPS receivers like the Magellan, Eagle, Garmin and Trimble. Many people working with GIS have used resource grade or survey grade GPS receivers to collect accurate field data with accuracy ranging from centimeters to a few meters. Recreational , or sportsman type GPS for $100-400 have accuracies in the range of 25-100 meters, and are not often thought useful for GIS work. That is not always true, and a short part of this workshop will be directed at ways GIS professionals can use inexpensive GPS units. The major focus, however, is on practical uses of GPS for work and play. Ken will target the workshop at novice users who are interested in purchasing a GPS or have one and want to understand more about how it works and how to use it.

Want to track your favorite fitness activity like the mileage, average speed and time for your daily jog/hike/ski/walk? Find your way back to that special fishing hole or camp site? Track your progress cross country on your next vacation (always a ready answer to the kids "how many more miles?" question). Navigate to an approximate location for field work? Identify the location where you took that special photograph? Want to get lost, but still know exactly where you are?

What we will do: We will cover the basics of how the GPS system works, in layman's terms. This will include information on "selective availability", the Department

of Defense's intentional degradation of the accuracy of GIS, which is the reason you can't get 5 meter accuracy with a $250 receiver in most instances. Discussion will also include basic map reading skills, practical tips on using any receiver in the field, commercial and public domain software for PC and Windows to assist in using a GPS receiver and resources to help you evaluate what receiver to buy and how to learn more about it.

What we won't do: Although we will have a few receivers available for demonstration and "hands on" work, the workshop will be primarily lecture oriented. We will not be providing specific step-by-step instructions on the use of specific receivers. The lecture and handouts will use specific examples, but will discuss feature as generically as possible. We won't talk in depth about how to interface GPS with GIS software. We won't sell anything or advocate or endorse any one product... they are all fun to use! We won't bore participants with technical details (no datums, SIN or COSINE's).

Our thanks to those that helped present Public Night:

Rick Breckenridge, Flathead County
Gretchen Burton, MSU Geographic Information & Analysis Center
Annette Cabrera, Yellowstone County GIS Department
Janet Cheney, Bonneville County, Idaho
Kim Foiles, US Forest Service, Missoula RO
Steve Holloway, Oikos Works
Margie Lubinski, Lolo National Forest
Ed Madej, Natural Resource Information System
Susan Parrott, Central Montana Resource Conservation District
Anne Rys-Sikora, Lolo National Forest

A special thanks to Ken Wall of Geodata Services, Inc. of Missoula for generously contributing a GPS receiver to the physical GIS Tool Box!

POST-CONFERENCE WORKSHOPS ~ THURSDAY, APRIL 30, 1998

Introduction to Java and HTML [$15]
Room 112, 8:00 A.M. – noon
There will be 200 million web users by the year 2,000. Should even a fraction of those users look for GIS data, that fraction could still total more people than the population of Montana. A group potentially that large just cannot be ignored. This workshop is designed to give a basic understanding of HTML mechanics so you will not be totally dependent on an editor to create your web site. Also this workshop covers the biggest thing to hit the Internet since Marc Andreesen—Java. A basic tour of Java, its features, and its capabilities will be covered. Sample web pages and, time permitting, an applet will be created. Instructor: David E. Smith, Butte-Silver Bow GIS. Maximum enrollment: 19

Internet Map Server Technologies [$40]
Room 111, 8:00 A.M. – 4:30 P.M.
Learn how to serve maps on the Internet. This all-day presentation will cover everything from the basics of Internet technology to serving Java-enabled GIS queries and displays on the Internet. Learn how to use the MapObjects, Internet Map Server, and the ArcView Internet map server to enable users with no more than a web browser or a free, downloadable viewer to display and query a GIS database. Instructor: Chuck Lewis, ESRI. Maximum enrollment: 30.

Metadata Management [$15]
8:00 A.M. to 12:00 noon, offered again from 1:00 P.M. to 5:00 P.M..
Room 103, College of Technology
A four-hour workshop designed for those agencies actively looking for a metadata solution. This hands-on workshop provides overview information on Federal Geographic Data Committee (FGDC) standards, introduction to using a relational database to support metadata creation, and the approach to managing metadata as a valued business resource. Attendees must bring some basic spatial data descriptions (identification, bounding coordinates, description, citation, etc.) for a "hands-on" practicum. Attendees will be given a disk containing the metadata records created during the workshop. The course is software specific, using the Spatial Metadata Management System (SMMS) from Enabling Technology, Inc., Maximum Enrollment: 35 per workshop. Instructor: Michael Brackett and Eric Meyer Data Resource Design and Remodeling.

Basics of AML for Arc/Info Users [FREE]
Ramada Inn Copper King, 9:00 A.M. - noon
This workshop will include the basics of AML programming starting from "What is AML?" to writing scripts using AML functions. Topics will include: Basics of AML such as starting Script Macros in AML; AML Directives; AML Functions; Making a

Script File in the Text Editor; and Making Menus with AML. Instructor: Dr. Shivaji Prasad, Sir Sanford Fleming College. Maximum enrollment: 30.

Fundamentals of COGO: ARC/INFO. [$100]
Room 106, 8:00 A.M. - 4:00 P.M.
This seven-hour workshop will provide new or novice users of coordinate geometry (COGO) technology the opportunity to use Arc/Info and the COGO module to convert warranty deeds, certificates of survey, and subdivision plats from hard copy to digital format. This is designed to be a "hands-on" experience, and attendees must bring a deed, COS, or subdivision plat to the workshop. Instructor: Jackson K. Beighle, Benchmark GIS. Maximum enrollment: 10.

Conference Schedule

Tuesday Morning

Time block		1998 Montana/Idaho GIS Users' Group Conference	Tuesday, April 28 Morning Session	
7:00 am	8:00 am	Registration (all day) Breakfast Meeting for Tuesday Moderators and Speakers		
Plenary Session		Tuesday Morning Plenary Session Moderator: Hans Zuuring, President of MT GIS Users' Group		
8:00 am	8:15 am	• Opening of Conference by Hans Zuuring, President of the Montana GIS Users' Group • Welcoming remarks by Jack Lynch, Butte-Silver Bow Chief Executive		
8:15 am	9:00 am	Keynote Address by Joe Berry, "Mapping the Yellow Brick Road: Dreams, Realities and Future Directions of GIS Technology"		
9:00 am	10:00 am	• Address by Lois Menzies of the Montana Geographic Information Council (MGIC) • Address by Hal Anderson of the Idaho Geographic Information Advisory Council (IGIAC) • Questions and Answer Session (Moderator: Hans Zuuring)		
10:00 am	10:30 am	Address by Doug Nebert, Director of Federal Geographic Data Committee Clearinghouse, US Geological Survey, Reston, Virginia		
10:30 am	11:00 am	Session Break and Vendor Displays		
Concurrent Sessions		New Technologies Moderator: Baron Buckingham	Local Government Moderator: Doug Burreson	Natural Resources Moderator: Larry Smith
11:00 am	11:30 am	Future USGS Map Production (Mark Eaton, USGS)	An Update on the Land Record Modernization Project: Parcel/Cadastral Mapping (Stu Kirkpatrick, Dept. of Administration)	Modeling and Mapping Wildlife Species Distribution for Biodiversity Management (Richard Aspinall, Montana State University - GIAC)
11:30 am	12:00 pm	Mapping Tansy Ragwort with Kodak DCS 420 CIR Camera: A RSAC & Flathead Forest Technology Transfer Project (Don Krogstad, Flathead National Forest)	Montana Local Government GIS Coalition Report and Discussion (Gretchen Burton, Montana State University - GIAC)	GIS mapping to identify restoration priorities (Marilyn Marler - University of Montana)
12:00 pm	12:30 pm	New Technologies in the Creation of Digital Orthophotography (Becky Morton, Horizons Inc.)	Ownership Parcel Mapping for the "Have Nots" (Ken Wall, GeoData Services)	Tailings/Impacted Soil Remediation on the Streamside Tailings Operable Unit (Jim Johnson, Schafer and Associates)
12:30 pm	1:30 pm	Lunch Break (buffet style)		

