

GREAT LAKES REGIONAL DATA EXCHANGE

October 26-28, 2004 at the Marriott Renaissance Center in Detroit, Michigan



Conference
Program



Decision Support for the Great Lakes - St. Lawrence System in the New Millennium

CONFERENCE INFORMATION

About RDX

Welcome to RDX 2004! The theme for this year's Great Lakes Regional Data Exchange Conference is *Decision Support for the Great Lakes – St. Lawrence System for the New Millennium*. A substantial need exists to coordinate the diverse data holdings, integrate information systems, and develop interoperable computer models and decision support tools that deal with Great Lakes - St. Lawrence River resource management priorities. The conference and training seminars are designed to facilitate information exchange between participants, to identify opportunities for collaboration and to seek a consensus on a common vision for integrated decision support tools to meet the needs of regional policy and decisionmaking.

The RDX 2004 Conference is convening at the Detroit Marriott Renaissance Center from Tuesday, October 26 - Thursday, October 28. Maps of the conference rooms and floor plans are on page 4.

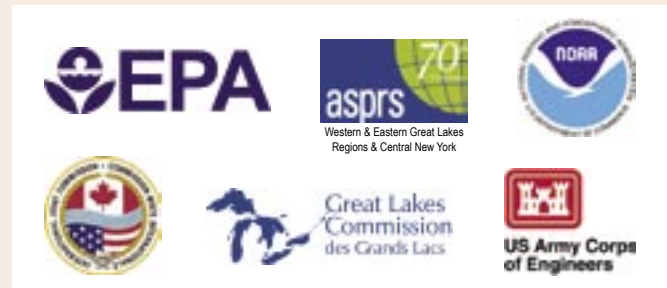
Target Audience

The conference is designed to appeal to a broad spectrum of participants who are interested in regional data and information sharing, and Internet-based and Geographic Information System (GIS) technologies.

- Federal and state/provincial governments, academic and non-profit organizations that engage in data collection, development, storage and management that wish to explore new ways for regional information coordination
- State/provincial/municipal information managers who oversee web and GIS technologies and are looking for new ideas and techniques
- Great Lakes stakeholders who are interested in web and GIS tools to improve decision-making



RDX 2004 Sponsors



Partners

Environment Canada; Great Lakes Information Network (GLIN); Merit Network, Inc.; Ontario Ministry of Natural Resources - Land Information Ontario (LIO); Open Geospatial Consortium (OGC); U.S. Fish & Wildlife Service; U.S. Geological Survey (USGS); Wisconsin Sea Grant; York University - GeoICT

Exhibitors

Commercial - Air-Land Surveys; Cloudmark; EarthSoft, Inc. - EQuIS: Environmental Quality Information Systems; Pan-gaea Information Technologies, Ltd.; Western Air Maps, Inc.; Weston Solutions, Inc.; WoolPert LLP

Other - Chlorine Free Products Association; Great Lakes Commission; Institute for Fisheries Research; Natural Resources Research Institute University of Minnesota; U.S. Environmental Protection Agency (USEPA); U.S. Geological Survey (USGS) Great Lakes Science Center

Program Committee

Greg Buehler, *Open GIS Consortium, Inc.*
Jennifer Day, *International Joint Commission*
Ian Gillespie, *Environment Canada*
David Hart, *University of Wisconsin-Madison Sea Grant Institute*
Brian Huberty, *U.S. Fish & Wildlife Service, R-3*
Candy Irvin, *Access Indiana*
Jessica Moy, *Michigan State University*
Scott Nelson, *U.S. Geological Survey*
Pranas Pranckevicius, *U.S. EPA Great Lakes National Program Office*
Mike Robertson, *Ontario Ministry of Natural Resources*
C. Vincent Tao, *York University*
Jennifer Wolf, *Merit Network, Inc.*

Great Lakes Commission Organizing Committee

Hugh Brennan, Jon Dettling, Roger Gauthier, Shannon Glutting, Christine Manninen, Devra Polack, Kevin Yam

Venue

Detroit Marriott at the Renaissance Center
Detroit, Michigan 48243 USA
Phone: 1-313-568-8000

RDX SCHEDULE

Tuesday, October 26, 2004

Training Seminars 8:30 am - noon	Flash design and development <i>Nicolet A</i>	Solutions to web mapping <i>Duluth A</i>	Web and video teleconferencing <i>Duluth B</i>	
12:00 - 1:00 pm Lunch - <i>Food Court</i>				
Training Seminars 1:00 - 4:30 pm	Great Lakes Internet Backbone – Internet2 and E-learning <i>Nicolet A</i>	Encoding: XML and GML <i>Nicolet B</i>	Metadata <i>Duluth A</i>	Internet security and SPAM control <i>Duluth B</i>
6:00 - 9:00 pm Welcome Reception - <i>East Foyer</i>				

Wednesday, October 27, 2004

7:30 - 8:30 am Registration, Breakfast - <i>East Foyer</i>				
8:30 - 10:00 am	Conference Introduction - Columbus Welcome to RDX - Dr. Michael J. Donahue, <i>Great Lakes Commission</i> "Binational Information Management" - Dennis Schornack, <i>International Joint Commission (IJC)</i> "Internet Future Across the Great Lakes-St. Lawrence River Region" – Dr. John S. Camp, <i>Wayne State University; Merit Network, Inc.</i> Keynote: "The Great Lakes in the Age of Information" – G. Tracy Mehan III, <i>The Cadmus Group, Inc.</i>			
10:00 - 10:30 am Break - <i>East Foyer</i>				
Breakout Sessions 10:30 am - noon	Case studies: Great Lakes management <i>Cadillac</i>	Data exchange policies <i>Brule</i>	Decision support systems I <i>Nicolet</i>	Regional exchange of monitoring data <i>Duluth</i>
noon - 1:30 pm Lunch, Catered - <i>Cartier</i> Keynote: "Cyber Security" - Karl Jacob, <i>Cloudmark, Inc.</i>				
1:30 - 3:00 pm	Plenary - Columbus "Great Lakes Information Network (GLIN) Strategic Plan" – Christine Manninen, <i>Great Lakes Commission</i> "Data Exchange and Homeland Security" – Ed Freeborn, <i>National Law Enforcement and Corrections Technology Center</i> "Legal Implications of Information Exchange" – Lou Milrad, <i>Gardiner Roberts LLP</i>			
3:00 - 3:30 pm Break - <i>East Foyer</i>				
Brainstorm Sessions 3:30 - 5:00 pm	Environmental applications <i>Nicolet</i>	Opportunities for binational economic development <i>Duluth</i>	Opportunities for education <i>Brule</i>	Protection of public health <i>Cadillac</i>
7:00 - 10:00 pm Off-Site Social Event - Night on Greektown and Dining at Fishbones				

RDX SCHEDULE

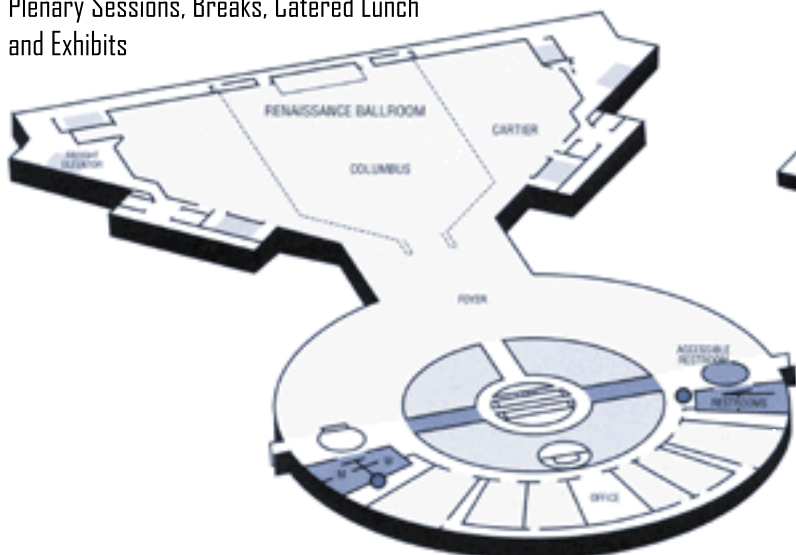
Thursday, October 28, 2004

7:30 - 8:30 am					Breakfast - <i>East Foyer</i>				
Breakout Sessions 8:30 - 10:00 am	Decision support systems II <i>Nicolet</i>	Distributed web mapping applications <i>Duluth</i>	Ecosystem observing <i>Cadillac</i>	Federal, state/provincial web portals <i>Brule</i>					
10:00 - 10:30 am					Break - <i>East Foyer</i>				
10:30 am - noon	Panel Discussion - Columbus <i>State and Provincial Chief Information Officers</i> "E-Government Successes and Regional Exchange Opportunities" - Patrick Garvey, <i>U.S. EPA - OEI (Moderator)</i> - Brian Maloney, <i>Ontario Land and Resources Cluster</i> - Kenneth D. Theis, <i>Michigan Department of Information Technology</i>								
noon - 1:00 pm					Lunch - <i>Food Court</i>				
Geographic Focus Sessions 1:00 - 2:30 pm	Lake Erie and Lake Ontario <i>Duluth</i>	Lake Huron <i>Nicolet</i>	Lake Michigan <i>Cadillac</i>	Lake Superior <i>Brule</i>					
2:30 - 2:45 pm					Break - <i>East Foyer</i>				
2:45 - 4:00 pm	Achievement Awards Presentation Closing Panel Discussion - Columbus "Future Directions" - Greg Buehler, <i>Open Geospatial Consortium</i> - Roger Gauthier, <i>Great Lakes Commission</i> - Mike Robertson, <i>Ontario Ministry of Natural Resources</i>								

