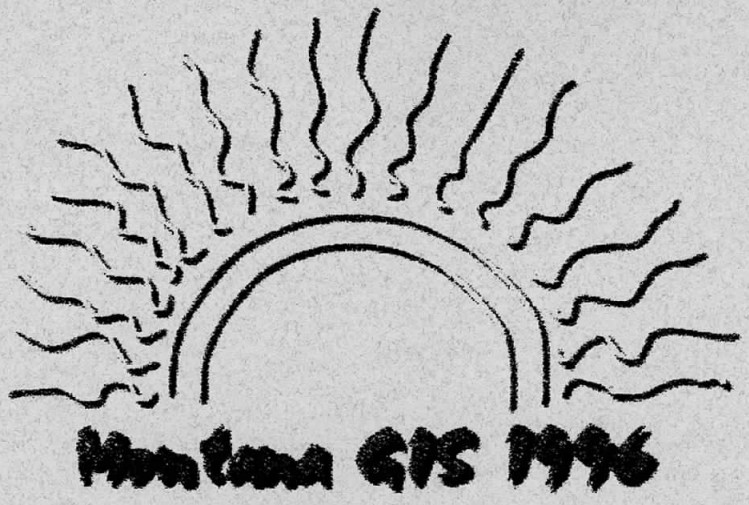
1996 Conference Program

8th Annual Montana GIS User's Group Meeting
April 1-3, Holiday Inn, Missoula, Montana.



"Sharing Information – From Local to Global"

Welcome! As our day-to-day activities take place we don't often realize how our world changes around us. Once the domain of specialists, geographic information systems (GIS) are quickly moving into our homes and businesses. Today you find map viewing and query tools embedded in everything from common spreadsheets to your car. The Web entices you to "surf-the-net" and query or download geographic information. Like every year , this year's conference program reflects the progress of the GIS profession and the issues that face our community.

For the next few days, we invite you to join your friends and neighbors from Montana, the Nation, Canada and other foreign lands in sharing insights into changes in the world of the GIS professional. You are encouraged to absorb and challenge the ideas presented here, but most of all you are encouraged to enjoy.

All Montana GIS conferences are sponsored by the **Montana GIS User's Group, Inc.**, a state wide consortium of public agencies and private businesses involved with the application and development of GIS technology. Special thanks this year to co-hosts **The University of Montana School of Forestry, Missoula County GIS Users' Group** and the **Natural Resource Information System**

SPECIAL GUEST SPEAKERS:

Daniel Kemmis (Speaking Tuesday at 8:15 a.m.)

Dan is currently the Mayor of Missoula, a former speaker of the Montana House of Representatives and was a Montana legislator for eight years. The immediate past Chair of the National League of Cities Leadership Training Council, Mayor Kemmis is also a member of the Board of Directors of the Kettering Foundation and the Pew Partnership for Civic Change as well as a Fellow of the Dallas Institute. He is the author of the book Community and The Politics of Place, and of The Good City and the Good Life, recently published by Haughton Mifflin Company. Mayor Kemmis has had articles published in national publications on such topics as the city center, community building, and the economy of the west. He has been recognized by the Utne Reader in 1995 as on of its "100 Visionaries."

Nancy Tosta (Speaking Tuesday at Tuesday at 9:00 a.m.)

Nancy is currently a Special Assistant to the Secretary of Interior, and a former Chief of the Branch of Geographic Data Coordination, U.S. Geological Survey, Reston, VA. She has led the crusade for data standardization, thus impacting every facet of GIS from hardware to software to services. Nancy has been key in developing the National Spatial Data Infrastructure and in gaining support for it within the administration and Congress. She also regularly writes column titled "Data Data" in the most widely circulated GIS magazine, GeoInfo Systems. Nancy keynoted one of the first Montana GIS conferences and we welcome back one of the most visible and vocal promoters of spatial issues at the national level.

Bill Huxhold (Speaking Wednesday at 8:10 a.m.)

Bill is Chairman of the Department of Urban Planning at the University of Wisconsin-Milwaukee. As the author of two books on urban geographic information systems, Managing Geographic Information Systems Projects, and An Introduction To Urban Geographic Information Systems, both with Oxford University Press, Bill is a one of the most respected authorities on urban GIS systems in the country. He is also a member of the editorial board of GeoInfo Systems and the URISA Journal. In addition to his teaching and research, Bill has had many years of practical GIS experience. He developed one of the first urban GIS systems for the City of Milwaukee in 1976 as management information systems director.

John R. Steffenson (Speaking Wednesday at 8:50 a.m.)

John is the Federal Program Manager for Environmental Systems Research Institute, Inc. (ESRI) in Boulder, Colorado and works with Federal agencies involved in natural resource management. Before coming to work for ESRI, John was a Program Manager for the USDA Forest Service in Portland, Oregon and led the GIS implementation on such projects as the President's Forest Plan under Jack Ward Thomas and the Columbia River Basin Ecosystem Management Project. He also served as staff consultant to the House Interior Sub-Committee on Mining, Forest Management and the Bonneville Power Administration in the early 1980's. John has degrees in Forestry and Geography and over 15 years experience working with Geographic Information System technology and land and resource management. He currently resides in Northern Colorado with his wife and two children.

CREDITS

1996 Program Committee:

Doug Burreson, Missoula County Surveyor's Office
David Delsordo, Confederated Salish & Kootenai Tribes
Fred Gifford, Natural Resource Information System (NRIS), Montana State Library
Sue Haverfield, Flathead County
Steven Holloway, Oikos Works, Inc.
Dan Jordan, City of Missoula
Stu Kirkpatrick, Butte-Silver Bow County
Kris Larson, Natural Resource Information System (NRIS), Montana State Library
Margie Lubinski, Lolo National Forest
Jeff Peters, Mountain Cad, Inc.
Scott Purl, School of Forestry, University of Montana
Michael Sweet, School of Forestry, University of Montana
Robin Ames Wall, Geodata Services, Inc.
Ken Wall, School of Forestry, University of Montana
Paul Wilson, Department of Geography, University of Montana
Missoula County GIS Users' Group

1996 Scholarship Recipients:

Montana State University - Billings:
Shane Cook, Kathy Olson
Montana State University - Bozeman
Mandy Lineback, Skip Repetto
University of Montana - Missoula
David Highness, Thane Mackey, Andrew Reed, Jill Sullivan, Ellen Voth
Confederated Salish & Kootenai Tribes
Richard Orton
University of Calgary, Canada
Denis Gourdeau

Montana GIS User's Group, Inc. Board of Directors:

Each year, the GIS Users' Group has elections for new board members at the annual conference. Board members serve a 2 year term, in accordance with the Users' Group bylaws. The current board members are:

- Stu Kirkpatrick, Butte Silver Bow County, President
- * Ken Wall, University of Montana and GeoData Services, Secretary
- * Kris Larson, Natural Resource Information System (NRIS)
- * Don Krogstad, Flathead National Forest
- * Fred Gifford, Natural Resource Information System (NRIS), Past President
- Loretta Reichert, Montana Department of Environmental Quality
- Hans Zuuring, University of Montana, Treasurer

The people with *'s by their names will have served their 2 year term by the time the conference rolls around again this April. The only exception to the 2-year rule is the President; the President becomes Past President, & serves an additional 2 years.

The Montana GIS Users' Group *THANKS* the following for their generous donation to 1996 Montana GIS User's Group Scholarship Fund Raffle:

Jim Flansburg
Boone & Crockett Club
The University of Montana Wildlife Spatial Analysis Lab
Montana Geographic Alliance, Jeffrey Gritzner
Montana GIS Users' Group Education Subcomittee
Tom Toman, Rocky Mountain Elk Foundation
DaVinci's Framing and Gallery
Environmental Systems Research Institute, Inc.
Mountain CAD, Inc.
Hitachi
PCI EPS, Inc.
Tom Golnar and Kris Larson (for many hour of scraping labels to help bring you *Spatial Ale*)
The Planning Committee and Other Assorted Ale Helpers

Montana GIS Users' Group Education Subcommittee:

Marcia Beckwith, National Geographic Society
Annette Cabrera, Yellowstone County
Jeffrey A Gritzner, Montana Geographic Alliance, The University of Montana
Sue Haverfield, Flathead County Clerk and Recorder
Steve Holloway, Oikos Works, Missoula
Kris Larson, GIS Program, Montana State Library
Margie Lubinski, Lolo National Forest
Alex Philp, Public Policy Research Institute, The University of Montana
Monte Sealey, Central Montana RDC, Inc.
Cliff Sisko, Bureau of Land Management
Michael Sweet, School of Forestry, The University of Montana
Ken Wall, School of Forestry, The University of Montana

The Montana GIS Users' Group also *THANKS* all of the helpers, speakers, and workshop presenters who stepped forward to make the 1996 Montana GIS Users' Group Conference a success. We couldn't have done it without you!