Tuesday Afternoon

Time block		1998 Montana/Idaho GIS Users' Group Conference	Tuesday, April 28 Afternoon Session	
Concurrent Sessions		Native American Moderator: David DelSordo	Local Government Moderator: Dave Dewing	Natural Resources Moderator: Lisa Fox
1:30 pm	2:00 pm	GIS Lab & the Salish/Kootenai Tribal College (Linda Weaslehead)	2000 Census (US Census Bureau)	Landtype Associations of the Northern Region--An electronic environmental assessment tool. (Cathy Maynard, USDA Natural Resource Conservation Service)
2:00 pm	2:30 pm	Intertribal GIS Council on Indian Land Records (Bill Northover)		National Hydrography Dataset (Ellen Finelli, USGS)
2:30 pm	3:00 pm	Documenting location to support repatriation of Native American Cultural Artifacts and Remains (Betty White)	Sharing GIS data and applications across platforms (Chuck Lewis, ESRI)	StreamNet: Northwest Aquatic Resource Information Network (Janet Decker-Hess, FWP)
3:00 pm	3:30 pm	Session Break and Vendor Displays - Break sponsored by Analytical Surveys, Inc.		
Concurrent Sessions		Native American Moderator: David Delsordo	Local Government Moderator: Nickie Duff	Special Topics in Education Moderator: Annette Cabrera
3:30 pm	4:00 pm	Native American Roundtable Moderator: David Delsordo, Confederated Salish and Kootenai Tribes	Local Government E911 (GeoResearch, Billings)	Maps and GIS as Stories (Steve Holloway, University of Montana)
4:00 pm	4:30 pm		Local Government E911 (Miller and Associates)	K-12 Education Panel - Moderator: Annette Cabrera (Panelists: Ed Madej, NRIS; Margie Lubinski, USFS; Marlene Zentz, Billings Public Schools)
4:30 pm	5:00 pm		E911 Panel - Moderator: Dan Jordan, GIS Coordinator City of Missoula (Panlists: Surry Latham, State of Montana 911, Susan Bromstad, Missoula County 911, Jack Christiansen, Kootenai County Idaho, Janet Chaney, Bonneville County (Idaho) GIS)	
5:00 pm	6:30 pm	• No-host/ Poster Session/Vendor Displays • Northern Rockies Chapter of URISA Meeting. Moderator: Janet Chaney, Vice-President Idaho URISA. Discussion Topic: Student opportunities for partnerships between business and education. • USFS meeting. Moderator: Margie Lubinski • First Nations Roundtable reception • Montana Interagency Technical Working Group Meeting. Moderator: Mike Sweet, Vice-chair. Discussion Topic: It's 5 P.M., do you know where your ownership, transportation, and hydrography data are? – the 1998/1999 plan of work.		
6:30 pm	10:00 pm	Conference Banquet Dinner and Dance Music by 'The Hot Tamales"		

Vendor Track		
Tuesday, April 28	11:00-11:30 A.M.	Chuck Lewis, ESRI **Arc/Info Application Development with Visual Basic**
	1:30-2:00 P.M.	David Baldwin, Integrated Geosciences, Inc. **GIS and Aquifer Vulnerability**
	2:15-2:45 P.M.	Dave Ward, Space Imaging EOSAT **Space Imaging Satellite Imagery Products and Applications**
	3:30-4:00 P.M.	Bruce Burger, Positive Systems, Inc. **Using Multispectral Digital Aerial Photography in Remote Sensing and GIS Applications**
	4:15-4:45 P.M.	Stuart Blundell, Integrated Geosciences, Inc. **AI Leaning Algorithms for Image Analysis**
Wednesday, April 29	10:30-11:00 A.M.	Chuck Lewis, ESRI **Internet Mapping in 5 Minutes with ArcView IMS**
	11:15-11:45 A.M.	Bryant Ralston, ESRI **Introduction to ArcView Tracking Analyst**
	1:30-2:00 P.M.	Terry Bartlett, Marshall and Associates **Off-the-shelf Applications**

Wednesday Morning

<table>
<tr><th colspan="2">Time block</th><th colspan="3">1998 Montana/Idaho GIS Users' Group Conference</th><th>Wednesday, April 29 Morning Session</th></tr>
<tr><td>7:00 am</td><td>8:00 am</td><td colspan="4">Registration (all day)
Breakfast Meeting for Wednesday Moderators and Speakers</td></tr>
<tr><td colspan="2">Plenary Session</td><td colspan="4">Wednesday Morning Plenary Session
Moderator: Hans Zuuring</td></tr>
<tr><td>8:00 am</td><td>8:30 am</td><td colspan="4">Welcome Address by Hans Zuuring and announcements</td></tr>
<tr><td>8:30 am</td><td>10:00 am</td><td colspan="4">Keynote Address by Earl Epstein
Address by Roger Crystal, President of American Society for Photogrammetry and Remote Sensing</td></tr>
<tr><td>10:00 am</td><td>10:30 am</td><td colspan="4">Break and Vendor Displays - Break sponsored by ARCO Environmental Remediation</td></tr>
<tr><td colspan="2">Concurrent Sessions</td><td>Local Government
Moderator: Fred Gifford</td><td colspan="2">New Technologies
Moderator: Shivaji Prasad, Sir Sanford Fleming College</td><td>Natural Resources
Moderator: Craig Rindlisbacher</td></tr>
<tr><td>10:30 am</td><td>11:00 am</td><td rowspan="3">Public Data Access Panel, Moderator: Fred Gifford, GIS Coordinator, Montana Natural Resource Information System. (Panelists: Bill Northover, Confederated Tribes of Umatilla, Intertribal GIS Council Chair, Mary Bryson, Director, Montana Department of Revenue, Dr. Earl Epstein, Professor, School of Natural Resources, Ohio State University, Steve Hellenthal, Manager of Data Processing, Yellowstone County)</td><td colspan="2">Proposed GPS Spatial Accuracy Categories for Data Acquisition (John Courtright, BLM)</td><td>Status of Elk Habitat in North America (Kirk Horn, Rocky Mountain Elk Foundation and Ken Wall, Geodata Services, Inc)</td></tr>
<tr><td>11:00 am</td><td>11:30 am</td><td colspan="2">Phoenix Project - Idaho Power AM/FM (Baron Buckingham)</td><td>GIS-based Study of Late Pleistocene Glacial Advance: Flathead Indian Reservation (Tim Olson, Salish/Kootenai College)</td></tr>
<tr><td>11:30 am</td><td>12:00 pm</td><td colspan="2">Using GIS In Health Care (Nafisseh Heiat, Montana State University - Billings)</td><td>Generating Non-standard Soil Survey Interpretations with GIS (Keck, Blount, et al., USDA BSB)</td></tr>
<tr><td>12:00 pm</td><td>1:30 pm</td><td colspan="4">Conference Business Meeting and Lunch
• Montana GIS Users' Group Annual Report, Hans Zuuring
• Northern Rockies Chapter of URISA, Janet Chaney Vice President
• Montana Technical Working Group Presentation, Tom Potter
• Local Government GIS Coalition Presentation, Doug Burreson
• Montana GIS Users' Group Education Subcommittee Grant Presentation, Billings School District</td></tr>
</table>