Renaissance Center Floor Plans

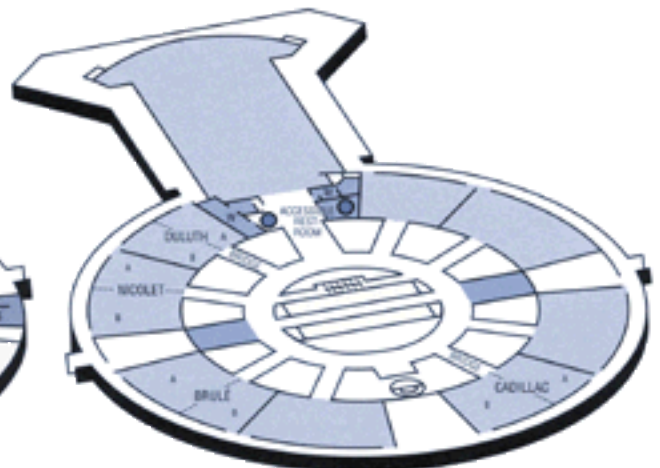
Level 4

Plenary Sessions, Breaks, Catered Lunch and Exhibits



Level 5

Training Seminars, Breakout, Brainstorm and Geographic Focus Sessions



TRAINING SEMINARS

Training at RDX

On Tuesday, October 26, the RDX Conference begins with seven training seminars, followed by the opening reception. Distributed between two 3.5 hour blocks, participants can choose to attend one seminar from the morning session, and/or one seminar from the afternoon. Topics were chosen to appeal to a broad range of RDX participants.

Morning Sessions: 8:30 am - noon

Flash design and development

What is Flash, and why is it so popular? Flash not only pushes the limits of Web design, animation, and multimedia, but makes it possible to build dynamic web tools that are also easily portable for stand-alone media. Learn the possibilities, limitations, tips and tricks of this versatile authoring tool.

Instructor: Devra Polack, *Spinster Design*

Solutions to web mapping

Discover the ways in which web mapping has advanced recently with the introduction of Specifications by the Open GIS Consortium (OGC). During this seminar, you will get introduced to how a Canadian agency has effectively leveraged a standards-based spatial infrastructure and you will learn how these services can easily enable spatial content on your web site. This session will use a simple, yet powerfully customizable toolkit for developing web-mapping applications called Chameleon.

Instructors: Greg Buehler, *Open Geospatial Consortium*
Ian Gillespie, *Environment Canada*
Tom Kralidis, *Environment Canada*
Dave McIlhagga, *DM Solutions*

Web and video teleconferencing

What products and services are currently available, and which are right for you? This workshop will introduce concepts on how to design and implement voice and video over IP networks.

Instructors: Laurie Kirchmeier, *Merit Network, Inc.*
Jonathon Tyman, *Internet2*

Afternoon Sessions: 1:00 - 4:30 pm

Great Lakes Internet Backbone - Internet2 and E-learning

High-speed networking is a strategic need for research and education organizations in Michigan. The course will introduce the best practices in networking, technology development and web-based learning.

Instructors: Mary McLaughlin and Jennifer Wolf,
Merit Network, Inc.

Encoding: XML and GML

This half-day course is designed to get you started regardless of your previous exposure to GML. Except for the first three introductory topics, this is a technical course, which assumes previous exposure to XML technologies and a working knowledge of programming languages and system modeling concepts (including UML). The first topic is non-technical and is intended to give a conceptual picture of what GML offers and the benefits it offers over similar technologies available today. The course will provide some details on key XML technologies including, in particular, XML Schema, XLink and XPointer. The course will focus specifically on how GML is used rather than on a detailed review of the specification.

Instructor: David Burggraf, *Galdos Systems, Inc.*

Metadata

The focus of this course will be on tools for the development of standards-compliant metadata for geospatial and non-geospatial data. While most people working with GIS data are familiar with the need for and use of metadata, it is sometimes difficult to actually produce this information or to share it in meaningful, widely available ways. The course will begin with a brief introduction of some of the major schemas for metadata (FGDC, ISO, Dublin Core). Following this introduction, we will demonstrate the use of a number of different software tools for metadata creation and sharing. A mix of both proprietary and free, open source tools will be discussed to meet the needs of all users in attendance.

Instructor: Jerry Johnston, *Pangaea Information Tech.*

Internet security and SPAM control

Learn how to better implement and maintain Internet, intranet, and extranet infrastructure and services as well as develop related applications. Strategies on reducing email spam will also be discussed.

Instructor: Jamie De Guerre, *Cloudmark, Inc.*

SPEAKER INFORMATION

Keynote and Plenary Speakers

Speakers arranged alphabetically by last name



Dr. John S. Camp

Chief Information Officer, Wayne State University;
Board Member, Merit Network, Inc.

Presenting: Conference Introduction: "Internet Future across the Great Lakes-St. Lawrence River Region"

When: Wednesday, October 27, 8:30-10:00 am

Speaker Background: John Camp is the Chief Information Officer at Wayne State University (WSU) in Detroit, Michigan. He is responsible for enterprise-wide strategic and tactical planning activities, implementing those plans, and coordinating information technology activities in schools, colleges and divisions at Wayne State. One of John's current initiatives is serving on the governing body of the Michigan Lambda Rail (MiLR). The three largest public universities in Michigan — Michigan State University, the University of Michigan and Wayne State University — are creating MiLR, a 750-



Patrick Garvey

Network Steering Board EPA Staff Director, U.S. EPA - Office of Environmental Information (OEI)

Presenting: Panel CIO Discussion: "E-Government Successes and Regional Exchange Opportunities"

When: Thursday, October 28, 10:30 am - noon

Speaker Background: Pat Garvey is in the Office of Information Collection. As the Staff Director to the Network Steering Board for the EPA members, Mr. Garvey is providing technical guidance and advice to the EPA Central Data Exchange project, the Facility Registry System integration development effort, and the agency-wide Integrated Error Correction/ Data Quality initiative. Pat has been recognized for numerous awards including the Federal 100 from Federal Computer Week. Projects that Pat has managed have also been chosen as a finalist in the E-Gov Best Practices program



Karl Jacob

Chief Executive Officer and Co-Founder, Cloudmark

Presenting: Luncheon Keynote: "Cyber Security"

When: Wednesday, October 27, noon - 1:30 pm

Speaker Background: Karl Jacob is a three-time entrepreneur and has been building Internet companies since 1992 in roles that span management, technology and marketing. Jacob joined Benchmark Capital as an entrepreneur-in-residence in July 1999, charged with creating the "next big thing." He formed Keen, and was the CEO and President until May 2002. While at Keen, he led the company to be credited as the fastest growing ecommerce company in history taking it from no revenue to sustained revenue and membership growth. Prior to Keen he spent two years as a Microsoft execu-



Brian Maloney

A/Head Information Management, Ontario Land Resources Cluster and Assistant Deputy Minister (ADM) Science and Information Resources Division (SIRD)