Vendors

1. Marshall & Associates, Inc.
2. IZ Labs, Inc.
3. Electronic Data Solutions, Inc.
4. SMD Electrical and Mechanical Engineering
5. PCI EPS, Inc.
6. Hitachi
7. Environmental Systems Research Institute, Inc.
8. Nies Mapping Group, Inc.
9. Mountain CAD. Inc.
10. Integrated Geoscience, Inc.

MONTANA GIS 1996
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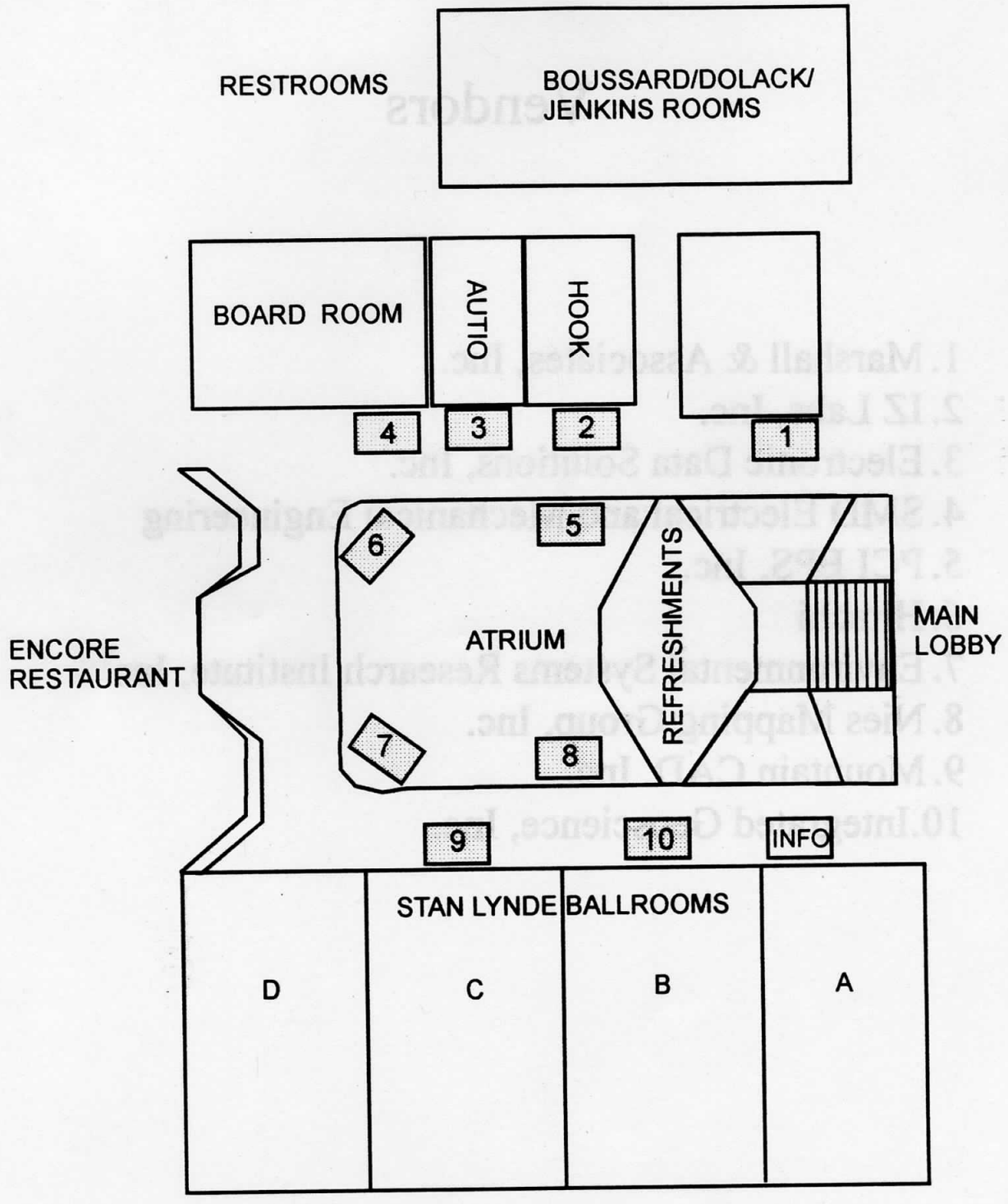

	8th Annual Montana GIS Users' Group Conference, All Day, Monday, April 1	
	Registration 7a.m. to 8 p.m. **coffee and tea available**	
8:00 a.m. - noon	*MTGIS Pre-conference workshops* *Morning Session* Introduction to GIS: Basic Concepts (all day) ARC/INFO Tips, Tricks, and Techniques GPS #1: Introduction to the global positioning system GIS resources on the Internet Altered reality - special effects and GIS 10:00 a.m. break will provide muffins, coffee and tea	
noon - 1:00 p.m.	**Lunch Break (on your own)**	
1:00 - 5:00 p.m.	*MTGIS Pre-conference workshops* *Afternoon Session* Introduction to GIS: Basic Concepts (continued) Advanced Map Production Using ArcView 2.1 and Postscript Geographic Analysis Tools in Arc/Info GPS #2: Familiarization and Field Operations of GPS Receivers 3:00 p.m. break will provide cheese & cracker tray, soda, coffee and tea	
	Dinner Break (on your own)	
	West Meeting Room (Jenkins/Dolack/Boussard)	Hook/Autio Room
5:00 - 5:45 p.m.	Vendor Session (available)	Vendor Session (available)
5:45 - 6:30 p.m.	Environmental Systems Research Institute, Inc. (ESRI, Inc.) Product presentation and discussion	Vendor Session (available)
6:30 - 9:00 p.m.	*PUBLIC Night * Free and open to the public – Ballroom B* *Hosted by the Natural Resource Information System, Montana Sate Library, Helena* Geographic Projects in the Schools GIS and Education GIS Activity Center	

	8th Annual Montana GIS Users' Group Conference, Morning Session, Tuesday, April 2		
	Registration 7a.m. to 7 p.m. danish, muffins, fruit juice, coffee and tea available		
8:00 - 8:15 a.m.	Plenary Session - Ballrooms A, B and C *Welcome - Stu Kirkpatrick, President of the Montana GIS Users' Group*		
8:15 - 9:00 a.m.	*Keynote speaker: Daniel Kemmis, Mayor of Missoula* "How GIS Fits Into Community Involvement in the Political Process"		
9:00 - 9:45 a.m.	*Keynote speaker: Nancy Tosta, USGS* "GIS and Community Building"		
9:45 - 10:30 a.m.	*FGDC Panel Discussion* *Moderator: Fred Gifford, NRIS* *Panelists: Nancy Tosta, Bill Tanke, John Wilson*		
10:30 - 11:00 a.m.	Break and Temporal Adjustment bagels with cream cheese, coffee and tea available		
	Track1- Special Topics *Ballroom A*	Track 2 - Local Government *Ballroom B*	Track 3 - Special Topics *Ballroom C*
	Public Access to Geographic Information	GIS and Local Government Applications	Native American Perspective
11:00 - 11:30 a.m.	Setting Up a Node on the National Spatial Data Infrastructure	Using GIS to Develop an Employer Database for Career Services/Placement in an Academic Environment	Balancing Culture, Ecology, and Economics: GIS in the Salish and Kootenai Tribes Forest Management Process
11:30 - Noon	A Public Access Resource Center: Empowering the Public to use EOSDIS	Panel: Local Government GIS Coalition - Parcel and Address Mapping	Evaluating Mineral Resource Potential on the Fort Peck Reservation Using GIS Analysis
Noon - 12:30 p.m.	Using GIS and Internet to Communicate Recreation and Natural Resources Information	Panel: Local Government GIS Coalition - Parcel and Address Mapping (continued)	The Bureau of Indian Affairs Geographic Data Service Center
12:30 - 1:30 p.m.	Lunch Break (buffet style, Ballroom D – your name tag is your meal pass) tossed greens, pasta salad, mandarin fruit slaw, waldorf salad, relish tray, sliced ham, sliced turkey, sliced roast beef, pastrami, salami, swiss cheese, american cheese, cheddar cheese, breads, tomatoes, onions,pickles, coffee, tea and milk		