Wednesday Afternoon

Time block		1998 Montana/Idaho GIS Users' Group Conference	Wednesday, April 29 Afternoon Session	
Concurrent Sessions		New Technologies Moderator: Baron Buckingham	Local Government Moderator: Dave Williamson	Metadata & Frameworks Moderator:Kris Larson
1:30 pm	2:00 pm	An Investigation of Dynamic Simulation: The Integration of GIS with Air Dispersion Modeling (Jere Folgert)	Greater Yellowstone Initiative - County Outreach Project (Patty Scarrah, Montana State University – GIAC)	Metadata (Kris Larson, NRIS)
2:00 pm	2:30 pm	Internet Learning Resources for Distant GIS Education (Shivaji Prasad)	Strategic Planning for GIS and needs assessment (Gregg Selby, Weston)	Value-Added Metadata (Michael Brackett, Enabling Technologies)
2:30 pm	3:00 pm	Towards a redefinition of scale (Richard Aspinall, Montana State University-GIAC)		Metadata Frameworks in Local Government (Craig Rindlisbacher)
Concurrent Sessions		Meetings		
3:00 pm	5:00 pm	Montana Geographic Information Council. Moderator: Lois Menzies, Montana Department of Administration	Montana Local Government GIS Coalition	Montana/Idaho Planning Committee for 1999 Conference
5:00 pm	6:00 pm		Conference Closes	

ABSTRACTS FOR THE 1998 MONTANA/IDAHO GIS CONFERENCE PROGRAM

Tuesday Morning Plenary Session

Mapping the Yellow Brick Road: Dreams, Realities and Future Directions of GIS Technology

Joseph Berry
Berry and Associates
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The growing use of computers in all aspects of professional life is profoundly changing data collection procedures, analytical processes and even the decision-making environment itself. Use of word processing, spreadsheet and database management systems have become commonplace in the modern work place. The rapidly maturing technology of Geographic Information Systems (GIS) promises a similar revolution for research, planning and management of land. In one sense, this technology is similar to conventional map processing involving map sheets and drafting aids, such as pens, rub-on shading, rulers, planimeters, dot grids and transparent sheets for map overlay. However, GIS technology treats maps as organized sets of numbers providing new analysis tools that address complex issues in entirely new ways. It moves mapping beyond its historical role of graphical inventories and geo-queries of traditional geography, to maps of cognitive abstractions, such as landscape structure indices, weighted visual exposure density, and optimal path corridors for wildlife or in-store shoppers. This movement marks an important turning point in th euse of maps – from emphasizing physical *description* of geographic space to spatial prescription of appropriate management actions. Also, it sets the state for revolutionary concepts of map structure, content and use. In many ways, GIS technology is as different as it is similar to conventional map processing and database management. The ability to identify and implement new applications often is as important as the automation of current mapping practices. This presentation investigates the critical skills both specialists and decision-makers need to be actively involved in spatial analysis and modeling, as GIS moves our view of geographic space beyond mapping to spatial reasoning.

Trends in Spatial Data Documentation, Discovery and Access

Douglas Nebert
FGDC Secretariat, Reston, Virginia

The development of a National Spatial Data Infrastructure in the U.S. and related efforts in other countries is stimulating an interest in common, implementable standards for discovering, sharing, and accessing digital geospatial data. Despite the independent evolution of metadata standards in various local, national, and international communities, there is a consensus forming on a single International metadata content standard that can be profiled and extended by information communities as they see fit. Likewise, the OpenGIS Consortium is seeking proposals for a standard method for spatial data discovery, called the Catalog Services Request for Proposals. Further behind, but of great interest to everyone, are conventions for the distributed visualization of geospatial data from many servers onto a single client screen. A small set of international implementors agreements for geospatial metadata, data discovery, and access will improve everyone's ability to access local and global data resources, encourage interoperable software solutions that are no longer local or proprietary in scope, and increase the exposure and use of spatial data in non-traditional GIS settings.

Tuesday Morning Concurrent Sessions
11:00 A.M. to 12:30 P.M.

New Technologies Track

Future USGS Map Production

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Email: maeaton@usgs.gov

The U.S. Geological Survey's National Mapping Division (NMD) is evolving its Graphics Program to reflect the changing directions in digital and graphic spatial data. Whereas NMD traditionally derived its digital data from its topographic maps, the graphic map is now a derivative of multiple digital data sources. This switch in data roles presents a challenge in having to yield a consistent map product from potentially disparate digital data sources, yet also provides tremendous opportunities for adapting output products to changes in user requirements and for improving the efficiencies of map production. The Graphics Program includes a Maintenance Plan that will triple the amount of topographic maps revised by the year 2000. To accomplish this the USGS needs to take advantage of the newest technologies in digital cartography, work with

cooperators at the state and local levels and take advantage of local data holdings. The traditional role of making USGS topo maps is evolving to one of coordinating diverse sources of information into an efficient process for updating USGS graphics.

Mapping Tansy Ragwort with Kodak DCS 420 CIR Camera
A RSAC – Flathead Forest Technology Transfer Project

Doug Krogstad
USDA – Forest Service, Flathead National Forest
1935 3rd Ave. E.
Kalispell, MT 59901
Phone: (406) 758-5223 Fax: (406) 758-5363
Email: Krogstad_Don/ri_flathead@fs.fed.us

A major infestation of Tansy Ragwort has occurred on the Tally Lake District of the Flathead National Forest in Region One. Efforts are underway to control and monitor this infestation. The Flathead Forest and the Remote Sensing Applications Center (RSAC) entered into a project to evaluate the Kodak DCS 420 CIR digital camera for mapping and monitoring Tansy Ragwort. The main goal of the project was to transfer the digital camera technology to the forest. This paper will discuss the technology transfer methods, training and the results of mapping Tansy Ragwort with the digital camera. Future applications, support and implementation of this technology region wide will also be presented.

New Technologies in the Creation of Digital Orthophotography
Purpose: Demonstration and discussion of new features in orthophoto creation and the resulting advantages in the final product.

Becky Morton, Horizons, Inc.
3600 Jet Drive, P.O. Box 3134
Rapid City, ND 57709-3134
Phone: (605) 343-0280 Fax: (605) 343-0305
Email: "Becky Morton"<sales@horizonsinc.com

Tall features in aerial photography have always presented a challenge to the functionality of digital orthophotography. Tall features appear to lean away from the center of the photograph usually obscuring other features in the photography. Recent advantages in orthophoto creation now allow solutions to these problems.

The Montana Cadastral Mapping Project - An Update

Stu Kirkpatrick
Montana Department of Administration
Room 219, Mitchell Building
125 North Roberts
Helena, MT 59620-0113
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Email: skirkpatrick@mt.gov

A short, low tech, low key information session on the progress and status of the project. At the writing of this abstract the project does not have the official status of being started. However work is being accomplished. We will examine the nature DOA/ISD=s automated parcel capture program that incorporates the BLM=s GCDB data the Department of Revenue=s CAMA database to create digital land parcels based on legal descriptions. Various scenarios for both parcel creation and maintenance will be presented and the pros and cons of different methodologies discussed. Partnership opportunities that will provide the data to cooperators at the lowest possible cost will be explored as will the current financial outlook. A ten to fifteen minute question and answer period will be provided.

The Montana Local Government GIS Coalition

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Geographic Information & Analysis Center
P.O. Box 173495
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Email: burton@guava.glac.montana.edu

Most rural counties in Montana have not implemented GIS technology and those who did have struggled to acquire the technical expertise and data necessary to succeed. Many local governments are understandably reluctant to convert their informational resources to a digital format not only for financial reasons but also due to the confusion on where to begin while being inundated with vendor information. The Geographic Information & Analysis Center at MSU has been involved with the issues facing local governments for several years and was awarded a grant to establish and maintain the Montana Local Government GIS Coalition (MLGGC).

In the three years since its inception, the MLGGC has achieved all of its goals including creating a forum for communication and mutual support among local governments, providing training opportunities, and promoting a bottom-up approach to data acquisition.

The MLGGC is now entering the next level of its existence: several new endeavors are planned, many of which involve a greater focus on the rural counties of our state and how they can achieve more with fewer resources. This presentation will describe the MLGGC's objectives, both past and present, and it will also allow time for an open discussion on how this organization can beter serve its membership.

Ownership Parcel Mapping for the "Have Nots"

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Geodata Services, Inc.
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Missoula, MT 59801
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Email: geodata@geodata-mt.com

Local government officials without a large population or tax base (and without GIS staff) take heart. There are productive, low cost steps you can take to begin building a useful and workable interim GIS database for ownershp parcels. Ken Wall, president of Geodata Services, Inc. in Missoula will present a working model developed for Ravalli County that involves developing a point database built on georeferenced scans. The process is supplemented by a geographic coordinate database (GCDB) map linked to CAMA. With this method you can get up and running in months, not years.