Presenting: State CIO Panel Discussion

When: Thursday, October 28, 10:30 am - noon

mile regional optical network with the capacity to meet their emerging and demanding research needs. Another of John's current activities is WSU's Center of Excellence for Administrative Systems, one of a small number of centers of excellence worldwide. Sun Microsystems and WSU are designing an integrated solution for 'optimizing' WSU's suite of administrative applications. Camp's professional activities include directing more than twenty externally funded projects, authoring twenty-five publications and two books, serving on committees (e.g., EDUCAUSE's Network Awards Committee (chairperson 2002-2003) and Current Issues Committee (2004—present)) and boards (e.g., Detroit CIO Governing Body and Merit Network, Inc.), and giving addresses at and national and international conferences. Most recently John presented/exhibited at EDUCAUSE's annual conferences (2000—2003), Sun's World Education and Research Conference (2001 and 2004), and SCT's annual Summit conferences (2001—2003). John is currently an elected Member-at-Large on SCT's Banner Advisory Board and an appointed member of SCT's Pillar Institutions Group. John received his Ph.D. in Mathematics and Mathematics Education from Columbia University, in New York.

in January 2001 and were recognized by Government Computer News in November 2000 for an Agency Excellence Award. In previous years, Mr. Garvey was the Director of the Envirofacts Warehouse Team of the U.S. EPA. While he was the manager, the Envirofacts Warehouse received the 1999 GII Award in Government, the Vice President's Hammer Award, the 1998 Smithsonian ComputerWorld Award and the 1998 CIO Enterprise Value Award as well as other awards within and outside the government. Mr. Garvey has been with EPA since 1984. He has worked in the Hazardous Waste Program, the Agency's Comptroller Office, the Denver Regional Office and now is with the Office of Information resources Management in Washington, DC. Pat has worked in state government in Texas and Florida. He has spoken at numerous national and regional conferences on a variety of topics on information technology, environmental protection, environmental justice, public empowerment, and data and information quality. Pat Garvey graduated with a Masters degree from the L.B.J. School of Public Affairs at U. of Texas Austin in 1975. His undergraduate work is from Florida State University in Social Work.

tive, following Microsoft's acquisition of Dimension X where he was founder and CEO. Two of Jacob's companies have been selected for Fortune Magazine's Cool Companies of the year list and Business Week named him one of the top 10 Up and Comers in 2000. Jacob has spoken on pivotal issues to the Internet industry at many conferences and trade shows including the Deutsche Bank Technology Conference, Goldman Sachs Internet Conference and Merrill Lynch Investment Conference. He is also one of the only executives to be a three-time return presenter at Demo, a premier industry event that hand selects the products set to ignite the technology landscape and turn the markets around for a given year. He advises and sits on the board at several companies including Cloudmark. Jacob holds a B.S. in Computer Science from University of Southern California, 1991 and currently sits on the school's board of counselors for the School of Engineering.

Speaker Background: Mr. Brian Maloney is a graduate of the University of Toronto with a B.Sc. in Survey Science. He is a licensed Ontario Land Surveyor. He has been a member of Canadian Council on Geomatics since 1995. Mr. Maloney has held several management positions in the Ontario Civil Service and has been instrumental in promoting the vision implementation of Land Information Ontario - including leading the development of Ontario's Land Information Infrastructure. Mr. Maloney has been a member of the team from Ontario Ministry of Natural Resources which is in the developmental stages of Information sharing and co-operation with British

SPEAKER INFORMATION

Columbia and most recently Quebec. Before joining the Ministry of Natural Resources, Mr. Maloney was the Chief Surveyor for the Ministry of Transportation. He was responsible for operational policy related to engineering and legal surveys, mapping and remote sensing. He also managed the delivery of geodetic and photogrammetric

surveys, and cartographic mapping. Mr. Maloney is a member of the Ontario Chapter of the Urban and Regional Information Systems Association. He sits on several federal committees responsible for the creation of a Canadian Spatial Data Infrastructure.



Christine Manninen

Program Manager, Great Lakes Commission

Presenting: Great Lakes Information Network (GLIN) Strategic Plan

When: Wednesday, October 27, 1:30-3:00 pm

Speaker Background: Christine Manninen is manager of the Communications and Internet Technology Program at the Great Lakes Commission in Ann Arbor, Mich. Most notably, she guides development of the Great Lakes Information Network (GLIN: www.great-lakes.net) and related web applications. Created in 1993, GLIN promotes information sharing among the eight U.S. states and two

Canadian provinces in the Great Lakes basin and is used by tens of thousands of policymakers and stakeholders daily. Manninen has a bachelor's degree in biological sciences from Michigan Technological University and is a master's candidate in environmental journalism at Michigan State University. She has been a consultant to the United Nations Educational, Scientific and Cultural Organization (UNESCO) on several international projects, including development of the "Water Portal of the Americas," an initiative to map the water resources of the American continents. In addition to doing web design and consulting, Manninen is president of the board of directors of the Isle Royale Natural History Association, a member of the Merit Advisory Council, and active in the American Water Resources Association and the Society of Environmental Journalists.



G. Tracy Mehan III

Principal, The Cadmus Group, Inc.

Presenting: Keynote: "The Great Lakes in the Age of Information"

When: Wednesday, October 27, 8:30-10:00 am

Speaker Background: G. Tracy Mehan, III, served as Assistant Administrator for Water at the U.S. Environmental Protection Agency from 2001-2003, directing both the Clean Water and Safe Drinking Water Acts programs. Prior to that he served as director of the Michigan Office of the Great Lakes, and a member of former Governor John Engler's Cabinet for eight years. Mehan also served as Associate Deputy Administrator of EPA in 1992. Starting in 1989 he was director of the Missouri Department of Natural Resources in the administration of then Governor John Ashcroft. In that capacity

he managed the state's environmental, parks, historic preservation, geology, energy and other programs. During his tenure as Assistant Administrator at EPA, Mehan developed new policies and guidelines on watershed-based permitting and water quality trading. He also promoted expanded ambient water quality monitoring and innovative approaches to meeting the challenge of the infrastructure financing gap. Mehan has broad experience in water diversion issues in both the Missouri River and Great Lakes basins. Currently, he is a Principal in the Arlington, VA, office of The Cadmus Group, Inc., an environmental consulting firm. He is a graduate of Saint Louis University and its law school and is a member of the Missouri Bar. Mehan is the recipient of the 2004 Environment Award from the Association of Metropolitan Sewerage Agencies (AMSA) and the 2003 Elizabeth Jester Fellows Environmental Partnership Award from the Association of State & Interstate Water Pollution Control Administrators (ASWIPCA).



Lou Milrad

Partner, Gardiner Roberts LLP

Presenting: Plenary: "Legal Implications of Information Exchange"

When: Wednesday, October 27, 1:30-3:00 pm

Speaker Background: Lou Milrad is a business-oriented lawyer who has devoted more than 25 years of specialization practicing technology law. During that period he has advised public and private sector management on the business, policy and legal issues of technology procurements, database ownership, and public/private

sector IT and IP strategic alliances. He assists clients in launching new ventures, including overseeing development of business plans, strategies to protect intellectual property assets, identifying sources of financing, corporate communications, structuring partnering and other alliances, commercializing innovation, and creating strategic relationships for product distribution. Lou has a comprehensive understanding of the technologies and emerging opportunities in the traditional and in the new economy sectors. Lou is listed in LEXPERT, a directory of leading law firms and practitioners in Canada, as a leader in Computer and Information Technology Law. Lou is also the editor of "Computers and Information Technology" published by Canada Law Book as part of their O'Brien's Encyclopedia of Forms series.



Ken Theis

Deputy Director of Agency Services, Michigan Department of Information Technology

Presenting: State CIO Panel Discussion

When: Thursday, October 28, 10:30 am - noon

Speaker Background: Kenneth Theis received his B.S. at Ferris State University and M.B.A. at Northwood University. He came to the State of Michigan from the General Motors Corporation where he held several key business and technology leadership positions. Mr. Theis has extensive background in business processes, technology and developing successful teams to tackle the most complex

projects. Accomplishments include leading Oldsmobile Division Systems reengineering & IT implementation supporting reengineered processes / reorganization. Kenneth also led the Systems Reengineering & Information Technology implementation for the reorganization of six General Motors Marketing Divisions into one centralized Vehicle Sales / Service / Marketing organization. In 1998, Theis received the General Motors Chairman's Honors Award, and was also the recipient of the General Motors CIO Award in 1999. In March 2000, Mr. Theis was appointed as the Deputy Chief Information Officer (CIO) for the Family Independence Agency (FIA). Under Mr. Theis' leadership, the State of Michigan has successfully implemented a statewide Child Support Enforcement System enabling the State to recover substantial federal penalties.