	8th Annual Montana GIS Users' Group Conference, Afternoon Session, Tuesday, April 2		
	Track 1 - Special Topics I *Ballroom A*	Track 2 - Local Government *Ballroom B*	Track 3- Special Topics II *Ballroom C*
	Get To The Point (Data)	Good Water / Bad Water	Data Sources and Management
1:30 - 2:00 p.m.	The Shortest Distance Between Two Points: Distance-based Paths and Territories.	Hydrogeologic Mapping with GIS for the Montana Ground Water Characterization Program.	Mega-scale Data Management Using the Object-oriented Paradigm
2:00 - 2:30 p.m.	Creating a County Road Base Layer Utilizing GPS	Modeling Septic Carrying Capacity of Aquifers Within Missoula County Using GIS	Network-Accessible Repositories for Spatial Datasets -- The Current State
2:30 - 3:00 p.m.	Using The Criterion Survey Laser For GIS Data Capture in the Field	Assessment of the Impacts of Septic Systems on the Missoula Valley Acquifer	USGS National Mapping Division Report on the Status of USGS Products
3:00 - 3:30 p.m.	**Break and Temporal Adjustment** **cheese and cracker tray, soda, coffee and tea available**		
	Track 1 - Natural Resources *Ballroom A*	Track 2 - Local Government *Ballroom B*	Track 3- Special Topics *Ballroom C*
	Aquatic and Terrestrial Systems	Communities at Risk (Life in the Suburbs)	Surface Uses and Abuses
3:30 - 4:00 p.m.	The Clark Fork River Analysis: Data Collection and Management	Hot Property in Montana: GIS and the Wildland/Urban Interface Problem	Comparison of Anusplin, MT-CLIM-3D and PRISM precipitation estimates
4:00 - 4:30 p.m.	Revised Universal Soil Loss Equation: Estimation At The Landscape Scale Using GIS	Adapting a Manual Fire Risk Rating System Process to GIS: The Whitefish Case Study	Delineation of Watershed Boundaries in a GIS: Capabilities and Limitations
4:30 - 5:00 p.m.		Garbage in, Garbage Out: Using ArcView to Update Montana Landfills Data	Creating a Regional Elevation Model from 7.5 Minute Digital Elevation Models: The Mis-Adventures of DEM-Man in a Digital Landscape!
5:00 - 6:30 p.m.	*Vendor Show, Facility Tours, No-host Social*		
	West Meeting Room (Jenkins/Dolack/Boussard)	Hook/Autio Room	
5:00 - 5:45 p.m.	Vendor Session (available)	Vendor Session (available)	
5:45 - 6:30 p.m.	SMD Engineering, Helena Scanning, vectorizing, and cleaning to a projected cover	PCI EPS, Inc. Product presentation and discussion	
6:30 - 9:00 p.m.	Conference Dinner, Poster Session, Entertainment by "Grass Valley String Band", Vendor Sessions, and Local Government GIS Coalition Open Discussion *Dinner will be served buffet style in Ballroom D (your name tag is your meal pass)* *tossed greens, cole slaw, potato salad, macaroni salad, relish tray, baked potato, baked beans,* *corn-on-the-cob, fried chicken, sirloin steak, rolls, coffee, tea, milk, cake tray*		

	8th Annual Montana GIS Users' Group Conference, Morning Session, Wednesday, April 3 **danish, muffins, fruit juice, coffee and tea available**			
8:00 - 8:10 a.m.	Plenary Session - Ballrooms A, B and C *Welcome -Mike Sweet, Program Chair, School of Forestry, University of Montana*			
8:10 - 8:50 a.m.	*Keynote speaker: Bill Huxold* *"Implementing GIS in the Urban Landscape"*			
8:50 - 9:30 a.m.	*Keynote speaker: John Steffenson, ESRI* *"Trends in Spatial Information Technology: What's Hot, What's Not"*			
9:30 - 10:00 a.m.	**Break and Temporal Adjustment** **muffins, coffee and tea available**			
	Track 1 - Natural Resources *Ballroom A*	Track 2 - Local Government *Ballroom B*	Track 3- Special Topics *Ballroom C*	Track 4 - Special Topics *West Meeting Room -- Jenkins/Dolack/Boussard*
	Remote Sensing Applications	Local environments	The Canadian Perspective	Fine Tuning GIS
10:00 - 10:30 a.m.	Using Aerial Photographs and Landsat TM Imagery to Detect Vegetative Change, Between 1937 and 1992, for the East Front of the Rocky Mountains in Montana	Geographic Information Systems - Applications in Urban Forestry/Land Use Planning	An Overview Of The Project: The Crown Of The Continent Electronic Data Atlas	When Polygons Don't Behave: The Region Data Model.
10:30 - 11:00 a.m.	Comparing Landsat TM based vegetation Classifications for the Colville National Forest	The Role of GIS in Butte-Silverbow County's Long-term Lead Poisoning Prevention and Abatement Program.	Implementing a multi-agency, binational ecosystem information system: The Crown of the Continent Electronic Data Atlas	Generating Flowlines Through Lake Polygons
11:00 - 11:30 a.m.	Change Detection Analysis of a Watershed in the Swan Valley, Montana, using Landsat Multispectral Scanner Data	Real-time Emergency Assisting and Coordination of Traffic (REACT)	Barriers to GIS use in the Canadian setting: The experience of Waterton Lakes National Park (no abstract)	GIS and the User Interface
11:30 - 1:00 p.m.	Plenary Session - Ballrooms A, B and C *MTGIS BUSINESS MEETING AND LUNCH* *Moderator: Ken Wall, GeoData Services* Users' Group Annual Report, Stu Kirkpatrick, Butte-Silverbow County Education Subcommittee Report, Margie Lubinski, Lolo National Forest Technical Working Group Report (TWG), Cathy Maynard, Helena National Forest Local Government GIS Coalition, Doug Burreson, Missoula County Montana Information Technology Advisory Committee Presentation ***** Lunch Break (buffet style, Ballroom D – your name tag is your meal pass) *tossed greens, cole slaw, pasta salad, waldorf salad, cucumber/dill salad, ambrosia salad, relish tray, potatoes qu gratin, rice pilaf or pasta, mandarin chicken, desert table, rolls, coffee, tea and milk*			

	8th Annual Montana GIS Users' Group Conference, Afternoon Session, Wednesday, April 3		
	Track 1 - Natural Resources Ballroom A	Track 2 - Local Government Ballroom B	Track 3 - Special Topics Ballroom C
	Applications for Wildlife Habitat	Public Partnerships and Data	GIS and Education
1:00 - 1:30 p.m.	Wildlife-Habitat Relationships: GIS Tools for Planning and Management	Social Databases: CAMAS Rural Planning	Delivering GIS education through the WEB: News from the front.
1:30 - 2:00 p.m.	Evaluating the Distribution of Ponderosa Pine Forest and Associated Wildlife Habitats in the Salmon-Selway Ecosystem: Regional and Local Scales	Public/Private Partnership for Managing Rural Local Government GIS: The Ravalli County Model	The Ethics of Geographic Information System Mapping
	Short Break **soda, coffee and tea available**		
2:00 - 3:30 p.m.	Plenary Session - Ballrooms A, B and C Panel Presentation and Discussion on Data Ownership and Exchange -- *"Share MY data?"* Moderator: David Delsordo, Confederated Salish & Kootenai Tribes Panelist: Craig Stewart, Stuart Blundell, Randy Piearson, John Carter		
3:30 - 3:45 p.m.	Wrap-up – Allan Cox, Director, Natural Resource Information System, Montana State Library, Helena		
3:45 - 5:00 p.m.	**Facility Tours**		

Pre-Conference Workshops

Introduction to GIS: Basic Concepts

Holiday Inn Parkside, Ballroom B, 9:00AM to 4:30PM, April 1. Geographic Information Systems: Basic Concepts is a six-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. The day-long class provides 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. Instructors: Allan Cox and Fred Gifford, Natural Resource Information System.

ARC/INFO Tips, Tricks, and Techniques

Holiday Inn Parkside, Ballroom C, 8:00AM to 12:00PM, April 1. This workshop will focus on navigating the arcane waters of ARC/INFO command line and AML. ARC/INFO provides the tools to perform most GIS data processing tasks. The problem is working efficiently and avoiding software limitations and bugs. Come and learn about the Ten (or more) Commandments for using ARC/INFO. More a group therapy session than workshop, presenters hope to learn about participants' favorite techniques as well as share their own. Handouts provided. Primarily for workstation Arc/Info users. Instructors: Gerry Daumiller, Natural Resource Information System; Jack Horton, Environmental Systems Research Institute (ESRI).

Advanced Map Production Using ArcView 2.1 and PostScript

Holiday Inn Parkside, Board Room, 1:00PM-4:30PM, April 1. Advanced Map Production will help cartographers get better map products out of their GIS system, using the layout features of ArcView 2.1 and PostScript drawing programs such as Adobe Illustrator. We will discuss layout, typography, color control and simplifying large files for printing, among other topics. You will get hands on experience using ArcView 2.1 on portable computers. Instructor: Ed Madej, Desktop Assistance.