Natural Resources Track

Mapping and Modeling Wildlife Species Distribution for Biodiversity Management

Richard J. Aspinall, Gretchen Burton and Lisa A. Landenburger
Geographic Information Analysis Center
Montana State University
Bozeman, MT 59717
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Email: aspinall@sun2.giac.montana.edu

The use of GIS to manage species distribution data in conjunction with environmental data offers opportunities to develop integrated databases for mapping, analyzing and modeling biodiversity. This paper describes data from maps of species records and their use in three types of model of species distribution constructed using ARCINFO. The models use i) a simple index of habitat preference, ii) statistical description of the environmental conditions with

which the species is associated, and iii) a spatial model based on Bayes theorem. The appropriate use of these methods is discussed in the context of biodiversity management using examples from the Cairngorm Mountains in Scotland and Yellowstone National Park in Montana.

GIS Mapping to Identify Restoration Priorities on the Blackfoot River

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University of Montana
Missoula, MT 59812
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Email: marler@selway.umt.edu

Montana Fish, Wildlife and Parks has an active and successful habitat restoration program in the Blackfoot River drainage. Part of its success relies on cooperative efforts with landowners to address riparian impacts. GIS Mapping is an effective tool for the organization and visualization of data related to restoration needs. In the fall of 1997, I mapped plan community types, ownership, eroded bank sections, and riparian health along the Blackfoot River from Nevada Creek to the North Fork confluence (11.2miles). These features were digitized as separate layers over high-resolution imagery (1-m pixels) of the study area using ArcView. Incorporating this data into a GIS project facilitates data analysis at various scales and in multiple contexts. It is a powerful and accurate way to present information to landowners, and can help managers to identify priority areas for future habitat restoration projects.

Vendor Track

Arc/Info Application Development with Visual Basic

Chuck Lewis
ESRI, Inc., Olympia
606 Columbus Street NW, Suite 213
Olympia, WA 98501-1099
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Email: clewis@esri.com

Purpose: This session will introduce and demonstrate the use of the ARC/INFO Open Development Environment (ODE) in Visual Basic. This is a new GIS development environment that is provided with ARC/INFO 7.1.2.

Description: Learn how to develop ARC/INFO applications in Visual Basic using the new Open Development Environment (ODE). ARC/INFO ODE is a collection of programmable GIS objects that application developers can use to create their own menu interfaces, icons, buttons, and selection boxes using industry-

standard programming environments such as Visual Basic, PowerBuilder, TCL/TK, Java, C++, and others. The ODE's purpose is to deliver the complete functionality of ARC/INFO through a C interface on both UNIX and Windows NT platforms. The Windows NT ARC/INFO ODE also includes powerful ActiveX objects for each of the ARC/INFO environments. Many existing AML applications can run unmodified within an ODE environment. This session will introduce the components that ODE provides, and will demonstrate how Visual Basic can be used to design an application based on how you want it to look and behave.

Tuesday Afternoon Concurrent Sessions
1:30 P.M. to 5:00 P.M.

Native American Track ~ Mapping Indian Country 1998

Setting Up A GIS/GPS Lab at a Small Tribal College

Linda Weaselhead
Salish Kootenai College
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Ronan, MT 59864
Email: Linda_Weaselhead@skc.edu

GIS (Geographic Information Systems) and GPS (Global Positioning System) offer valuable tools to both the instructor and the student. A GIS/GPS Lab at any college would be of great value as a learning tool. Staffing can be found in existing instructors or in students interested in GIS/GPS doing internships or work study. Funding can be found in new grants. Existing equipment and grants can be used as matching funds. Salish Kootenai College is in the early stages of setting up their lab. This outline of what we have done and what we plan to do will hopefully help others who would like to set up a lab at their school.

Intertribal GIS Council Initiative on Indian Land Records

Bill Northover
Confederated Tribes of Umatilla
Intertribal Council Chair

The Intertribal GIS Council (IGC) is a national, Native, non-profit organization dedicated wholly to promoting tribal self-determination by improving management of geographic information and building intertribal communications networks. The IGC was established in 1993 to educate native people and tribal organizations about the many applications of spatial data technology and to promote

successful use of GIS for effective management of native land and associated natural, human and cultural resource values.

The IGC Land Records Committee under a grant from the Indian Lands Working Group is exploring the feasibility of designing the specifications for a GIS base application for the management of land records information. The impetus for this effort is the issue of fractional land interests. While this concern does not affect all tribes, there is sufficient interest, particularly among the northern tier tribes to employ the subject of heirship on the fractionated lands as the messenger to raise the awareness for the need of a comprehensive, spatially driven, land records management system in Indian Country.

The IGC Land Records committee has three objectives for this project: 1) Engage Tribal and BIA staff from both the realty and GIS arenas in meaningful discussions to educate one another bout our specific disciplines. 2) Develop a vision for what a truly integrated land records management system should look like and encompass. 3) Create a technical working group to examine the potential specifications and components that would be necessary to build improved applications.

Organizing the Repatriation of Native American Human Remains and Cultural Artifacts

Betty White
Repatriation Office
National Museum of the American Indian

The Repatriation Office at the National Museum of the American Indian (NMAI) was established in 1990 by the National Museum of the American Indian Act (NMAIA). The NMAI Act requires the Smithsonian Institution to prepare an inventory of native American human remains and funerary objects and to repatriate such material on request to culturally affiliated Native Americans. The Act authorizes the assembly of a Board of Trustees and empowers them to write policy. The collections Policy, written by the Board in 1992, contains repatriation policy and procedures for the return of human remains, funerary objects, ceremonial objects, and communally owned objects. In 1990 the NMAI also voluntarily adopted for guidance the principles contained in the Native American Graves Protection and Repatriation Act (NAGPRA) which outline the inventory and repatriation of sacred objects and objects of cultural patrimony.

In 1996, Congress amended the NMAI Act to include a deadline for the distribution of inventories and summaries by no later than June 1, 1998. In addition, the amendment requires the Smithsonian Institution to prepare a summary of unassociated funerary objects, sacred objects and objects of culturall patrimony, similar to the requirements set forth under the NAGPRA. However, in November 1993, prior to the deadlines imposed upon the Smithsonian Institution under the amending legislation, the Repatriation Office at NMAI submitted the combined summaries and inventories of the NMAI collection to all Federally recognized tribes. The Repatriation Office organized a second

mailing in November 1995 to inform Native American groups of approximately 5,000 new entries in the NMAI database.

Local Government Track

2000 Census

Jim Castagneri
U.S. Census Bureau
11177 W. 8th Ave
Lakewood, CO 80215
Phone: 303-231-5015 Fax: 303-231-5082
Email: Castagne@census.gov

The Census is coming! The countdown to Census 2000 has begun and the objective is to provide a faster, less costly and more accurate census. Plans for the 2000 Census are built around specific strategies: building partnerships with local governments and community organizations; keeping the census simple; and using technology intelligently. Understanding how the census will be taken and then partnering with the Census Bureau on programs such as the Local Update of Census Addresses, TIGER Updates, Statistical Areas Program, Recruiting, and Promotional Activities will ensure an open process and a more accurate census for your community.

Sharing GIS Data and Applications Across Platforms

Chuck Lewis
ESRI, Inc., Olympia
606 Columbus Street NW, Suite 213
Olympia, WA 98501-1099
Phone: (360) 754-4727 Fax: (360) 943-6910
Email: clewis@esri.com

Purpose: This presentation will discuss and demonstrate various ways to make your GIS data and applications accessible across UNIX, NT, Windows, and the Internet.