SPEAKER INFORMATION

RDX 2004 Presentations by Sessions

Abstracts arranged in order of presentation

Breakout Sessions (Wednesday, Oct. 27, 10:30 am - noon)

Case studies: Great Lakes management

Moderator: Ian Gillespie, *Environment Canada*

Room: Cadillac

Abstract Title: U.S. Federal Data and Regional Water Withdrawal Decisions

Presenter: Rebecca Lameka, *Great Lakes Commission*

Numerous regional initiatives, studies and agreements have demonstrated a heightened awareness and increased interest in developing the data, information and tools necessary to support sound water resources decisionmaking. With advancements in data collection, transmission, storage, analysis and retrieval occurring continuously, the decision support framework requires reliable information analysis and management tools. In response to these regional needs the U.S. Congress authorized a study under the John Glenn Great Lakes Basin Program of Water Resources Development Act 1999, to inventory data and information collected and generated by federal agencies relevant to the Great Lakes biohydrological system. Information to be collected includes: groundwater and surface water hydrology; natural and altered tributary dynamics; biological aspects of the Great Lakes system influenced by and influencing water quantity and water movement; Meteorological projections and the impacts of weather conditions on Great Lakes water levels; Other Great Lakes biohydrological system data relevant to sustainable water use and management.

The availability and status of biohydrological information that can be used to inform science-based water resources decisionmaking in the Great Lakes-St. Lawrence River basin are summarized. An assessment of current information system resources available across the basin, including listing of binational programs, federal and state agency clearinghouses and Canadian federal and provincial collaborators, is provided. Emphasis is also placed on the need for institutionalizing data exchange in a more formal approach to facilitate standardized regional decisionmaking. 59 tasks in creating a strong information base and a decision support system were identified.

Abstract Title: Great Lakes Aquatic Nonindigenous and Invasive Species Database

Presenter: David Raikow, *Great Lakes Environmental Research Laboratory, NOAA*

Invasive species are a widely recognized and severe economic and ecological problem in the Great Lakes. Comprehensive authoritative information on the ~175 known aquatic invaders, however, is spread among disparate information sources such as the primary scientific literature, gray literature, and on-line sources. As a result it is difficult for policy makers, scientists, students, and the public to quickly find such information. The U.S. National Oceanic and Atmospheric Administration's (NOAA) National Center for Research on Aquatic Invasive Species (NCRAIS), in partnership with the U.S. Geological Survey (USGS) and Smithsonian Environmental Research Center (SERC) has begun to consolidate this information for use in a distributed database system dedicated to invasive species called NISbase. This project will be described, as will impediments to truly comprehensive data coverage. For example, collection records for invasive species are currently limited to the U.S. This creates erroneous distribution maps for species in the Great Lakes when generated in real-time. Thus accurate analysis and presentation of Great Lakes invasive species ecology requires bi-national data exchange.

Abstract Title: The *Pileus Project*: Incorporating Climate Variability and Change into Decision-Making in the Great Lakes Region

Presenter: Jeanne Bisanz, *Michigan State University*

Many regional industries are affected by climate, and industry stakeholders routinely make decisions to manage the risk related to current climate variability. There is compelling evidence that our global climate is changing, and as the climate changes, so too will the risk faced by stakeholders. A complication is the relatively high uncertainty about the degree and nature of climate change and the

consequences for the decision-maker. The *Pileus Project* focuses on understanding the potential impacts and benefits associated with climate variability and change with respect to economic decision making for two regional industries: agriculture (specifically tart cherries, corn and wheat) and recreation/tourism (specifically skiing and camping). Each activity is climate dependent, stakeholder driven, economically significant, and Great Lakes relevant. The overall objectives of the *Pileus Project* are to:

- 1) cultivate stronger stakeholder-research partnerships,
- 2) engage stakeholders to help establish assessment goals, identify specific information needs, and provide expertise, data and information,
- 3) develop quantitative, interactive models that effectively simulate relationships between climate variability and change and the agriculture and recreation/tourism industries, and
- 4) integrate stakeholder input and model simulations to develop decision-support tools for risk management integrating quality climate science in the Great Lakes Region.

Pileus Project researchers have worked closely with stakeholders to identify climate-related stresses for their industries. Input and ongoing feedback from stakeholders has been crucial in designing and refining impact models for the agriculture and recreation/tourism industries. The models are integrated in an end-to-end assessment, whereby historical and projected future climate scenarios are linked to ecological, economic, and decision-support models. The component models will be incorporated into web-based risk management tools that will assist stakeholders in making climate-dependent decisions related to their industries. One important aspect of the project is the explicit estimation of the uncertainty of the climate scenarios along with that of the crop/tourism and economic models. Each component has its own levels of uncertainty (which increase when the three are combined). Consequently, the communication of this "cascade of uncertainty" to stakeholders is both paramount and challenging.

Abstract Title: Presenting Great Lakes Biological Information on the National Biological Information Infrastructure

Presenter: Scott Nelson, *Great Lakes Science Center, USGS*

The Great Lakes Science Center (GLSC) exists to meet the Nation's need for scientific information for restoring, enhancing, managing, and protecting living resources and their habitats in the Great Lakes basin ecosystem. The National Biological Information Infrastructure (NBII) is a broad, collaborative program designed to provide increased access to data and information on the nation's biological resources. The GLSC and the NBII are both part of the U.S. Geological Survey's Biological Resources Discipline. This presentation will describe the efforts of the Great Lakes Science Center, together with the NBII and its partners, to present biological information on the World Wide Web.

Data exchange policies

Moderator: Vincent Tao, *York University*

Room: Brule

Abstract Title: Data Requirements For Ontario Water-Taking Permits

Presenter: Dave Van Vliet, *AquaResource Inc.*

The Province of Ontario is in the process of implementing new legislation that will have a significant impact on the need to have access to many sources of water resources data currently managed by various agencies. The proposed new water-taking permit regulation under the Ontario Water Resources Act would: improve the assessment of the impact of water takings; include water conservation as a factor ministry directors must consider; set additional conditions for the ministry's directors to refuse permits; require mandatory reporting of water takings by permit holders; and require enhanced notification to municipalities and conservation authorities.

SPEAKER INFORMATION

This presentation provides an overview of the issues associated with data access and data exchange that will be faced when attempting to meet the above objectives. When the new regulation is in place, water resources data must be exchanged with provincial authorities including the Ministry of Environment, the Ministry of Natural Resources, as well as Local Municipalities, and Conservation Authorities.

Lakes-St. Lawrence River basin are summarized. An assessment of current information system resources available across the basin, including listing of binational programs, federal and state agency clearinghouses and Canadian federal and provincial collaborators, is provided. Emphasis is also placed on the need for institutionalizing data exchange in a more formal approach to facilitate standardized regional decisionmaking. 59 tasks in creating a strong information base and a decision support system were identified.

Abstract Title: The Exchange Network - Supporting the Mission

Presenter: Pat Garvey, *U.S. EPA - OEI*

Data collections are one of our most valuable resources. Data needs to be conforming to data standards if used by third parties and secondary users. Data and information needs to be shared through secure electronic methods. The Exchange Network offers an Internet and standards-based secure data exchange between partners. The Network has standards based guidelines and protocols to establish web services and to format data that others want and need. Shared services are part of this Exchange Network offered by EPA's Central Data Exchange group. A Grant program offers our Tribal and State partners financial support in developing a trusted Node on the Exchange Network and mapping data to registered XML schema formats. A cultural change is occurring through the Exchange Network. Get Powered up and Get Connected. Attendees will learn the key Exchange Network components and services including key web sites and learn of the already achieved successes by States and EPA using the Network, as well as, new grant opportunities for FY 2005.

Abstract Title: Development of Data Exchanges in Ontario - Policies, Issues and Lessons Learned

Presenter: Mike Robertson, *Land Information Ontario - OMNR*

The process of implementing data sharing relationships and data exchanges between multiple levels of public sector organizations creates unique challenges from both a legal and policy perspective. Land Information Ontario, within the Ontario Ministry of Natural Resources, has a mandate to establish and coordinate all land related information across the province. The goal is to ensure that geospatial information is well managed, accessible, integrable, and affordable. Over the past five years LIO has been able to implement a variety of data exchange partnerships that has enabled both public and private sector organizations to share geospatial data.

Technology can address the processes of geospatial data transfers quite easily, either through web mapping services, web feature services, OGC standards or other electronic means but there is a fundamental hurdle that is critical to establishing formal data sharing relationships. Data sharing agreements, access rights, use of geospatial data, protection of personal information and data security are challenges that need to be overcome, and accepted, through legal agreements, before any exchange of data occurs between two organizations. This presentation will outline some of the challenges related to establishing data sharing partnerships and the "lessons learned" during the implementation of the Ontario Geospatial Data Exchange.