Geographic Analysis Tools in ARC/INFO

Holiday Inn Parkside, Ballroom C, 1:30PM-4:30PM, April 1. A two part workshop covering analysis tools available in Arc/Info. Part1 - This presentation is a tour of Geographic analyses organized by topic. Methods for accomplishing each type of analysis are drawn from the entire ESRI product line. Take this opportunity to peruse the toolbox and think about different ways of doing geographic analysis. You may even find a few things under the rug you didn't know were there! Topics include: interactive query, spatial overlay, interpolation surface analysis, visibility analysis, distance and pathfinding, analysis of territories, hydrologic modeling, dispersion and advection, and interfacing models to ARC/INFO. Part 2 - You will leave this presentation with a clear understanding of the concepts behind routes (dynamic segmentation) and regions, and their uses. You will see how they build on other features in the coverage to simplify the storage of data that would otherwise be cumbersome to maintain and use. Instructor: Jack Horton, Environmental Systems Research Institute (ESRI).

GIS Resources on the Internet

Geography Lab, Room 258, Social Sciences Building, University of Montana, 8:00-11:30AM, April 1. This class will explore the basic resources available on the Internet for GIS, including data, software, and answers to technical questions. We will explore World Wide Web sites, the use of file transfer protocols to access geographic data sets, and newsgroups/listservs for the answers to GIS questions. Instructor: Ed Madej, Desktop Assistance.

Altered Reality--Special Effects and GIS

School of Forestry, Forestry 201, University of Montana, 8:30AM to 12:00PM, April 1. This workshop uses common commercial software by Corel and Adobe to extend the use of GIS data and communicate it to others. We will particularly focus on communicating to people not familiar with map interpretation. Examples include editing video and still photographs combined with GIS perspective views, presenting time sequences, and morphing landscapes. Wayne Freimund, Scott Purl, Mike Sweet, Ken Wall, University of Montana.

GPS #1: Introduction to the Global Positioning System

Holiday Inn Parkside, Ballroom A, 8:30AM to 12:00PM, April 1. This workshop presents the basic and current knowledge of the Global Positioning System. The presentation is designed for prospective users of GPS receivers and data. The coverage includes the design, development, characteristics, and potential evolution of the system. Mapping considerations including references, datums, projections, coordinates. Methods and efficiency are also discussed. Specific interests of the workshop participants will be addressed if time permits. Instructors: Fred Gerlach, Mapspace; Ken Wall, Geodata Services, Inc.; Frank Maus and Turner Paddock, University of Montana.

GPS #2: Familiarization and Field Operation of GPS Receivers

School of Forestry, Forestry 201, 1:00PM to 4:30PM, April 1. This workshop presents a familiarization with several types of GPS receivers and a field introduction to their use for positioning and navigation. A more intensive set of field exercises will then be conducted using navigation/low precision survey grade receivers to demonstrate field operations for differentially corrected positioning, digitizing, and attribute assignment. The workshop will culminate with a computer demonstration of GPS data processing and analysis. The receivers used in the exercises are within the capabilities of the Standard Positioning Service. Instructors: Fred Gerlach, Mapspace; Ken Wall, Geodata Services, Inc.; Frank Maus and Turner Paddock; University of Montana.

ABSTRACTS FOR THE 1996 MONTANA USERS' GROUP CONFERENCE PROGRAM

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CONFERENCE PROGRAM for Tuesday Morning - April 2, 1996

Tuesday Morning Concurrent Sessions (11:00 a.m. to 12:30 p.m.)

Local Government II -- GIS and Local Government

Panel on Montana's Local Government GIS Coalition

Steve Hellenthal, chair
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The Montana Local Government GIS Coalition was formed during the summer of 1995 and has been active in several initiatives since that time. Some of these initiatives are on-going and welcome more discussion. This panel will discuss the following issues and developments and any other topics the audience may wish to add if time permits:

- Recent development of a traveling GIS technical demonstration which is available for presentation to interested parties.
- A workshop to be conducted at various regional sites to provide hands-on experience and training in documenting data in accordance with FGDC standards.
- An update on the status of ITAC appointed GIS Task Force and their proposed recommendations for GIS development in Montana.
- An update on research being conducted on funding sources for Montana's Local Governments.
- A legislative proposal being formulated by the Local Government Coalition, the Department of Revenue, the Montana State Local Government Center, and the Geographic Information and Analysis Center (MSU) to develop and begin to implement a strategy for creating a statewide parcel coverage.
- An open discussion on future direction of the Coalition is also welcome.

Using GIS to Develop an Employer Database for Career Services/Placement in an Academic Environment

Nafisseh Heiat
Associate Professor of Management Information Systems

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Geography plays an important role in many decisions. A GIS will perform two critical functions. First, it allows synthesis and analysis of geographically related data. Second, it allows the information developed using GIS analysis techniques to be displayed in a geographic context. Thus, GIS allows users to grasp the relationships, patterns, and trends among data that were present, but not apparent when pouring over stacks of tables, spreadsheets, and computer printouts. Better access to maps and locational data is beginning to affect many organizations in public and private sector.

This study describes the new application of a PC-based GIS developed to support career services/placement in a four year college. Using MapInfo from MapInfo Corporation a student database for alumni with data about their employment was converted to a geographical database by integrating the statistical tables with state, city, and county maps. The geographical database was queried and analyzed to develop policies for coordinating campus-wide interviews with employers providing assistance to students and alumni in obtaining career employment. In addition, the GIS model was utilized by the college foundation to plan their bi-annual funding campaigns.

This paper describes the methodology used, its results, and the wider potential benefit of this work to other academic organizations beyond the immediate goal of supporting student career services and placement.

Tuesday Morning Concurrent Sessions (11:00 a.m. to 12:30 p.m.)

Special Topics I -- Native American Perspective

Balancing Culture, Ecology, and Economics: GIS in the Salish and Kootenai Tribes Forest Management Process

Susan Kraft Ball
Confederated Salish-Kootenai Tribe
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The Confederated Salish and Kootenai Tribes have embarked on the development of a new Forest Management Plan using multiple GIS applications. Extensive GIS database development by BIA and the Tribes over the last 10 years, and the availability of TM vegetation data from The University of Montana Wildlife Spatial Analysis Laboratory formed the framework for coverages for the Tribes' Draft Forest Management Plan now undergoing EIS analysis. Development and use of fire regime, seral class (forest structure), scenic integrity, habitat security, and watershed vulnerability coverages will be discussed.

Evaluating Mineral Resource Potential on the Fort Peck Reservation Using GIS Analysis

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A geographic information system (GIS) was used to evaluate gas, oil, coal and gravel resources on the Fort Peck Reservation. Analysis was performed using ARC/INFO on a SUN workstation.

Resource data layers were constructed in the Geographix Exploration System on a 486- based, PC computer for Cretaceous gas zones and Paleozoic oil horizons. Selected contour lines, structural trends, and well and geophysical data were transferred to the GIS where cultural features, ownership, and lease data reside. USGS Coal resource maps were digitized into the GIS for ownership evaluation. Gravel data was imported from a Paradox database for tribal tracts that overlie geologic formations known to contain gravel. Field investigations confirmed the existence or absence of gravel. GIS overlay techniques checked the manual overlay method, identified additional prospect areas, and provided a statistical and spatial ranking of the resource.

Two GIS analysis techniques are employed: GRID Sum and polygon overlay, grid analysis simply stacked, added, weighted and averaged the resource cells which were created in the GIS. Results were statistically grouped, ranked, and reported in maps, tables, and graphs. This computer technique performed years of work in a few hours.

The Bureau of Indian Affairs Geographic Data Service Center

Mark Zundel
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The Geographic Data Service Center (GDSC). located in Denver, Colorado is responsible for:

- implementing policies, procedures, standards, goals and objectives for spatial data technology
- for developing and maintaining a national spatial data base
- for promulgating technology guidelines
- for assisting tribes, agencies, and area offices in spatial data systems development and management

Spatial data technologies include Geographic Information Systems (GIS), Global Positioning Systems (GPS), and remote sensing such as satellite imagery exploration. These are powerful tools which can be used to effectively manage natural resources and perform engineering level applications. Tribes have increasing recognized the importance of these tools to the goals of self-sufficiency and self-determination. They know that doing "more with less" necessitates the use of advanced technologies such as spatial information systems. The primary challenge of using these tools effectively stem from the technological complexities and the diversity of advanced human skills, and resources that are required. The Geographic Data Service Center meets this challenge by providing tribes the training, consultation services, support, and equipment access necessary.

The dilemma now facing the GDSC is maintaining current levels of service in the face of declining federal budgets and increasing service demands.

Tuesday Morning Concurrent Sessions (11:00 a.m. to 12:30 p.m.)