Description: This session will discuss different ways to share GIS data and applications across different hardware platforms and throughout complex environments. A single solution approach will not be the focus. Many practical constraints will be considered, such as implementation time, operating systems in use, cash flow, network environment, etc., etc. Solutions discussed will range from Arc/Info, MapObjects, AarcExplorer, MapObjects LT, Internet Map Servers, web browsers, and many others, but not with the intent that you need all of them to get the job done. This session isn't just for large organizations with large budgets!

Enhanced 911

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The Global Positioning System and Geographic Information Systems (GPS/GIS) have aided local governments in developing and implementing Enhanced 9-1-1 Telephone Systems. E-911 allows dispatchers and emergency responders to locate callers based on unique locatable addresses and detailed mapping. GPS data and Geolink software combine to allow counties or cities to drive their road network and map road centerlines and collect attribute data, such as surface type, no. of lanes, etc. In addition, the locations of all structures and their attributes, such as structure type, resident, current address, are collected. The raw data is then processed to create a GIS coverage, which can be used to assign logical addresses, conduct sign inventories, prepare road atlases, and create Master Street Address Guides and emergency service zones which are the backbone of E-911. Previously assigned and vaguely referenced "RR and Box" addresses can be replaced with unique, locatable addresses for each structure. Detailed maps are provided to emergency responders to allow quick response. Other local government agencies, such as the Highway Department, Tax Assessor, and Planning/Zoning can also benefit from the GIS base by adding their own layers of information. E-911 is often used by local governments as a catalyst to implement a land records modernization effort with comprehensive mapping and address records updating.

The Use of GIS and GPS Technologies for 9-1-1 mapping and Rural Addressing

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James O'Loughlin will share his organization's experience with the use of GIS and GPS technologies in order to assist in the difficult tasks of mapping and rural addressing required for the implementation of Enhanced 9-1-1 system.

Landtype Associations of the Northern Region – An Electronic Environment Assessment Tool

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An age old challenge for scientists had been finding methods of distributing specialized data in a format that is easy to access and interpret for their less specialized audience. By taking advantage of current electronic publication technology, that obstacle can now be significantly reduced. This presentation will demonstrate the recently released CDOM of the landtype association ecological mapping compiled by the Northern Region of the Forest Service. Information on the CDROM links maps, photos and other graphics to descriptive narratives, allowing the user to view images of over 90 Arc-Info map compositions, 500 pages of text and numerous charts and tables using the best single source of information on soils for Northern Idaho and Montana and provides a consistent basis of geomorphic characteristics intended for use in watershed analysis and planning. The presentation will describe how this coverage of over 30,000 polygons for an area of roughly 40 million acres was created; the steps used in attributing the map theme; and will also describe the methods used to transfer the Arc generated map compositions, analysis tables and narrative text into user-friendly PDF image files that were then assembled into this electronic publication.

The National Hydrography Dataset

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The National Hydrography Dataset is the culmination of recent cooperative efforts of the U.S. Environmental Protection Agency (USEPA) and U.S. Geological Survey (USGS). It combines the best of the USEPA Reach File (RF3) and USGS Digital Line Graph (DLG) hydrography files: hydrologic ordering, hydrologic navigation for modeling applications, and a unique identifier (reach code) for surface water features from RF3; and the spatial accuracy and comprehensiveness of DLG hydrography.

Consequently, the National Hydrography Dataset incorporates the criteria st out by the FGDC. The National Hydrography Dataset is designed to provide

comprehensive coverage of hydrologic data for the U.S. While based on 1:100,000-scale data, the National Hydrography Dataset is designed to incorporate – and encourage the development of higher-resolution data required by many users. It will also facilitate the improved integration of hydrologically-related data in support of the application requirements of a growing national user community and will enable shared maintenance and enhancement.

StreamNet
The Northwest Aquatic Resource Information Network
A Regional and Statewide Information System
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StreamNet is a cooperative venture between the Columbia Basin's state fish and wildlife agencies, tribes and federal natural resource agencies through a partnership involving the states of Oregon, Washington, Idaho, and Montana funded by the Bonneville Power Administration. StreamNet was created in 1994 when the existing Rivers Information Systems from the four states and the Coordinated Information System, a large anadromous fish dataset, were merged. StreamNet serves the Northwest Power Planning Council's Fish and Wildlife Program, Endangered Species Act activities and other state and regional-level planning, policy, and management activities. The overall goal of the project is to create, maintain, enhance, and provide public access to regionally consistent natural resource data.

Thre StreamNet data system consists of a series of aquatic resource databases on fish production, fish and wildlife references and stream hydrography. Public access is provided tabularly and geographically through the Internet, distributed systems, FTP, and custom products. In Montana, the program is administered by Montana Fish, Wildlife and Parks (MFWP) Informatin Services Unit in Kalispell. Data emphasized include fish species distribution and the genetic sampling, population trend data, production counts and historic distribution to verify these data; an annotated 1:100,000 stream hydrography layer and aquatic restoration projects. Major projects supported with these data include all fish species of special concern management plans, the MFWP Stream Rating Program, and MFWP GIS Services.

Maps and Geographic Information Systems as Stories

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Maps and Geographic Information Systems tell stories about place. How do they go about telling these stories? Do some do a better job than others? Do all maps tell the same story or are there different kinds of stories, like books or music? How does a "country western" map differ from a "baroque"? How does a "romance" GIS differ from a "mystery"? What are these story types and why should we be interested or care in how maps tell stories? Looking at the map or GIS as a story can help the geographer to better communicate and focus the organization of spatial information. Telling stories about place IS the underlying but often hidden agenda with all maps and GIS. Becoming clear about the story allows us to become clear about the place we are mapping and the focus of our efforts.

K-12 Education Panel
Moderator: Annette Cabrera
Panelists: Ed Madej, NRIS; Margie Lubinski, USFS; Marlene Zentz, Billings Public Schools

For the first time at the MT/ID GIS conference, there will be a session devoted to GIS K-12 Education. In the past several years, educators have shown a growing interest in incorporating GIS into their curriculum. Ed Madej, an ArcView instructor, will be discussing the role NRIS plays in making software and training available to teachers. Margie Lubinski will discuss her experience with adopting a school and how a GIS professional can assist in bringing GIS into the classroom. Teachers who have 'been there and done that' will share their wisdom based on experience. After the speakers, there will be time for a question and answer session. Anyone who is interested in GIS K-12 education is encouraged to attend and participate in the discussion.

Use of a GIS to Evaluate Aquifer Vulnerability at Big Sky, Montana

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Big Sky, an unincorporated resort community located 40 miles south of Bozeman, Montana, is experiencing rapid growth. Groundwater resources are presently used to meet 100 percent of domestic and public water supply needs. Because water needs will increase with future growth, and due to the recognized adverse health effects of groundwater contamination, protection and management of these resources is a vital concern. The discovery of leaking sewage lagoons combined with resort expansion and proposed development indicated a need to assess aquifer vulnerability at Big Sky. Aquifer vulnerability assessments provide a tool to help resource managers protect and manage groundwater and, ultimately, surface water. As management tools, vulnerability studies help identify aquifers that may be sensitive to certain land uses and thus require more protection.

This study examines the relative intrinsic vulnerability of local aquifers to nonpoint source contamination applied at the land surface. Although nitrate and pesticides are the contaminants of primary concern, the assessment evaluates intrinsic vulnerability without consideration of contaminant-specific attributes and behavior. An intrinsic study, which depends solely on hydrogeologic factors, is necessary due to limitations imposed by a lack of spatial data and the complexity of the hydrogeologic system.

ArcView GIS® was utilized to map vulnerability parameters and to manage, analyze and display data in an effective manner. As opposed to older, more time-consuming methods of hand-preparing overlay maps, a GIS offers an efficient technique to combine and analyze vulnerability parameters using an index and overlay method. The delineation of existing water quality and ability to monitor future impacts was previously hindered by a lack of background data. This study provides hydrochemical, hydrogeologic and aquifer vulnerability data in a GIS format and establishes a foundation for continuing work in the area.