Abstract Title: Using Standards to Share Critical Data between States and Local Government

Presenter: Shilpa George, *IDSiGIS*

Data sharing has become a buzzword. However, what are the real benefits of common data standards and near real-time data sharing using web services? This presentation will examine the roll out of a shared infrastructure for hazardous materials information to meet compliance and emergency response measures in Maryland State and each of its Counties and Fire Districts. We will discuss the benefits of real-time data sharing between Private Business, State, and Local Government in creating a common framework for compliance management and informed emergency response.

Information sharing in this infrastructure includes participation from State, Local Government, and private business safety and health managers.

The presentation will also demonstrate the use of geospatial technologies for effective risk identification and frameworks for geospatial data sharing between different levels of government.

The presentation will be an interactive, fast moving session with live demonstration. Please call for more information about the presentation.

Decision support systems I

Moderator: Brian Huberty, *U.S. Fish & Wildlife Service*

Room: Nicolet

Abstract Title: Automated EQuIS Data Management: Electronic Data Deliverable Sub-Systems and "Push" Interfaces

Presenter: Mitch Beard, *EarthSoft*

To effectively and successfully manage lakes and reservoirs managers must have large quantities of water quality data available in a form that is easily and readily analyzed to make both short-term and long-term decisions. In order to control taste and odor or toxin-producing algal blooms, it is necessary to detect the onset of the bloom to trigger control measures that minimize environmental and regulatory conflict. Longer-term issues require detection of trend changes in nutrient loading or hypolimnetic oxygen demand.

With the volume of data increasing as well as the work load, many groups seek to automate large parts of the data management process.

Data management can be broken into two primary functions, getting data into the data warehouse, and getting data out of the warehouse. We are now able to automate much of the process so massive amounts of data can be easily managed. Electronic Data Deliverables (EDDs) have been designed and are in use around the country. No new EDDs are required. EQuIS is able to automate the checking of EDDs for correctness and completeness so that little human effort is required. EQuIS data warehouses may be automatically populated.

The EQuIS system being used for some EPA Region 5 Superfund projects will be described in this talk. EQuIS and its limnological data management and visualization capabilities to support decision-making will also be described in detail.

Abstract Title: Integrating Watershed and Transportation Planning: A Stand-alone DSS for the non-GIS Professional

Presenter: Stephanie Kula, *U.S. Geological Survey*

Because many environmental effects of human activity are manifest at the watershed level, watershed-based analysis is a logical way to evaluate stressors to the natural environment. Nevertheless, transportation planning is commonly based on political boundaries. The Decision Support System (DSS) described here provides a means to integrate the usually separate endeavors of watershed management and transportation planning in Northeast Ohio. The goal of the DSS is to provide information that will allow system users to identify and then avoid or minimize negative effects of transportation development on the watershed and resources within. The macro scale of this DSS requires the area be seen as a whole and thus enables examination of indirect effects of transportation development on watersheds and associated biological and hydrological resources. The DSS is designed as a GIS windows-based, stand-alone application that does not require the user to have or be proficient in GIS. The DSS; a cooperative effort by the Cuyahoga River Community Planning Organization, U.S. Geological Survey, U.S. Environmental Protection Agency, Ohio Department of Transportation, and Northeast Ohio Area-wide Coordinating Agency, aims to get available GIS information out of "the back room" and into the hands of a larger pool of people early in the planning process.

Abstract Title: Utilizing Detailed Modeling and Monitoring Data for Decision Support

Presenter: Paul J. Martin, *AquaResource Inc.*

Groundwater and surface water modeling tools are routinely applied throughout North America to address a particular problem and are generally applied for average conditions. However, management decisions such as drought response generally occur during non-average conditions. Detailed models often require consid-

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erable effort to establish, calibrate / verify, and simulate conditions; the result is that it may take longer to reliably run the model than the time available to make the decision. Nonetheless, detailed models integrate a wealth of physical data, including the calibrated response to observed stresses, and as such are valuable tools for evaluating changing conditions due to changing stresses. Often models provide reasonable magnitude changes, but due to natural complexities, they cannot predict exact water levels or flows. As a result, real-time monitoring data is more frequently used to make short-term management decisions.

This paper discusses the approach toward development of a decision support tool that links the cause and effect prediction capabilities of a groundwater model with real-time monitoring data. In doing-so, the calibrated reactions of the groundwater system to observed stresses can be tied with observed water levels and streamflow conditions to provide more accurate predictions of near-future conditions and facilitate more-informed management decisions.

Abstract Title: A Unique Federal-State-Local Government Partnership

Presenters: Richard J. Zdanowicz and Jon F. Bartholic, *Water Division, US EPA Region 5 and The Institute of Water Research, Michigan State University*

The Midwest Spatial Decision Support Systems Partnership (<http://www.epa.gov/waterspace/>) finds itself well positioned to advance Region-wide web-based decision support efforts for watershed management and land use decision-making in the Midwest. Our goal is to develop, promote, and disseminate web-based spatial decision support systems to help manage watersheds. We also aim to help inform citizens, their partnerships, and local units of government about the environmental consequences of local land use decisions. In particular, our vision is to make these systems that are science-based, free-standing and intuitive, freely available via the Internet to local officials, natural resource managers, and the general public.

This presentation briefly reviews the key roles and accomplishments of the Midwest Partnership targeted at helping local communities develop cost effective approaches to watershed management planning and land use decision-making. Partnership activities include the following: sponsoring certain Decision Support Tools; expanding the effectiveness of sponsored tools; sponsoring hands-on training workshops; providing direct feedback from decision-makers to tool developers; working with the International City/County Management Association (ICMA), The University Extension Community and others to reach communities and develop capacity; expanding the partnership to include others who serve the needs of local communities.

Regional exchange of monitoring data

Moderator: *Pranas Pranckevicius, U.S. EPA GLNPO*

Room: *Duluth*

Abstract Title: Michigan's Electronic Filing of Wastewater Discharge Monitoring Reports and Data Exchange

Presenter: *Michael Beaulac, Michigan Department of Environmental Quality*

The Great Lakes basin is the focus of a multitude of monitoring and data collection agencies and organizations. Despite long term efforts on the part of these monitoring entities, there remains a great deal of progress to be made in the area of monitoring program coordination and collaboration. The Great Lakes Monitoring Inventory project, funded by the Joyce Foundation, is the first attempt at developing a comprehensive inventory of monitoring programs for the entire Great Lakes basin. By surveying federal, state/provincial, local, university and other non-governmental agencies a database of active monitoring programs was developed. This database will serve as a central location for monitoring program information in the region and will improve the ability of agencies to place more emphasis on monitoring coordination and data sharing. Rather than a monitoring data source, the inventory contains descriptive information including program manager contact information, parameters measured, sampling location, funding source, collection methods, quality assurance procedures, and much more. The inventory will be accessible to all through a fully searchable web site. Following completion of the inventory, there will be an analysis of gaps and overlaps in monitoring coverage and policy recommendations will be developed for improving monitoring coverage and coordination across the Great Lakes basin.

Abstract Title: Developing the Binational Executive Committee Monitoring Inventory

Presenter: *Brad Hill, Environment Canada Ecosystem Health Division, Ontario Region*

The Binational Executive Committee (BEC) has identified the need for a binational, basin-wide inventory of monitoring programs in order to raise awareness of ongoing activities, promote collaboration, and identify gaps. This was seen as a necessary step to improve the coordination of monitoring in the Great Lakes.

Based on the outcome of several workshops, BEC Senior Management endorsed the establishment of the inventory with the following recommendations: the inventory should build on previous and on-going work of others; the inventory and input form need to be on-line and should be accessible through www.binational.net; the input fields should be consistent with existing metadata standards; it should be mandatory that BEC agencies (and affiliated agencies) contribute to the inventory; others should be encouraged to contribute; in order to ensure completeness, BEC agency representatives should sign off on their agencies' input.

This presentation focuses on the incorporation of BEC Senior Management's recommendations into the development of "The Great Lakes Monitoring Inventory", a publicly accessible online application now established on www.binational.net which allows agencies to share information on monitoring programs in order to foster collaboration.