Special Topics II -- Public Access to Geographic Information

Setting Up a Node on the National Spatial Data Infrastructure

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The Montana State Library received a Federal Geographic Data Committee (FGDC) Competitive Cooperative Agreements Program grant in February of 1995 to help fund its effort to become a node of the National Spatial Data Infrastructure (NSDI), and make metadata about its GIS data holdings and the holdings of other government agencies in Montana available on the Internet. The FGDC requires NSDI nodes to have metadata that conforms with the FGDC Metadata Standard, a World Wide Web Server, and a Z39.50 compliant server to index the metadata and handle spatial and keyword searches. The URL of our NSDI node is http://nris.msl.mt.gov/nsdi/wais.html This paper describes the software and information that is required to set up an NSDI node.

A Public Access Resource Center Empowering the Public to use EOSDIS

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Mission to Planet Earth (MTPE) is the largest scientific project in the world. The primary objective of our project is to develop means to increase the number of people who participate in the Mission. To attain this objective, a consortium called the Upper Midwest Aerospace Consortium (UMAC) has been formed involving Universities in Montana, Idaho, Wyoming, and North and South Dakota. Together, scientists from these states have formed a Public Access Resource Center (PARC) whose purpose is to convert Earth Observing System (EOS) data from MTPE into practical products valuable to PARC members and to the general public. PARC's are a new concept in distributing remotely sensed data via the Internet that have recently become part of the design for NASA's EOS Data Information System (EOSDIS) architecture. The UMAC PARC is developing applications products, communication networks, and computing strategies to deliver remote sensing imagery to users across the five-state PARC area.

Using GIS and the Internet to Communicate Recreation and Natural Resource Information

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During the past few years, the growth in popularity and availability of the Internet has challenged natural resource professionals to make use of this new medium. The University of Minnesota, Department of Forest Resources is developing tools to allow a wide variety of users to access spatial information over the Internet. Two projects with the US Forest Service and the Minnesota Department of Natural Resources serve as pilots for this development work. Project histories, access tool descriptions and data access issues will be discussed.

CONFERENCE PROGRAM for Tuesday Afternoon - April 2, 1996

Tuesday Afternoon Concurrent Sessions I (1:30 p.m. to 3:00 p.m.)

Special Topics I -- Get To The Point (Data)

The Shortest Distance Between Two Points: Distance-based Paths and Territories

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The shortest distance between two points is rarely a straight line. In this session you will learn how to make paths that minimize travel time, cost, or whatever. You will also learn how to find territories that are within a given travel time or cost of a location. These distances can be calculated on either a network of lines (e.g. roads or streams) or an overland surface of grid cells.

Creating a County Road Base Layer Utilizing GPS

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The implementation of a Geographic Information System (GIS) in local government can be a difficult and expensive undertaking. The City of Bozeman, Gallatin County, and the Geographic Information and Analysis Center at Montana State University have undertaken a cooperative project to develop a base layer with locational accuracy. Input from planners, technicians, engineers, and cartographers was received before a decision was made to research and develop a GIS base layer with the limited resources available. The GIAC began the project with a pilot study involving a portion of one township; the centerlines of the roads were surveyed using GPS technology with 1-5 meter accuracy, and parcel data was added by registering each individual plat to the road centerlines. This pilot study provided an estimate of time and labor costs, as well as recommendations for methodology on the entire county road coverage and future parcel mapping. Additionally, staff from both the City and County were given hands-on training in GIS software. Thus the project was successful in accomplishing the goals of producing an accurate base map of the entire county, while crafting a blueprint for successful implementation of a GIS in local government.

Using The Criterion Survey Laser For GIS Data Capture in the Field

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Recent software advancements have increased the productivity of the Criterion series survey lasers for field data collection applications. These software advancements have enabled the survey laser to be directly incorporated into either a Trimble GPS data collection system offering increased system versatility, or as a stand-alone data collection system allowing GIS data capture. The laser can also collect data to create topographic models and perform volume computations. Using ConTerra System's Laser-Walkabout software or Trimble Navigation's Asset Surveyor software allows the survey laser to compute the position of a feature and stores the feature name and attributes associated with the computed position. This data will be downloaded to a PC for further processing and editing and then can be imported into most GIS's. The survey laser is ideal for digitizing inaccessible features. The survey laser is also ideal for data collection situations that are not conducive to more traditional data collection techniques, such as using GPS under heavy tree canopy. The laser will be largely unaffected by tree canopy and will yield accurate X,Y, and Z coordinates of digitized features. This product demonstration will familiarize the audience with the many features and diverse data collection applications of the survey laser.

Tuesday Afternoon Concurrent Sessions I (1:30 p.m. to 3:00 p.m.)

Local Government -- Good Water/Bad Water

Hydrogeologic Mapping with GIS for the Montana Ground Water Characterization Program

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As part of the Montana Ground Water Characterization Program, aquifers and other geologic units were mapped in a five-county region of eastern Montana. A series of hydrogeologic maps was made using either surface elevation or mean sea level datums. Primary maps (elevations and thickness of aquifers, elevations of the basal confining unit, and surficial deposits thickness) were produced from ESRI Arc/Info coverages. Data types used to make these coverages included point (data from well logs) and line and areal (geologic maps). Point-data included information from logs of 4268 water wells and 3747 oil and gas wells, which are stored in the Ground Water Information Center database at MBMG.

TINCONTOUR was used to produce draft contour maps of hydrogeologic units from the point coverages. Each map was then recontoured by hand, digitized, and used to construct lattices of the same spacing as the 1:250,000 scale DEM's. Subtraction of the lattices from the DEM's produced lattices depicting depth to various geologic horizons.

Because of the large numbers of data points and data values attached to each, GIS tools helped this project make multiple draft maps quickly and will allow dissemination of maps at different scales to different users.

Modeling Septic Carrying Capacity of Aquifers Within Missoula County Using GIS

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Under contract with Missoula County, Septic Carrying Capacity of aquifers within Missoula County was modeled using GIS (PAMAP). The purpose of the study was to estimate the maximum number of septic systems which could be built on each 1/4 section of developable land within the county, while maintaining compliance with Montana's Non-degradation laws.

A set of map layers was created for the county which represented 1) hydrologic conductivity (correlated to surficial geology), 2) existing number of septic systems, 3) background nitrate concentrations in groundwater, 3) gradient (slope) of the water table. Resolution of the map layers was set at a 1/4 section grid (160 acres). A dilution equation was then used within PAMAP to model carrying capacity from the map layers for the entire county. The carrying capacity results were prepared as a set of map layers which show the remaining number of septic systems which could be built on each 1/4 section within the county, while approaching, but not exceeding allowable levels of nitrates in the groundwater.

Assessment of the Impacts of Septic Systems on the Missoula Valley Acquifer

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As part of the District's Unsewered Areas Study, density of septic systems, ground water sampling results and hyrogeologic characteristics were compiled and mapped for the Missoula Valley. These and several other factors were used to rank and prioritize high density unsewered areas within the Valley for connection to the public sewer.

The hydrogeologic characteristics were mapped and compiled into a model of the aquifer's sensitivity to pollution using hte EPA DRASTIC method. AUTOCAD and ArcCAD were used to map model parameters, analyze data and display results.

Tuesday Afternoon Concurrent Sessions I (1:30 p.m. to 3:00 p.m.)

Special Topics II -- Data Sources and Management

Mega-scale Data Management Using the Object-oriented Paradigm

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GIS analysts have in recent years been asked to undertake projects of increasing size and complexity. This is especially problematic when GIS efforts must be applied to complex, region-wide problems that require large collections of various types of datasets (e.g., GIS layers) and data transformations (e.g., programs). The object-oriented paradigm organizes datasets and data transformations in a hierarchical fashion that provides an unambiguous and comprehensive view of a large GIS database based on concepts with which GIS users are familiar. The resulting organizational framework provides a context in which virtually all application and management activities can be viewed. Construction of such a hierarchy can assist in the planning of upcoming projects and enable better management of legacy GIS databases by allowing a data manager to construct indices into large collections of data. More specifically, the object-oriented paradigm can facilitate search and query operations, allow monitoring of dataset and/or project status, and provide a means of tracking dataset history. Taking advantage of the object-oriented paradigm does not require massive training programs or the reconstruction of existing databases. Rather, it requires that we reconstruct our thoughts and habits.