The results of the analysis indicate that the highest vulnerability correlates with the alluvial aquifer adjacent to the West Fork of the Gallatin River and lower reaches of the Middle and South Fork tributaries. Significantly, the zone of highest vulnerability underlies Meadow Village, a subdivision with one of the highest population densities in the Big Sky area. The vulnerability of the alluvial aquifer in the Meadow Village area may be higher than mapped due to increased recharge and contaminant loading related to the golf course, condominiums and single-family dwellings.

As expected, low vulnerability coincides with clay-rich glacial till and earthflow – materials that provide the greatest potential to attenuate contaminants and impede their downward movement. With the exception of the Meadow Village area, much of the Big Sky area and many existing subdivisions occur in areas mapped as having low to moderate vulnerability. However, it must be emphasized that vulnerability rankings are only relative indications of vulnerability based upon the parameters included in the analysis. Data resolution and the inherent heterogeneity of geologic materials can lend itself to inaccurate representations of vulnerability. Furthermore, the inclusion of other vulnerability parameters may alter the resulting prediction of vulnerability.

Space Imaging Satellite Imagery Products and Applications

Dave Ward
Space Imaging Eostat
(no abstract received to date)

Using Multispectral Digital Aerial Photography in Remote Sensing and GIS Applications

Bruce Burger, Positive Systems, Inc.

Purpose: To provide a survey overview of the potential benefits derived through use of high resolution, multispectral digital aerial photo imagery in GIS-related applications.

Summary: As maturing GIS environments demand more detailed data layers to meet complex decision-making needs, remotely sensed imagery's value and utility are contributing to a wider array of applications. Though the continued promise of soon-to-be-available, inexpensive, easily obtainable imagery from one-meter satellites offers hungry users a glimpse of what might be, various delays have kept the burden on workhorse aerial sensing platforms to deliver today's high resolution image data. Some of these evolving applications may be well-served by the high resolution satellites of tomorrow. However many will continue to be served more cost-effectively from airborne platforms.

This presentation highlights a widely used source of 0.5 meter to 3.0 meter per pixel GSD (Ground Sample Distance) multispectral imagery, the ADAR System 5500 digital aerial photography system. Multispectral imagery is captured by the ADAR System from standard aerial photography aircraft. Each image is comprised of four separate bands, similar to Landsat TM Bands 1-4, in the blue, green, red and near infrared reflected wavelengths.

Applications requiring information describing vegetative health over large areas benefit from this type of imagery. These include environmental compliance (municipal storm water run-off analysis, population and industrial impact studies), natural resource management (forestry, wetlands, riparian and coastal resource analysis), and rapidly expanding applications in precision farming (stress detection, crop performance and yield map correlation). Examples of real world projects -- from definition of the application need, to specification of the image

product, to incorporation of the imagery into typical GIS environments will be discussed.

Automated Cartographic Feature Selection using Machine Learning Methods

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Integrated Geoscience, Inc. (IGI) and Dr. David Opitz of Rocky Mountain Adaptive Software (RMAS) are teaming to develop a novel machine-learning method for digital image analysis and feature-extraction mapping that is superior to existing image classifying tools currently being used at NASA because it incorporates a powerful new algorithm called ADDEMUP that uses genetic algorithms (GAs) to explicitly search for a highly diverse set of accurately trained neural networks to be used in combination. Combining the output of multiple trained neural networks is an extremely powerful classification technique as long as there is some disagreement among the network's predictions. Training on different subsets of features should help promote this required disagreement. ADDEMUP addresses the central problem faced by digital image analysis - how to select the features (or combinations of features) that are most relevant for learning.

ADDEMUP uses the empirically proven KBANN algorithm (Towell, 1994) to translate the rules in the domain theory (feature selection subset) into a set of neural networks, thereby determining the network's topology and initial weight settings. Such a network is called a knowledge-based neural network. KBANN then refines these reformulated rules using standard neural-learning techniques such as backpropagation. ADDEMUP attempts to initially create an entire population of networks that comes from the same domain theory and yet is diverse. It does this by randomly perturbing the KBANN-generated network at various nodes, thus creating diversity about the domain theory. ADDEMUP's crossover and mutation operators were specifically designed for knowledge-based networks.

IGI provides Geographic Information Systems (GIS) consulting, training, and customized software application development services to government and private industry clients throughout the Northern Rocky Mountain region. As an Authorized Business Partner of ESRI, the world's largest GIS software developer, and a value added reseller (VAR) for Space Imaging EOSAT. we are in a unique position to exploit the union of GIS technology and high-resolution digital imagery. The next wave of mapping services will focus on creating or updating existing GIS land-base coverages from sub-meter digital imagery for

improved decision-support in environmental monitoring, natural resource exploitation, and engineering project management. Automated and semi-automated cartographic feature extraction software applications will play a major role in meeting this demand for rapid geospatial data integration and analysis.

IGI and Dr. Opitz plan on developing the ADDEMUP algorithm into a commercial mapping application for use with ESRI's ARC/INFO and ArcView GIS software products. Our goal is to produce an advanced cartographic feature extraction application that rapidly maps features such as roads, houses, buildings, hydrography, or any other type of selected features. The product will be beta-tested and marketed through the ESRI Business Partner service network. The target market is the new generation of desktop mapping system (DMS) users who are working in the Windows NT environment. Special emphasis will be placed on the utilization of existing GIS coverages as training data and on automated techniques for batch processing large image databases.

Wednesday Morning Plenary Session

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American Information Policy:
Historical Principles and Their Application to the Modern Information World

Anyone interested in access to publicly held data comes, eventually, to a fundamental question –- What rights do I have in the data and information assembled by a government in order to execute its mandated functions? How do you stand on this issue depends, as the saying goes, on where you sit. A government official may seek the right to determine conditions under which others have access to the agency's data because of a desire to generate sustaining revenues or protect the agency from a variety of vicissitudes. A citizen may assert the right to have data withheld from others because of personal or commercial privacy concerns. Alternatively, another citizen can demand the right to the data because they are considered necessary to an understanding of what the government is doing. Finally, a private organization may seek a right to the data in order to support activities that benefit many others in the community as well as the organization.

Government information and resource management policies have a history as old, or older, than our federal constitution. Elements of that history have informed our national land policy, economics and politics as well as our

information regimes, including those of copyright and freedom of information. The history is one of a balance between competing perspectives and interests. Changes, even to the last detail, disturb the traditional balance. Do the modern circumstances suggest a significant change in the balance of interests? Alternatively, should we strive to maintain the traditional balance even as the details are altered?

The history and perspectives will be reviewed an applied, with examples, to the modern information circumstances. Fundamental principles based upon this history and applications will be identified and used to draw conclusions about modern information policy.

The American Society for Photogrammetry and Remote Sensing (ASPRS)
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Rogers will discuss the organizational structure of ASPRS, benefits and membership categories and the future of professional organizations.

Wednesday Morning Concurrent Sessions
10:30 A.M. 12:00 Noon

Local Government Track

Access to Information – Rights and Responsibilities
Moderator: Fred Gifford, Natural Resources Information Service, Montana State Library
Panelists: Bill Northover, Intertribal GIS Council Chair
Dr. Earl Epstein, Professor, School of Natural Resources, University of Ohio
Steve Hellenthal, Manager of Data Processing, Yellowstone Co.

Information technology is having an increasing impact on the lives of Montana's citizens. As GIS professionals many of us develop and use important components of the public's information resources. When doing this we are constantly challenged to re-examine long standing ideas about public access to information, cost recovery, and rights to privacy. This panel will explore how the existing legal framework in Montana influences these issues, how various government agencies are interpreting their responsibilities, and how groups outside of Montana are currently addressing similar issues.

Proposed GPS Spatial Accuracy Categories for Data Acquisition

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Given the enormous quantity of Global Positioning Systems (GPS) 'Resource Grade' (2-5 metre) data that is gathered, it is clear that there exists a need for a methodology to characterize the quality of the spatial accuracy to facilitate data acquisition and distribution. Agencies have adopted policies in an attempt to describe the spatial quality of the data, however these processes do not serve the larger user community. This paper proposes the adoption of 'Spatial Accuracy Categories' which would segment the GPS spatial accuracy into categories. All GPS data would carry a 'Spatial Accuracy Category' alphanumeric which would define the quality of the data. The specifics of spatial quality have been addressed in the Federal Geographic Data Committee 'Draft Geospatial Positioning Accuracy Standards' as meeting a 95% confidence interval. The spectrum would be divided into the following divisions with the 1 metre to 30 centimetres still unresolved and open to discussion.