Abstract Title: Establishing a Monitoring Baseline for the Great Lakes Basin

Presenters: *Anne Sturm and Ric Lawson, Great Lakes Commission*

The Great Lakes basin is the focus of a multitude of monitoring and data collection agencies and organizations. Despite long term efforts on the part of these monitoring entities, there remains a great deal of progress to be made in the area of monitoring program coordination and collaboration. The Great Lakes Monitoring Inventory project, funded by the Joyce Foundation, is the first attempt at developing a comprehensive inventory of monitoring programs for the entire Great Lakes basin. By surveying federal, state/provincial, local, university and other non-governmental agencies a database of active monitoring programs was developed. This database will serve as a central location for monitoring program information in the region and will improve the ability of agencies to place more emphasis on monitoring coordination and data sharing. Rather than a monitoring data source, the inventory contains descriptive information including program manager contact information, parameters measured, sampling location, funding source, collection methods, quality assurance procedures, and much more. The inventory will be accessible to all through a fully searchable website. Following completion of the inventory, there will be an analysis of gaps and overlaps in monitoring coverage and policy recommendations will be developed for improving monitoring coverage and coordination across the Great Lakes basin.

Abstract Title: Archive and Retrieval of EPA Star Grant Data and Metadata: A Prototype developed by the Estuarine and Great Lakes Star Coastal Indicators Research Centers and EIMS

Presenters: *Valerie Brady and Terry Brown, Natural Resources Research Institute, University of Minnesota Duluth*

Data collected under federal funding should become available to others after the grants end. This requires both efficient data archive and retrieval systems and the creation of very complete, searchable metadata. The EPA Science To Achieve Results (STAR)-funded Estuarine and Great Lakes (EaGLE) Coastal Indicators Research Centers are prototyping a metadata and data archive and retrieval system in cooperation with EPA's Environmental Information Management System (EIMS). EIMS, EPA's geographic information catalog, has an existing framework for searching, preserving, administering and controlling access to metadata and data, although its emphasis has been on metadata only. This prototype system will expand EIMS to include the archive and retrieval of full data packages (metadata and datasets). The prototype requires researchers to create either EML (Environmental Markup Language) or FGDC metadata for datasets, allows a variety of levels of data security, and provides a highly searchable web-based retrieval system. A web-based EML metadata creation system was also produced to assist researchers in generating truly useful metadata. The EaGLE Centers consist of over 100 researchers creating indicators of coastal ecological condition for the US Atlantic, Pacific, Gulf and Great Lakes coasts. We anticipate archiving at least 100 datasets by 2007.

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Brainstorm Sessions (Wednesday, Oct. 27, 3:30-5:00 pm)

Environmental applications

Moderator: Gail Krantzberg, IJC, Great Lakes Regional Office

Room: Nicolet

Abstract Title: Web-Based Decision Support System for Assessing Environmental Impacts of Land Use Change

Presenter: Bernie Engel, *Purdue University*

The Long-Term Hydrologic Impact Assessment (L-THIA) decision support system (www.ecn.purdue.edu/runoff/lthianew) helps community planners, developers, and citizens quantify the water quality and quantity impacts of land use change. A user-friendly, integrated web and GIS mapping service allows a client to zoom to the area of the proposed change in land use, request the delineation of the watershed that encompasses the proposed area, identify the area and its new land use, and request an L-THIA run. Subroutines populate L-THIA with the required land use, precipitation, slope and other data and initiate a model run to estimate the before and after impact of the proposed land use change on annual runoff, many non-point source pollutants, and percent imperviousness within the watershed. The client may select tables, bar charts, and pie charts to review, print and save the estimated impacts.

Currently, the web, GIS version of L-THIA is fully functional for the six states within EPA Region 5 while a web version and desktop GIS version are available for nationwide use. L-THIA is also a key component of the Local Government Environmental Assistance Network (<http://www.ecn.purdue.edu/runoff/lthianew/>) as well as Digital Watershed (<http://www.iwr.msu.edu/dw/>). Additional complementary web decision support tools are also available at <http://pasture.ecn.purdue.edu/~watergen/>.

Opportunities for binational economic development

Moderator: Jennifer Day, IJC, Great Lakes Regional Office

Room: Duluth

Abstract Title: A Proposal for a Great Lakes Circle Tour Coastal Access Guide

Presenter: David Hart, *University of Wisconsin Sea Grant Institute*

The Great Lakes Circle Tour is a scenic road network established by the Great Lakes Commission (GLC) and designated by the eight states and two provinces adjacent to the lakes. A Great Lakes Circle Tour web site (<http://www.great-lakes.net/tourism/circltour/>) is maintained by the Commission which includes a schematic map and description of each lake's circle tour route, along with links to coastal cities and towns, attractions, lodging, parks, and general tourism resources. The GLC web site provides a good overview of the circle tour, but could be enhanced by an interactive web mapping site that helps direct travelers off the heavily-traveled state and federal highways of the primary circle tour route and towards the many coastal access sites and cultural tourism resources located on the downtown streets and rural roads that hug the lake. The interactive web mapping site could provide both a land-side and water-side perspective to the Great Lakes Circle Tour. The land-side orientation could integrate the primary circle tour route and local roads with coastal parks and beaches, hiking and biking trails, historical sites, and scenic vistas (including panorama photos). The water-side perspective could bring together features such as lighthouses, marinas, boat launches, fishing habitat, and shipwreck dive sites.

Abstract Title: Sustainability In Our Everyday Lives

Presenter: Archie Beaton, *Chlorine Free Products Association*

Sustainably managed companies provide many benefits to society. When buying groceries and/or cleaning products, "Do you know where your food/products are coming from and what effects do they have on our environment?" "Where do you get your information from?" It's great that someone labels their products as recycled, chlorine free, natural, etc. But, who's making sure that they are accountable?

The Need to Focus on Health and Safety Issues: "Do you know where your water

comes from?" What's in your water, that you use to bathe, wash and consume?" "Can your water hurt you?"

Protect Water Quality, Air, Soil and Wildlife: "Do you know how much water it takes to make your paper?" "Do you know where the trees came from on the paper that your writing on?" "How clean is the air we breathe?" "Do you know the difference between recycled and recyclable?"

Protect Unique Resources: "Is bottled water better than tap water?" "Are free range chickens really free?"

We need to communicate the benefits of the practice of sustainable manufacturing to the general public.

Chlorine Free Products Association has developed SMMI (Sustainable Manufacturing & Marketing Initiative), it is an independent third party to provide the accountability that we need.

Back to the question, "Where do you get your information from?" People retrieve information from many sources, but how do we know what is accurate and what is exaggerated?" We try to answer some of those questions and in order to do that you need accountability and that's where we come in.

Opportunities for education

Moderator: Michaela Zint, *University of Michigan, SNRE*

Room: Brule

Abstract Title: Knowledge and information management framework using GIS: An integrated approach

Presenter: Shiva Achet, *Roosevelt University*

A framework for information and knowledge management is proposed based on 1. Adaptive ecosystem management principles, 2. Hierarchy of goals, 3. Facilitation of stakeholders, and 4. People-resource interaction management. The adaptive ecosystem approach is system-based, problem-focused and improvement oriented. The hierarchy of goals links purpose, goal results and activities in a logical fashion. Facilitation analysis explores institutional relationship of different stakeholders. People-resource interactions are embodied as a part of the knowledge and information management system. The spatial domain of the knowledge and information management is a nested watershed continuum. The temporal perspectives from annual, periodic plans to long-term plans constitute the social learning processes. The linkage between the past and the present forms the basis for an outlook for the future. This integrated approach is employed to develop a research planning process for a watershed in the great lakes basin in a GIS framework.

Protection of public health

Moderator: Joan Rose, *Michigan State University*

Room: Cadillac

Abstract Title: EPA/OPPT's PBT Profiler

Presenter: Elizabeth Becker, *Consortium for Environmental Risk Management*

The PBT Profiler is a no-cost, online PBT screening methodology. The PBT Profiler is a subset of methods included in the P2 Framework, which is an approach to risk screening that incorporates pollution prevention principles in the design and development of chemicals. The objective of the P2 Framework is to inform decision-making at early stages of development and promote the selection and application of safer, sustainable chemicals and processes. This approach is implemented by means of a subset of estimation methods included in OPPT's P2 Framework.

EPA has taken methods for estimating environmental persistence (P), bioconcentration potential (B), and aquatic toxicity (T) and integrated these into a PBT Profiler. The PBT Profiler will predict P, B, and (fish chronic) T characteristics from chemical structure and provide a PBT Profile in an easy to understand format. When the user accesses the PBT Profiler on the Internet, the program prompts the user to enter the CAS Registry Number (RNs) of chemicals under consideration. The PBT Profiler is linked to a database containing the CAS RNs and the associated chemical structures for over 100,000 discrete chemical substances.