Network-Accessible Repositories for Spatial Datasets -- The Current State

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Modern computer networks provide an electronic pipeline through which information in a variety of forms can be advertised and distributed quickly and easily all over the world. Standard inexpensive tools allow the potential for a user connected to the Internet to locate information contained in a network repository anywhere else in the world. The huge increase in the number of users connected to the network, the availability of standard network access tools, and the rapid development of a "culture" of the Internet has had a dramatic impact on organizations who are building and maintaining network accessible data repositories. Sharing spatial datasets over the network represents a particularly challenging application,

because such datasets tend to be large, cross-referenced to a wide range of ancillary information (such as meta-data), and expensive to produce. This talk will focus on the issues pertinent to building and maintaining network-accessible repositories for spatial information, summarizing the discussion from a recent NCGIA sponsored workshop on this topic. The pertinent issues include the following:

- Access software: Is the repository accessed via standard World-Wide Web software or other specialized (non-Web) software?
- Access policy: Is the repository publicly/freely available via Internet, publicly available on a "pay for access" basis, or available only in a restricted access (i.e., "intranet") basis?
- Content contribution: Who controls how entities are added to the repository and what standards for information quality are applied?
- Content type: Does the repository include numerical datasets, scanned photographic imagery, digital video imagery, computer generated imagery, manipulable 3-D objects, audio, or all of the above?
- Contents as copies vs. copies: Does the repository contain directly downloadable entities (e.g., dataset copies) or references to entities (e.g., entity index with on-line assistance in contacting or ordering from dataset owner)?
- Content consistency with master database: Is the network-accessible repository the "master" database or a "shadow" of an off-line master, and if it is a shadow copy, how is it generated and updated to retain consistency with the master?

USGS National Mapping Division Report on the Status of USGS Products

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The U.S. Geological Survey, National Mapping Division, Rocky Mountain Mapping Center, Denver, CO. will be represented by Robert La Pedus at the 1996 MT GIS Conference. Mr. La Pedus will present an overview of new National mapping Division products and programs and report on the status of mapping projects in work or planned for Montana.

Tuesday Afternoon Concurrent Sessions II (3:30 p.m. to 5:00 p.m.)

Natural Resources -- Aquatic and Terrestrial Systems

The Clark Fork River Analysis: Data Collection and Management

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The presentation will be based on forms of analysis on the three main reaches of the Clark Fork River: i.e. tailings, vegetation, sediments, and bank features and field techniques and surveys. Methods of overlay and GIS manipulation to retrieve the desired data will be touched on. Acquisition of raw data, GIS input, and general setup of the entire map series will also be discussed. Scales of analysis will be discussed from an overview of all three reaches down to a single polygon and, in some cases, point data. A brief history of the CF basin will also be included, such as the 1908 flood that caused so much deployment of waste material.

Revised Universal Soil Loss Equation: Estimation At The Landscape Scale Using GIS

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Geographic information systems (GIS) offer users of the Revised Universal Soil Loss Equation (RUSLE) the opportunity to apply the equation to larger areas. GIS allows models to incorporate the spatial variability of required inputs. This study examined the sensitivity of the combined RUSLE Length-Slope (LS)factor, and a new physically-based LS factor developed by Moore and Wilson, to different data sources, grid resolutions, and to methods of computing upslope contributing areas. The sensitivity analysis was performed in a large (100 km2) forested catchment in southwest Montana. By definition, RUSLE is not applicable to areas subject to net sediment deposition. An attempt was made to validate the ability of the EROS model to identify these depositional locations. Observed Cesium- 137 soil redistribution data from a 1993 erosion assessment in a small (46 ha) closed catchment in western Idaho will be used to test EROS.

Digital elevation model source and choice of grid size were determined to affect terrain attributes and RUSLE LS factors. Single (D8 and Rho8) and multiple flow direction algorithms (FRho8 and DEMON) were used in the TAPES-G terrain analysis model to examine how calculation of upslope areas and LS factor were affected. The two major algorithm variations produced quite different distributions. The Moore-Wilson (delta)Tc parameter, which is calculated by the EROS model, was used to identify zones of net deposition. These zones were compared to points where soil motion rates had been determined using Cs-137 analysis. The model identified less than 60% of the 139 sample points correctly, yielding a phi correlation coefficient of 0.1 while running the model on 30 and 10 meter DEM data.

Tuesday Afternoon Concurrent Sessions II (3:30 p.m. to 5:00 p.m.)

Local Government -- Communities At Risk (Life in the Suburbs)

Hot Property in Montana: GIS and The Wildland/Urban Interface Problem

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The wildland/urban interface is a multi-faceted problem that is far from solved, as evidenced by the annual destruction of hundreds of homes by wildfire. This project investigates the use of GIS as a tool for fire management in the wildland/urban interface -- itself a complex spatial issue. Several key areas will be discussed: quantifying and mapping spatially variable wildfire hazard, determining hazard mitigation needs near homes, comparing and analyzing the spatial distribution of human- vs. lightning-caused fires, and addressing multi-jurisdictional fire protection issues.

The key to solving the problem is in assessing and understanding the nature of the problem. Coupled with agency- specific policies and directives, a GIS can facilitate more effective contingency planning. This can provide valuable information to fire managers and planners for contending with the problem, and dramatically improve the effectiveness of more traditional fire protection methods.

Adapting a Manual Fire Risk Rating Process to GIS: The Whitefish Case Study

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The Montana DNRC Fire and Aviation Management Bureau contracted with Geodata Services, Inc. in the fall of 1994 to assist them in using GIS for their fire risk rating system. The rating system, done by manual methods for several years was applied to a study area surrounding Whitefish Lake. The vegetation fuel classes were mapped with Landsat TM satellite imagery, individual structures and their roof types were digitized and mapped, and digital elevation models were created. Several rating criteria such as distance

measurements, slope and aspect classes, and were fully automated with GIS. Other criteria, such as road characteristics and risk factors were interpreted by fire personnel viewing GIS displays.

Garbage in, Garbage Out: Using ArcView to Update Montana Landfills Data

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Landfill data for Montana have been available in digital format from the USGS since 1986. These landfill site locations were displayed using ArcView, and found to be inaccurate. We will describe cooperative review of the available site data, as well as the creation of a current and more complete Montana landfill coverage using ArcView. Tabular output from the Montana Solid Waste Program was used to upload a data table, build draft graphic displays, and to finally build a spatial dataset of open and known historic landfills. All this was done without expensive programmer time. Important lessons were learned about data format conversions, data visualization, and bringing desktop GIS within reach of environmental managers.

Tuesday Afternoon Concurrent Sessions II (3:30 p.m. to 5:00 p.m.)

Special Topics -- Surface Uses and Abuses

Comparison of ANUSPLIN, MT-CLIM-3D, and PRISM Precipitation Estimates

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Spatially varying estimates of precipitation are required for regional resource assessments and environmental modeling applications. Interpolation of precipitation data to unmeasured locations is particularly difficult in complex mountainous terrain and at the mountain-plains interface where highly variable spatial patterns of precipitation are produced. Three models (ANUSPLIN, MT-CLIM-3D, and PRISM) that employ different techniques to develop gridded precipitation surfaces from published climate

station (point) data and digital elevation models (DEMs) were presented at the Second International Conference Integrating GIS and Environmental Modeling held in Breckenridge, CO. The current study compares the performance of these models using the same monthly and annual data sets to determine whether the predicted precipitation surfaces are hydrologically reasonable over a region that contains a diverse physiography and produces a wide range of precipitation regimes. Mean monthly and annual precipitation estimates were prepared for the Bozeman, Billings, Ashton, and White Sulphur Springs in southwestern Montana and the Cody quadrangle in Wyoming for 1961-90. Input data included monthly precipitation data from 258 weather stations and a 0.5 km square-grid DEM that was derived by the authors from the appropriate 3 arc-second USGS DEMs with ANUDEM. A total of 20 stations were randomly selected and withheld to evaluate model performance.

Delineation of Watershed Boundaries in a GIS: Capabilities and Limitations

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Watersheds are commonly used by land management agencies as a basis for planning and management decisions. For broadscale applications, watershed boundaries should be defined in a standardized, consistent, and repeatable fashion. Care must be taken that results are suitable for potential projects, and co-register with other data layers. Two studies clarify the capabilities of the Arc/Info GIS in generating watershed boundaries, and also the limitations of widely available data inputs used in the generation process. The first study devised an operator-assisted procedure and compared results from available GIS techniques and digital data sources, while the second compared GIS-generated boundaries with boundaries constructed manually from traditional data sources.

Creating a Regional Elevation Model from 7.5 Minute Digital Elevation Models: The Mis-Adventures of DEM-Man in a Digital Landscape!

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A regional scale Digital Elevation Model (DEM) at 30 meter pixel resolution and in an Albers Equal Area projection was created for western Montana and northern Idaho from USGS 7.5 minute DEMs. We acquired data from state and federal agencies and directly from the USGS, recording header information and quality assessment in a set of ARC/INFO databases. In cases where we received multiple copies of DEM files for the same 7.5 minute quadrangle, we assessed all copies and chose the best one based on processing level and visual inspection. DEMs with errors such as large spikes or pits, missing lakes, or missing data were manually repaired. Once the best available data were identified, individual 7.5 minute DEMs were merged into overlapping tiles as ARC/INFO grid coverages clipped to the extent of the standard USGS 1:100,000 scale quadrangles (100K tiles). To ensure seamless edge-matching between tiles, each 100K tile includes the 32 7.5 minute DEMs comprising the tile, plus parts of the 28 DEMs immediately adjacent to and surrounding the tile. Missing data in each 100K tile (usually located between

individual 7.5 minute DEMs) were interpolated as the average of the surrounding pixels. Areas where 7.5 minute DEMs were not available were filled using Defense Mapping Agency 3 arc-second DEMs that had been resampled to 30 meter pixel size by Hughes STX Corporation. To date we have used more than 3,500 7.5 minute DEMs to create 102 edge-matched 100K tiles. Specific study-area DEMs can now be created using an ARC/INFO AML that seamlessly merges the 100K tiles for any designated area.