100 Metres < -------(Level A)------<10 Metres<---(Level B)----< 1 Metre < ---(Level C)---< ?

There could also exist the option for the insertion of an additional numeric value to further define the 95% confidence interval. The purpose of this presentation is to facilitate a discussion of this proposal.

Phoenix Project/Idaho Power AM/FM

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Deregulation of the Electrical utilities industry has many energy providers looking for ways to stay competitive. Customer satisfaction and work management are the driving forces behind the recent insurgency of Information Technologies being implemented at utilities throughout North America. AM/FM/GIS, once thought to be an expensive technology that produced little benefits, now is the focal point for many decision critical support tools. While this new environment has created many challenges for utility IT professionals, it has also given them new opportunities. This presentation will explore some of the new Information Technologies that are being implemented at Idaho Power company, including AM/FM/GIS, GPS, Outage Management System (OMS), Automated Meter Reading (AMR), Distribution Automation (DA) devices, Real time historians and

the integration of many existing legacy systems like Supervisory Control and Data Acquisition (SCADA) and Customer Information Systems (CIS).

Using GIS in Healthcare

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Many healthcare institutions have discovered the value of geographical technology for marketing and planning decisions. GIS technology offers great possibilities for predicting who will require healthcare services by age, sex and race; track the movements of at-risk populations. GIS/GPS have been used in various emergency management systems planning and dispatching funcitons. In the coming years, we should expect to see major medical centers investing in the GIS/GPS technology as much as they presently invest in traditional clinical technology. Effective data management is essential to the healthcare industry's marketing success. Healthcare companies are turning to spatial data integration to identify new customers and their needs, and recognize and comprehend today's market influences. In the fiercely competitive healthcare marketplace, expanding existing service areas and identifying new markets requires effective market analysis. Advances in geographic technology are enabling healthcare providers to make more informed strategic decisions.

This study describes the application of a PC-based GIS developed for healthcare analysis in Billings, MT. Using MapInfo from MapInfo Corporation, the Montana Central Tumor Registry data was converted to a geographical database by integrating the statistical tables with the state, city and county maps. The geographical database was then queried and analyzed to provide a wide range of information about patient distribution and profile the predefined service area. The information was utilized to determine the need for a new service (Stereotactic Radiosurgery used for various malignancies and abnormalities of the brain) in Central and Eastern Montana. This paper describes the methodology used and its results.

Status of Elk Habitat in North America

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The mission of the Rocky Mountain Elk Foundation (RMEF), headquartered in Missoula, Montana, is to ensure the future of elk, other wildlife and their habitat. An important step in achieving that mission is a thorough understanding of the distribution, condition and key limiting factors associated with elk habitat. Toward that end, the RMEF entered into an ambitious geographic information system (GIS) project with Geodata Services, Inc. of Missoula: "The Status of Elk Habitat". The Project will gather expert opinion and mid-scale data to complete a baseline mapping of millions of acres—the entire North American continent – within an ambitious two-year timeline. This presentation will provide an overview of the project.

GIS-based Study of Late Pleistocene Glacial Advance, Flathead Indian Reservation, Montana

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The farthest southern advance of the continental ice sheet during the late Pleistocene epoch on the land of the Flathead Indian Reservation is currently being studied by a team of two faculty and four student researchers at Salish Kootenai College using GIS analysis tools. The recent establishment of a GIS laboratory at SKC and various approaches for incorporating GIS training within the SKC curriculum are described. We have found hands-on use by students working on in-depth research projects to be the most effective GIS learning environment. For this project several types of geological data are being analyzed using ArcView 3 with the Spatial Analyst extension: subtle surface topography features mapped using differential GPS techniques, subsurface stratigraphy obtained from well logs, and surface geology from field reconnaissance of surface exposures. Avenue scripts were written in-house to automate data entry. Preliminary results suggest that the ice sheet advanced significantly farther south than previously thought. This is significant for the understanding of the ground

water hydrology of the Mission Valley. This paper will be of particular interest to other tribal colleges considering acquiring GIS capability at their institutions.

Generating Non-Standard Soil Survey Interpretations with Geographic Information Systems

T. Keck, K. Blount, D. Strom, and T. Tully

USDA soil surveys have for many years provided valuable soils information for making sound conservation planning and land management decisions. More recently, technological advances in computers, database management, and geographic information systems have greatly expanded the potential applicability of this information. Unfortunately, they also increase the potential misuse of information as soil surveys are increasingly used in ways that are not compatible with how soils data was collected.

The Silver Bow Soil Survey was designed from the start to address specific soil/resource information needs for Silver Bow County. Major natural resource issues were identified with the help of local input. Weed infestations, impacts of subdivisions, riparian management, and locating suitable soil materials for reclamation were all major concerns in the county. None of these issues would be specifically addressed by standard, agriculture based, soil survey interpretations.

The objective of this presentation is to discuss appropriate use of soil survey information within a GIS environment and to show, with examples, how non-standard soil survey interpretations can be generated through modifications in data collection and application of GIS technology. Examples include: mapping weed infestations, identifying areas susceptible to weed invasion, and generating maps of sensitive groundwater areas by land owner class.

Vendor Track

Internet Mapping in 5 Minutes with ArcView IMS

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Purpose: This presentation will introduce and demonstrate how to build an Internet mapping application using the new ArcView Internet map Server extension. Customization capabilities will also be demonstrated.
Description: Learn how to quickly build Internet mapping applications using the new ArcView Internet Map Server (IMS) extension. Whether your needs are building internal (intranet) or public web site applications, ArcView IMS can help

you quickly reach your goal of building a robust mapping application. The IMS extension lets you use ArcView GIS out of the box to put mapping and GIS applications on the Internet. It includes a built-in setup wizard and ready-to-use Java applet to help you publish your data quickly. Interactive maps can be created from a number of different types of spatial data including ArcView GIS shapefiles, ARC/INFO coverages, Spatial Database Engine (SDE) layers, DWG, DXF,DGN, and a variety of graphic images. This presentation will demonstrate how to build an Internet mapping application from scratch. Customization capabilities will also be demonstrated.

Introduction to ArcView Tracking Analyst

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Purpose: To introduce the ArcView user to the forthcoming Tracking Analyst extension from ESRI.

Summary: The combination of location (geographic space) and time are crucial to many current and potential GIS applications. This introduction to the ArcView Tracking Analyst will include a discussion of this exciting new extension for ArcView GIS and its ability to connect to external real-time locational devices, playback previously recorded locational data, and set user-specified locational and attribute tracking "actions." A portion of the presentation will deal with the new terminology associated with adding the element of real-time locational data into the ArcView environment. Some examples of potential applications will be provided as well as a demonstration of the ArcView Tracking Analyst.

Wednesday Afternoon Concurrent Sessions
1:30 P.M. to 3:00 P.M.

New Technologies Track

An Investigation of Dynamic Simulation: The Integration of GIS with Air Dispersion Modeling to Facilitate Data Handling and Visualization

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Air dispersion models in their current from are powerful tools for predicting the transport spatial distribution and concentrations of pollutants such as sulphur

dioxide. It is recognized, however, that a deficiency exists in their data handling, interpolation and visualization abilities. Amy air dispersion models require vast amounts of spatially referenced data, (e.g. large receptor grids, point source emissions, topographic grids) which can be time consuming to organize and prepare. Model users and students may not be accustomed to data riches, and the apparent complexity of existing modeling tools may inhibit or even prevent the testing of new hypotheses. In terms of visualization, spatial patterns and pollution hot spots may be difficult to conceptualize from the models raw numerical output.