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Abstract Title: The Use of Information Technology To Enable Partnerships, Improve Sharing of Resources, and Advance the Goals of Pollution Prevention Within North America and Globally

Presenters: Tania Del Matto, *Canadian Centre for Pollution Prevention (C2P2)*
Andy Bray, *Northeast Waste Management Officials' Association (NEWMOA)*

The Pollution Prevention Resource Exchange (P2Rx) has developed an online information resource known as the Topic Hubs. The Topic Hubs cover a wide range of subjects and are written for anyone that wants to come up to speed on a subject, learn about pollution prevention opportunities, and access a wealth of related online resources. Each Hub is developed by one of the Regional P2Rx Centers and the content for that Hub is then syndicated throughout the National Network using an XML-enabled exchange system.

P2Rx and the Pollution Prevention World Information Network (P2WIN) have used information technology to build a partnership around the Topic Hubs that increases the audience for the Hubs and enhances the Hubs by adding global resources otherwise not widely available to the American audience. By expanding the existing exchange system, P2Rx and P2WIN are able to leverage resources and seamlessly share content. This partnership furthers the goal of P2Rx to act as the primary source of P2 information to the US audience while furthering P2WIN's successes in increasing access to P2 information throughout North America and globally.

This presentation will describe the data exchange system, the partnership, and the benefits of this partnership to the end users.

Breakout Sessions (Thursday, October 28, 8:30-10:00 am)

Decision support systems II

Moderator: Justin Booth, *Michigan State University*

Room: Nicolet

Abstract Title: Expedited Site Assessment in the Great Lakes Basin Using Information Technology

Presenters: Jennifer Troast and Natalie Kuester, *Weston Solutions, Inc.*

In order to assess potential impacts to water resources in the Great Lakes Region, environmental data management systems (EDMS) and geographic information systems (GIS) have been deployed to accelerate the process of data interpretation, remedy selection, and cleanup. Weston Solutions, Inc. (WESTON) has developed a data flow model that ensures data integrity from sample collection through data reporting.

Three case studies are presented that illustrate the seamless use of EDMS and GIS tools at sites that may impact water quality in the Great Lakes. Site A is located in on the shore of Lake Michigan. Historical use of the site as a creosote wood treatment facility resulted in hazardous materials seeping into Lake Michigan. Site B is a former chemical manufacturing facility along the Pine River in Michigan. Historical chemical disposal at the site has resulted in hazardous materials seeping into the river (which ultimately discharges to Lake Huron). Site C is located on the Little Menomonee River in Milwaukee, Wisconsin. Historical use of the site as a wood-treating facility resulted in creosote contaminated material to be discharged into the river. Data for all sites was electronically received from the laboratory, uploaded to an EDMS, and integrated with GIS.

Abstract Title: Great Lakes Habitat Evaluation Network (HEN)

Presenter: Robb Macleod, *Ducks Unlimited*

Ducks Unlimited (DU) started the planning process for an ambitious three-year research program to identify habitat specific data for waterfowl in the Great Lakes in the spring of 2000. During the planning process of this research, DU realized that it needed a mechanism to translate the results into a format that would be usable to both conservation planners and biologists. Therefore, HEN (Habitat Evaluation Network)- an ArcIMS application, was developed to turn the results of the research into tools conservation planners and biologists can use to target and identify habitat restoration in the Great Lakes. This talk will focus on how the results of the research were used to develop a custom ArcIMS application to guide habitat restoration in the Great Lakes.

Abstract Title: Making Detailed Coastal Science and Engineering Data Easily Accessible To Coastal Management Decision Makers and the Public – The Development of an Information Clearinghouse and Data Portal for the Communities of Southwest Washington

Presenters: Christian J. Stewart, *Christian J. Stewart Consulting*
Philip D. Osborne, *Pacific International Engineering, PLLC*

Coastal erosion hazards and long-term shoreline change are serious coastal management issues along the southwest coast of Washington state and have been under intense study for many years. Informed decision-making concerning risks associated with coastal erosion issues and coastal projects must rely on analysis of the available scientific and engineering data. Timely and efficient access to the best available data is often a decisive factor influencing the cost of coastal projects and improving the end-products of analysis. As a result of a number of large scale regional coastal investigations over the past ten years, a large amount of scientific and engineering data is now available for this section of coastline. The Coastal Communities of Southwest Washington - a group of coastal jurisdictions located between the Mouth of the Columbia River and Point Grenville at the north boundary of Grays Harbor County, and sponsors of many of these projects - wished to make this data available and readily accessible to other users, in particular those involved in making management decisions in the local communities, and as such, initiated the development of an Information Clearinghouse and "Coastal Data Portal" to provide efficient access to this data through the Internet. The internet portal (<http://www.washington-coastal.com/>) provides access to basic information about the Coastal Communities and the projects they have sponsored including linkages to various project reports. Users may search for and download detailed coastal data by specific region and data type through a hierarchical data query system. Geospatial data can be viewed directly in an ArcIMS web mapping interface. Users also have the ability for to view near real-time weather and other oceanographic data for select locations.

Abstract Title: A WebGIS-Based Hierarchical Watershed Decision Support System for the United States

Presenters: Yi Shi and Jeremiah Asher, *Institute of Water Research, Michigan State University*

The web-based Digital Watershed and Understanding your watershed programs created by Institute of Water Research of Michigan State University established a hierarchical watershed decision support system framework for the whole United States. The Digital Watershed website is designed to provide both a centralized nationwide information repository and computing center for watersheds in the United States. This site is based on the comprehensive database of 8-digit watersheds for the whole continent of the United States, which is included in the EPA BASINS system. The database contains all regulated facilities, river network, DEM, state soil and other data layers. A recently developed new feature is to dynamically retrieve the aerial photo images from TerraServer and use it as the background for the map. The digital watershed site is interconnected with Michigan's local level watershed decision support system called Understanding your watershed by the scaling function. Understanding Your Watershed is an interactive web-based mapping program utilizing the capabilities of a Web Geographic Information System (WebGIS). The program enables a user to select a Michigan 12-digit watershed and display various features within that watershed such as streets, water bodies, elevation, risk areas, wetlands and other information available across the state. The scaling function provides the seamless transition between two systems. This framework is being used to create and integrate local level watershed information systems for other states in EPA region 5. In the meantime, the decision support tools such as online watershed delineation and L-THIA (Long Term Hydrological Impact Assessment) developed by Purdue University are being integrated into the framework under the online spatial decision support systems interoperability project funded by EPA region 5. This paper describes the design principles and strategies behind the framework, illustrates the system functionality and reports the progress made for the ongoing interoperability project.

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Distributed web mapping applications

Moderator: Greg Buehler, *Open Geospatial Consortium*
Room: Duluth

Abstract Title: Building a Distributed Spatial Capacity for the Gulf of Maine

Presenter: Dave McIlhagga, *DM Solutions Group Inc.*

A Canada-US project sponsored by GeoConnections and FGDC was recently completed in the Gulf of Maine region that enabled Canadian and American Federal, State/Provincial, Academic and NGO partners to share data through open standards developed within the Open GeoSpatial Consortium (OGC). This presentation will discuss and showcase the primary outcome of this project - the Gulf of Maine Mapping Portal (www.gommmmap.org). This portal provides information and tools for publishing to OGC standards, discovering available data within the Gulf of Maine, and enabling organizations to more easily develop their own applications leveraging this ever growing spatial infrastructure for the Gulf of Maine. Through this presentation you will learn about the successes and lessons learned from this project, next steps to further advance the GoMMMap portal and OGC Gulf of Maine spatial infrastructure, and how this approach could be applied within the Great Lakes Region.

Abstract Title: Internet-based Interactive 3D Visualization and Monitoring of the Great Lakes Region Based on OpenGIS Web Services

Presenters: Dr. Vincent Tao and Björn Prenzel, *York University*

The binational Great Lakes region is North America's industrial heartland, and also supports a multi-billion dollar outdoor recreation and tourism industry, a strong maritime transportation system, and a diverse and extensive agricultural base (Great Lakes Information Network [GLIN] 2004). The Great Lakes Regional Data Exchange (RDX) 2004 conference was born out of recognition that in order to effectively fulfill the collective potential of the region, new data / information sharing approaches / tools / capacities are required. Towards this end, 2D and 3D spatial-based analysis and visualization systems are recognized as powerful tools for research and decision-support. The emergence of broadband internet infrastructures means that this capacity is being dramatically expanded by allowing for distributed data / information sharing, multi-user / multi-organization interaction, and strategic international collaboration / tactical decision making. The GeoICT lab at York University, Canada, in conjunction with its spin-off company, GeoTango International Corp. has developed GSN Globe, a powerful client for Internet-based, interactive, 3D visualization of spatial data / information through OpenGIS web services. The system also allows for access to location-specific data / information such as text, numerical data, imagery, multi-media, sensor information, etc. GSN globe represents a powerful data exchange system that can be readily adapted to suit many different analysis and decision-making contexts. In the case study shown here GSN globe is applied to the great lakes region. The example highlights how GSN globe's capacity for distributed geospatial data access, 3D visualization, and advanced image streaming / rendering can be used as a central collaborative analysis and decision-making tool in key industry sector applications such as eco-tourism, environmental monitoring, planning, and tactical and emergency response.