CONFERENCE PROGRAM for Wednesday Morning - April 3, 1996

Wednesday Morning Concurrent Sessions II (10:00 a.m. to 11:30 a.m.)

Natural Resources - Remote Sensing Applications

Using Aerial Photographs and Landsat TM Imagery to Detect Vegetative Change, Between 1937 and 1992, for the East Front of the Rocky Mountains in Montana.

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Historic landcover for a 42,000 ha study area was classified into six distinct types. Landcover polygons derived from interpreting, black and white, aerial photographs taken in 1937 were transcribed to orthophotographs and digitized into a GIS. A Landsat TM image (acquired July 1992) was classified into over 30 landcover types using a hybrid unsupervised / supervised classification technique. The study area was clipped out of the classified Landsat scene, and the 1992 landcover types were combined to make them comparable to the landcover types derived from aerial photograph interpretation. The minimum mapping unit (MMU) was 1 acre for both time periods.

The most noteworthy changes detected included: 30.4% of the grassland present in 1934 changed into high density conifer, 33.6% of the rocky reef transformed into high density conifer, and 72.5% of the low density conifer class transformed into high density conifer. These results suggest conifer encroachment is detectable using historic aerial photographs in conjunction with digitally classified Landsat TM imagery. The number of patches in the landscape increased from 4.4 to 17 fold depending on the landcover type. The finding is more likely the result of differences between ocular versus digital classification methods for the two time periods than to actual change in the landscape pattern.

Comparing Landsat TM based vegetation Classifications for the Colville National Forest

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A Landsat TM based vegetation classification database created at The University of Montana Wildlife Cooperative Research Unit's Wildlife Spatial Analysis Laboratory (WSAL) will be compared with a

vegetation classification created by Pacific Meridian Resources (PMR). The WSAL/PMR comparison is for a selected area in the Colville National Forest of northeastern Washington. Area and distribution characteristics of vegetation cover type, size/structure, and canopy closure are measured, and similarities and differences are discussed.

Aspects of GIS database standardization, database comparison techniques, and issues concerning potential vegetation database integration are also discussed.

Change Detection Analysis of a Watershed in the Swan Valley, Montana, using Landsat Multispectral Scanner Data

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Landsat Multispectral Scanner (MSS) Imagery provides an invaluable archive for understanding the dynamics of landscape level change over the past twenty years. However, the poor quality of this imagery requires intensive preprocessing to provide reliable output. In this study, three dates of MSS imagery (from the early 1970's, 1980's and 1990's) were analyzed in order to infer change within a watershed of the Swan Valley in Western Montana. Imagery was carefully rectified to a common map base, corrected for striping with a specially designed filter, and radiometrically rectified to insure a common spectral response. Two methods of change detection are compared: 1) a triple-difference threshold technique using the Normalized Difference Vegetation Index (NDVI) and 2) post-classification comparison. Analysis was conducted on polygons developed according to spectral similarity. The methods emphasized different, but important aspects of the complex changes that have occurred within the watershed. These differences are compared using photo-interpreted polygons from the 1970's and 1990's. Also presented are Markov models based on transition matrices, which can be used to estimate the strength and direction of landscape change.

Wednesday Morning Concurrent Sessions II (10:00 a.m. to 11:30 a.m.)
Local Government - Local Environments

Geographic Information Systems - Applications in Urban Forestry/Land Use Planning

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This program will outline a process/product that the City of Missoula utilized in developing a GIS/Urban FOrestry application. This was a pilot project to develop and troubleshoot a GIS application that interfaces an existing AUTOCAD basemap with an existing FOXPRO database. The end result was an application that could perform resource analysis within the realm of Urban Forestry. This application has the capacity to produce diameter distribution, species composition, condition results, canopy closure, etc. This program now plays an integral role in Missoula's Urban Forestry planning.

The Role of GIS in Butte-Silver Bow County's Long Term Lead Poisoning Prevention and Abatement Program

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n 1994 Butte-Silver Bow County (BSB) established a long term lead poisoning prevention and abatement program . In general, the main objective of this program is to reduce the levels and risks of lead exposure incurred by children. All sources of lead exposure are monitored, and individual cases are prioritized to maximize use of program resources. Because potential sources are many and case prioritization is complicated, GIS databases and methodology have been utilized to assist in identifying potential sites for clean up.

Lead source abatements are usually done on a parcel basis so accurate parcel addressing was an initial requirement of the program. BSB GIS assisted the 1995 lead survey team, providing survey forms based on Montana Department of Revenue's CAMA geocodes. New addresses, number and ages of children and ownership status have been input into the GIS from the results of this survey. Additionally, the BSB Health Department's STELLAR data comprised of blood lead level testing results, along with several soil lead testing site studies have been made GIS compatible. Environmental factors such as the location of waste rock dumps and contaminated railroad beds are also included. Using GIS techniques including address matching, spatial intersections, and buffering, hard copy maps have been produced which visually correlate the above factors. The maps are used by the BSB Health Department to prioritize sites for each construction season. ArcView applications are also being developed so Health Department personnel can monitor new test results of both blood lead and soil lead locations, as well as multi-path sources such as chipping interior and exterior paint, lead contaminated drinking water and house dust.

In the future, GIS will be used to monitor the status of remediated houses and soil removals through a permitting system integrated with a set of other institutional controls designed to monitor landuse and development in reclaimed mining areas.

Real-time Emergency Assisting and Co-ordination of Traffic (REACT): A Test Support for the Traffic Police Department in Bucharest

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The program accomplishes some of the important goals of an emergency service activity. It addresses any domain that deals with emergency events. We could mention the activities of several services such as: the traffic police, the ambulance-emergency service, the fire-brigade stations, etc. The analysis of data, which are significant to these special services (spatial data as well as specific descriptive data), is a typical requirement for a GIS software. Roads and environments are geographic entities described by means of spatial and attribute data. GISs provide query and display facilities and they analyse data spatially. The most important advantages of an GIS are the graphical representation of the data, especially traffic accidents by means of road characteristic and spatial analyses. In order to achieve the application's goals all the efforts were focused on the GIS' network capabilities which handle the traffic and emergency problems. This application is customized and developed for using by the Traffic Police Department of Bucharest (TPD).

Wednesday Morning Concurrent Sessions II (10:00 a.m. to 11:30 a.m.)

Special Topics I -- Canadian Perspective

An Overview Of The Project: The Crown Of The Continent Electronic Data Atlas

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The Crown of the Continent is that unique region of the Western Cordillera between the northern boundary of Yellowstone National Park and the southern boundary of Banff National Park. The Crown of the Continent Electronic Data Atlas (CCEDA) project was launched in May 1995 after some four years of planning by a binational consortium to integrate data and information on this internationally recognized ecosystem. The Atlas is a computerized repository of up-to-date biophysical and socioeconomic research collected in either map, chart or text form covering southwestern Alberta, southeastern B.C. and western Montana. Current data have been donated by the founding universities, National Parks and some government agencies. The integrated information will be available online to ecologists and other researchers, to the decision-makers and more generally to the interested public. A number of sponsors have already contributed computer hardware and software towards the project. An open invitation is hereby given for personal and corporate contributions towards an integrated seamless environmental information source for a wide spectrum of potential users.

Implementing a multi-agency, binational ecosystem information system: The Crown of the Continent Electronic Data Atlas

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GIS, bibliographic and raw scientific information is spread throughout government, industry, and academic offices, is poorly catalogued/referenced and is difficult to track down for use in environmental assessments,

ecosystem management, transboundary fish and wildlife analysis, and public education. Although Montana has addressed this problem through NRIS, similar facilities do not exist in Alberta as of yet. Furthermore, greater co-ordination is needed between universities, NRIS, and the BC Conservation Data Centre to understand processes in an ecosystem that straddles international borders like the Crown of the Continent.