In this research project, a pollution prediction simulator was developed using GIS to facilitate the data-handling and visualization aspects of air pollution dispersion modeling. Methods were developed for directly linking the USEPA's Industrial Source Complex Short Term 3 (ISCST3) dispersion model with Environmental Systems Research Institutes ARC/INFO GIS. The resultant system, the Geographical Pollution Prediction Simulator (GPPS), is an agglomeration of a carefully designed interface, a powerful air pollution model and GIS. This work-bench of tools is shown to be an effective teaching tool allowing "What-If" scenarios to be easily modeled and visualized, and has the potential to significantly enhance the quality of the environmental decision maker's working environment. Modeling and visualization are engaged together in a computationally based, dynamic interactive environment.

On-Line Internet Learning Resources for Distant GIS-Education

Dr. Shivaji Prasad
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Knowing **where to find** GIS-related information in Cyber Space for beginners of GIS is crucial. This paper provides some of the important URL addresses for various GIS-topics. The intent is this paper is to encourage distant-learning in Geographic Information System (GIS). It is hoped that this paper will encourage on-line learning and will provide an opportunity to seek knowledge from the vast on-line Web-based resources for novice distant learners of Geographic information System (GIS). It will also provide flexibility toward time- and place-constraints as is with the traditional methods of classroom oriented environment. Distant Learners in GIS can set their own pace of learning fitting to their own circumstances. A word of caution regarding the limitations of **which and how much is possible** and **which and how much is not possible** through the Web-based Distant education in the context of GIS is highlighted.

Among the search engines to access Web-base GIS topics, Lycos, AltaVista, InfoSeek, Excite Search and LookSmart were among the best search engines recommended for GIS servers. Among the frequently cited programs and curricula for Distant -Education in GIS were from Kingston University's program and the University of Texas at Austin, the NCGIA (National Center for

Geographic Information and Analysis, United States of America), and UNIGIS at Manchester Metropolitan University (United Kingdom).

Since the nature of geographic phenomenon over the earth's surface may be very specific as well as quite variable in time and space, the GIS skills applicable to real world situations has to be learnt in face-to-face- situation, which otherwise may not be possible through a stand-alone, on-line, Web-based mode of delivery. There is no doubt that on-line distant GIS-education will put the **once-novice** in an advanced stage of learning and will enable and prepare them to learn actual applications and **know-how** suitable for a particular real-world phenomenon in significantly less time and with more understanding. However, the GIS learner has to physically sit in front of a computer terminal and perform GIS application skills and analysis specific to the real-world problem at hand. Also, as there is a **minimal-to-none face-to-face** interaction of one human element to another, and since **user-interacting-only-to-computer** in a **stand-alone** mode, there is a irrecoverable risk of loosing appreciation for human passion, social-bounds, and human culture.

Towards a redefinition of 'Scale' for digital geographic data

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Traditionally the scale of spatial data stored on maps has been a cartographic property that represents both the geographic and thematic information content as well as aspects of data quality. As spatial data from maps are transferred into GIS and as GPS provides a method for capturing spatial data without an intermediate map product, this cartographic model of scale becomes less appropriate, and, in many cases, can be misleading. In this paper I present a different approach to scale that is more appropriate to digital spatial data.

Scale is presented as a product of the interaction of three properties of geographic data: i) spatial dependence, ii) spatial heterogeneity and iii) sampling length. These determine the geographic and thematic information contents, data quality in both these, and the generalisation/aggregation behaviour of the data as 'scale' changes. The traditional cartographic scale of maps is a special case of this more general theoretical definition. This definition also serves as the basis for design and development of methods for analysis in GIS.

The role of each of the three properties of this definition of scale is illustrated using geographic data describing climate. Point and area sampling are used to demonstrate changes in the geographic and thematic information contained in the data. Some general principles for data capture and measurement of phenomena are identified.

Sharing Data in the Greater Yellowstone Area Using the GYADC

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The Greater Yellowstone Area Data Clearinghouse (GYADC) was established in an effort to address a regional need for sharing information across agency boundaries. Greater Yellowstone Area land managers rely on spatial data within their jurisdiction to aid in decision support systems but also gain significant insight from information collected by neighboring agencies. Agencies involved include, but are not limited to, National parks, National Forests, USGS, Fish and Wildlife Services, Bureau of Land management, Bureau of Reclamation, academic institutions in the states of Idaho, Montana and Wyoming, state agencies and numerous local county and city governments. The GYADC promotes the sharing of data where needed, provides a means to avoid duplication in developing costly data, and focuses on a common plan to create crucial missing data sets.

The GYADC went on-line in July, 1997 after compiling resources from a survey sent to participating agency representatives. Services provided by the GYADC include information about the Federal Geographic Data Committee, the development of a National Digital Geospatial Data Framework, and the National Spatial Data infrastructure; an explanation of the County Outreach Project, the Snake River Corridor Data Node and the Kelly, Wyoming Demonstration Project which are all associated with the GYADC development; the mechanism to search one or more notes within the National Geospatial Data Clearinghouse for data discovery; a bulletin board for posting questions, answers and announcements on-line; a metadata collection tool; an inventory of spatial data available through the GYADC node and a link to related GIS sites.

The GYADC Technical Advisory Group has been established in an effort to provide consistent procedures for data collection, creation and documentation, maintenance and transfer methods across the Greater Yellowstone Area.

Plan for Success – Strategic Planning for GIS

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As organizations attempt to integrate GIS technology and spatial data into their enterprise or departmental information systems they are often frustrated by

diverse data models, incompatible data sets, and redundant data flows. Often there is no individual or decision structure for resolving these issues. If left unresolved, these issues undermine even the best efforts of application developers and system integrators to fully exploit spatial data. An effective GIS strategic plan defines a systems architecture and organizational architecture that resolves these issues at a high level. It also provides the framework for continuing to resolve these issues at more detailed levels. This session provides an overview to the GIS strategic planning process and identifies keys to successful needs assessments, conceptual design, data development and maintenance planning, organizational planning and implementation planning.

Metadata and Frameworks Track

Metadata Resources

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GIS practitioners invest hundreds of thousands of dollars every year developing geospatial data. This investment can eventually become worthless if the developer leaves without taking the time to create metadata, or the "data about the data."

What exactly is metadata and why is it so important? Why do we need a standard? What are the components of the FGDC (Federal Geographic Data Committee) Content Standards for Digital Geospatial Metadata? What fields are optional and what fields are mandatory for FGDC compliant metadata? What tools are available to help GIS professionals enter their metadata? What other metadata resources do local people have available to them?

I was recently hired as the Metadata Coordinator for the State of Montana, and will address these issues, as well as questions or concerns from the audience.

Value-Added Metadata

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The purpose of this presentation is to illustrate an innovative solution to the metadata challenge. The Spatial Metadata Management System (SMMS), a relational database designed by Enabling Technology Inc., is a highly functional system for creating and managing FGDC compliant records. This tool can help state, local, and federal agencies begin integrating the metadata process into their business activities.

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Various agencies are using SMMS in order to begin integrating data management into their business process. Both the Washington State Department of Transportation and Bureau of Land Management – Portland are creating metadata records and currently posting compliant files to the Internet. However, the next phase of their projects will include a web-component that will allow complex keyword searching of the entire data warehouse. These organizations will ultimately benefit from the power of an easily accessible central data source.

The cost of collecting data is high. However, SMMS uses a relational database to reduce the cost of collection and preserve the investment in metadata records. By managing metadata in this fashion, if any aspect of a record changes, individual fields can easily be updated to the database. Also, the metadata layer accessed by the web-component allows for the retrieval of data down to a level of accuracy understandable to any user. Users can search using keywords, bounding coordinates, publication dates, etc., and hyperlink to the electronic distribution site of the located dataset.

The presentation will include an overview of the underlying academics of the SMMS data model, a brief description of the SMMS interface, case study highlights, and the future direction of this innovative approach to metadata management.

Metadata Frameworks in Local Government
Craig Rindlisbacher

Vendor Track

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