The Crown of the Continent Electronic Data Atlas presents a possible solution. The Atlas catalogs existing GIS and remote sensing coverages, grey and white literature and scientific datasets for the entire Crown of the Continent Ecosystem and will distribute the information on the World Wide Web using spatial and keyword queries. In addition, the Atlas stores GIS data that is not maintained elsewhere, and serves as a central repository and analysis facility for its partners. Atlas staff construct and maintain communication tools such as WWW pages and discussion lists (LISTSERV's) for scientists and ENGO's in the region and are currently working to improve data dissemination within the particular constraint of Canadian copyright law. Finally, the Atlas serves as a co-ordinating facility to bring scientists working on academic, industry, ENGO or government projects together with their data to promote a working synergy in the Crown of the Continent.

Barriers to GIS Use in the Canadian Setting: The Experience of Waterton Lakes National Park

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No abstract available.

Wednesday Morning Concurrent Sessions II (10:00 a.m. to 11:30 a.m.)

Special Topics II -- Fine Tuning GIS

When Polygons Don't Behave: The Region Data Model

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Planar polygons cover a surface completely, with no gaps or overlaps. This works well for soils or vegetation, but many phenomena such as home ranges, mining claims, and fire history are non-planar. Regions were developed to handle these situations. They also work well when themes are nested or share a common set of linework. In this session, you will learn what regions are and how they work.

Generating Flowlines Through Lake Polygons

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The purpose of this paper is to describe a process created using GRID, a raster geoprocessing toolbox that is integrated with ArcInfo, to automatically create flowlines though water polygons. Before network analysis can be performed on streams and rivers there must exist a complete network with full connectivity. In other words, there can be no gaps in the linear stream network. Most digital data sources contain streams and rivers (lines) and lakes (polygons), but do not contain flowlines through those lakes. Traditionally, GIS users would manually digitize those flowlines. In practice, this is time-consuming and costly. This author has created a process in GRID to create connectivity or flowlines automatically. A software macro has been created which will create flowlines though the lakes and connect them to the linear network.

GIS and the User Interface

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Graphical AML application tools are a general purpose, menu-based interface to Arc/Info. Common operations such as mapping, query, data automation and analysis are implemented through a series of AML-based tools and menus.

Graphical AML are developed using an object-oriented programming methodology that allows Graphical AML programs to be used as a base to build custom applications. Applying these methods simplifies application development. The object-oriented methods employed to create Graphical AML represent a major breakthrough in GIS application development.

These application/graphical AML tools are functionally grouped into four tool sets: Map Tools, Edit Tools, Grid Tools and Command Tools. In each tool set a menu bar is displayed with pulldown menus providing access to the component tools. These menus provide general tools for data base management, modeling, changing workspaces, moving between tool sets, and accessing Arc/Info programs, command lines and system files. The basic functionality of each tool set is based on the Arc/Info program in which it operates.

CONFERENCE PROGRAM for Wednesday Afternoon - April 3, 1996

Wednesday Afternoon Concurrent Sessions II (1:00 p.m. to 2:00 p.m.)

Natural Resources -- Wildlife Habitat Relationships

Wildlife-Habitat Relationships: GIS Tools for Planning and Management

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This paper addresses the utility of GIS in wildlife-habitat modeling. The objective is to demonstrate how the analysis capabilities of GIS can be utilized in building reliable models. Models of wildlife-habitat relationships are widely applied tools in natural resource management. In ecosystems along the Rocky Mountain Front, where human activities are not heavy on the land, the condition of habitat is often the limiting factor for wildlife. It is therefore important for landowners, natural resource managers and land use planners to understand how the condition of these habitats influences the distribution, abundance and performance of wildlife species. Management tools are needed to quantitatively predict the risks, tradeoffs, and benefits of land use decisions on wildlife habitat over time and space. Existing tools in formats useful to decision- makers are limited; the challenge is to provide practical and reliable information on how wildlife species respond to changes in habitat and land use. With this paper, I will present a case study on the application of GIS in developing and validating wildlife- habitat models for elk and mule deer on the Rocky Mountain Front.

Evaluating the Distribution of Ponderosa Pine Forest and Associated Wildlife Habitats in the Salmon-Selway Ecosystem: Regional and Local Scales

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Conducting analyses at multiple scales is a basic premise of ecosystem management; however, this task is complicated by the availability of appropriate GIS layers at the necessary scales. The University of Montana is in the final stages of producing one such comprehensive data layer, existing vegetation and land cover across northern Idaho and western Montana, classified from Landsat TM data at a five acre (2 hectare) minimum mapping unit. At more localized scales, individual National Forests have inventoried their lands

using the detailed Timber Stand Management Record System (TSMRS). We compare one application of these two data sets toward managing ecosystems at multiple scales.

Operating on the assumption that ponderosa pine is a habitat in short supply in the Northern Rockies, we mapped its current distribution across Landsat TM scene P41/R28, which covers more than 8 million acres in the Salmon-Selway ecosystem and surrounding areas. In addition, to begin to address species interactions, we prepared habitat models for four birds that utilize ponderosa pine habitats to varying degrees, the Pygmy Nuthatch, Flammulated Owl, White-headed Woodpecker, and Northern Goshawk. We also identified habitats used by multiple species. Results using both data sets are compared for the Nez Perce National Forest.

Wednesday Afternoon Concurrent Sessions II (1:00 p.m. to 2:00 p.m.)

Local Government -- Public Partnerships and Data

Social Databases: CAMAS Rural Planning

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This presentation will present a research project conducted by Dr. David Jackson and Ken Wall for the Bolle Center for People and Forests. The focus of the project was mapping and modeling real estate development in rural Western Montana. Real estate development has become an important phenomenon in Western Montana as we move from stagnant growth in the 1980's to unprecedented growth rates in the 90's. This research examined behavioral preferences for development decisions, with preferences expressed in terms of location of development relative to national parks, wilderness, major lakes and reservoirs, cities and major highways. The GIS was used to generate proximity maps from growth aggregated to townships (36 sq. mile areas). Growth was measured by number of residential sales and new construction between 1990-1995 aggregated to each township from nearly 300,000 ownership parcel records. Poisson regression models were used to model growth patterns.

Public/Private Partnerships for Managing Rural Local Government GIS: The Ravalli County Model

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Ravalli County and the Bitterroot Water Forum, a private non-profit group, have joined together to implement GIS technology for water related issues in the Bitterroot watershed. Ravalli County has just completed coordinating a needs assessment, conducted by Geodata Services, Inc. under contract with the county. The needs assessment looked at several state, federal and local agencies and private companies and assessed ways that several groups and agencies can cooperate in implementing GIS in a rural county context. Efforts of the Bitterroot Water Forum, through grants administered by the Bitterroot Conservation District, continue to add to GIS data development and water quality and quantity monitoring in the Bitterroot. The two entities share software and hardware and are working cooperatively to develop GIS in this unique pilot project.

Wednesday Afternoon Concurrent Sessions II (1:00 p.m. to 2:00 p.m.)

Special Topics -- GIS and Education

Delivering GIS Education through the World Wide Web

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Last Fall Semester 1995 I decided to place my course notes for FOR503: GIS Methods and Applications I on the World Wide Web. I spend six weeks using HTML Assistant v4.0 (authoring software) to assemble the text and graphics. I used HTML2.0 standards to develop the various web pages. Through the use of hypertext functions a glossary of terms was linked to the body of the text as well as links to a number of web sites having geographic content. My notes were divided into eight parts. A series of study questions were inserted at the end of each part. Through the FORMS function students submitted their answers to these questions. These transmissions were received at the file server where a QBASIC program parsed the answers and the text associated with the original questions was merged to produce a valid assignment for each student. Through the incorporation of a status table I provided feedback to the students in the form of whether or not a transmission was received (yes/no) and then later a score was entered once their assignments were graded. This method of distance learning proved to be successful and permitted students to advance at their own pace and from off-campus locations at all hours of the day. The interspersion of color graphics and even an MPEG movie in the body of the text made the material more interesting and learning more fun! I did learn that these WWW notes need to be interspersed with discussion groups so that students could ask questions and clear up confusing issues.

The Ethics of Geographic Information System Mapping

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Go into any library, anywhere, and you will find fiction and non-fiction books. A clear distinction is made between the two. But look at the map collection and what do you see? Does this mean that all maps are of real places, or that all maps of real places show their spatial elements in a manner consistent with the "non-fiction" assumption we give to them? Quite the contrary. All maps are a product of the social-political paradigm or culture within which they are produced. They tell some of the truth, but not the whole truth. No map is free from subtle, and sometimes not-so-subtle, twists of reality. They may involve clear unethical manipulations of the spatial world, or simply practical choices of what to show and not to show. What happens when we compile spatial databases of reference as well as thematic elements, at various scales, from varying sources, and even different times? What ethical obligations do we have in the working with spatial data? Although all maps, and by extension all GIS, may be in the same section of the library, what ethical responsibilities do we, as the operators and users, share? What questions do we need to ask? What warning labels, if any, do we need to post? What aspects of the spatial fabric are missing from our datasets? Should we care?