Abstract Title: Next Generation Web Mapping Applications

Presenter: Ian Clemens, *IDV Solutions*

With all of the attention Geographic Information Systems (GIS) has gained in recent years, they have been slow to infiltrate organizations as a de facto decision tool. Certainly the web has been a boon to awareness of geospatial information; popular consumer services such as MapQuest are a good example. However, limits in web technologies have failed to deliver the functionality and interactivity necessary to convince enterprise users of the potential for GIS. In this presentation, we will show how ESRI web mapping technologies can be combined with a new breed of web application called Rich Internet Applications (RIA) to enable organizations to display, analyze, and manipulate data using intuitive maps and intelligent graphics. This combination of GIS and RIA is bringing increased return on investment (ROI) to organizations by combining the power of GIS, the distribution of the internet, and the interactivity of desktop applications to turn complicated data into understandable, visual information. Numerous demonstrations will be given.

Abstract Title: Bridging the Knowledge Gap: Facilitating Access to Atmospheric Emission Data

Presenters: Kevin Yam, *Great Lakes Commission*; Jeff Ehman, Jerry Johnston and Shon Doesck, *Pangaea Information Technologies Ltd.*

The eight Great Lakes states (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania and Wisconsin), the Canadian province of Ontario and the Great Lakes Commission have been involved in a decade long collaborative effort to develop a comprehensive regional inventory of air toxic emissions including 213 pollutant from point, area and mobile sources for the Great Lakes basin. The Great Lakes Commission has developed the "Centralized Air Repository On-Line" (CAROL) to enhance the emission inventory effort. Two primary goals are associated with this project: (1) to design, develop and deploy a web-based airborne toxic information system for the Great Lakes region; and (2) to communicate, share and exchange the contents of the system with a wide range of users. The system will bring together disparate datasets, including toxic substances from point, area and mobile emission sources, base mapping data and various critical environmental data. Using current Open Geospatial Consortium (OGC) interoperability standards, this data will be presented via the Internet to allow browsing and querying of otherwise unconnected data, using a range of underlying geospatial mapping technologies. This system represents a substantive contribution toward addressing critical communication and information gaps among public health professionals, environmental health researchers, policy-makers and the general public at the local and regional levels. For more information, visit: <http://www.glc.org/air> or <http://mds.glc.org/carol>.

Ecosystem observing

Moderator: David Schwab, *NOAA GLERL*

Room: Cadillac

Abstract Title: Great Lakes Aquatic GAP: Development of a Habitat Database for Riverine Systems in the Great Lakes

Presenter: Stephen S. Aichele, *U.S. Geological Survey*

The Great Lakes Aquatic GAP Analysis Program is developing predictive models of fish species distribution throughout the Great Lakes basin. These models associate fish species with macro-scale physical habitat attributes including drainage area, land cover, bedrock and surficial geology, and climate.

This project has developed a process and database structure to capture and store physical habitat attributes for each river segment in the 1:100,000 scale National Hydrography Dataset. These attributes characterize the channel, riparian zone, and drainage basin for each river segment. Fish species observations also have been linked to the river segments in the database. Drainage basins for each river segment incorporate the entire upstream contributing area. Geographic Information System datasets for Michigan and Wisconsin have been completed, and the New York dataset is nearing completion. Similar datasets for other Great Lakes states will be completed in coming years.

Although the datasets have been developed to assist in predicting fish distributions, they will likely be valuable in predicting other hydroecological information including stream flow distributions, flood frequency, base flow, and water quality. The dataset and a report describing the process used to create the dataset and attributes is available online.

Abstract Title: Great Lakes Wetland Monitoring-SAR and Landsat

Presenter: Laura Bourgeau Chavez, *General Dynamics AIS*

The focus of the project to be presented was to merge the capabilities of microwave (radar) and optical sensors to optimize satellite-based remote mapping and monitoring of coastal wetlands in the Great Lakes. The main goals were to develop techniques and demonstrate approaches to; (1) determine change over time in wetlands and adjacent uplands; (2) map extent of flooding in forested wetlands; and (3) merge Landsat and radar for improved wetland mapping capabilities. The approaches were developed over three study areas of the Great Lakes. Wetlands have historically been one of the most difficult ecosystems to classify using remotely sensed data. This difficulty is partially due to the high variability in wetland morphology. Our results show how Synthetic Aperture Radar (SAR) and multi-spectral sensors complement each other in the classification of wetland ecosystems. Multi-spectral data can provide information on cover type and wet-

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ness information in open canopied ecosystems while SAR can provide flood condition and extent of flooding of forests and other closed canopy ecosystems. We will present the results of our initial study which includes hybrid change mapping techniques using existing current and archival categorical maps and Landsat radiometric data from the same time periods (season and year); flood extent maps derived from SAR; and SAR-Landsat derived categorical maps of wetland and land cover type.

Abstract Title: Real Time Data Exchange for Great Lakes Ice Chart

Presenters: David Bradley, *Canadian Ice Service, Environment Canada*

The North American Ice Service (NAIS) is a virtual organization who members are the U.S. National Ice Service (NIC), the Canadian Ice Service (CIS) and the International Ice Patrol (IIP). The concept of the NAIS is to create a harmonized suite of products and services for ice information for North American waters to serve the needs of users for safety of navigation and informed decision-making. The NAIS is officially recognized by both the US and Canadian government through the signing of the "North American Ice Service". The integrated service will combine the strengths of the existing centers and result in seamless products of high quality and consistency. The NAIS will offer a single point-of-entry for ice information and will provide a suite of common North American ice products that may be produced at either center equally, effectively and indistinguishably to the user.

The Great Lakes was chosen as the first area to exercise the NAIS concept. Through the real-time exchange of data such as Radarsat and Envisat imagery and model outputs used to analyze ice information, the two Ice Centers are able to provide harmonized ice charts and products for the Great Lakes. Current activities are focusing on implementing common database and computing architectures to facilitate data sharing.

Abstract Title: Regional Association Development for the Great Lakes Observing System (GLOS)

Presenter: Roger Gauthier, *Great Lakes Commission*

The Great Lakes Commission is leading development of an integrated Great Lakes Observing System (GLOS) to provide critical real-time data for multiple users, including, among others, resource managers, researchers, homeland security interests, the commercial shipping industry and the recreational boating community. GLOS will be a regional node of the U.S. federal interagency Integrated Ocean Observing System (IOOS). Currently there are multiple, independent observing systems within the U.S. Great Lakes - St. Lawrence River system which collect, transmit, store and retrieve physical, chemical and biological data. The GLOS will provide coordinated access to these disparate data sets to better support Great Lakes management decisions. A business plan has been developed to support establishment of a regional association of data providers, managers and users to coordinate data collection, integration and retrieval. The GLOS regional association is expected to coordinate user requirements, advocate for funding and generate value-added products over the Internet on a 24/7/365 basis. The business plan development has involved a range of federal, state and provincial agencies, academic institutions, and relevant nongovernmental organizations. Funding for this initiative is through the NOAA Coastal Services Center.

Federal, state or provincial web portals

Moderator: Eric Swanson, *Center for Geographic Information, State of Michigan*

Room: Brule

Abstract Title: Land Information Ontario: Creating a Spatial Data Infrastructure for Ontario

Presenter: Mike Robertson, *Land Information Ontario - OMNR*

Land Information Ontario (LIO) has created an infrastructure that will support the development of partnerships in the collection, management and distribution of Ontario's land information assets. The Ontario Land Information Infrastructure has two major thrusts: ensuring the existence of certain important data sets, and ensuring access to, and widespread general use of, geospatial data. Self-sustain-

ing, well managed, good quality, important data sets are created through a wide variety of cross-jurisdictional projects and policy initiatives. Access to geospatial data are encouraged through data catalogues, data sharing organizational structures and data sharing tools. This discussion reviews the objectives, the history and the reality of Land Information Ontario and its role among the users and managers of geospatial data in Ontario. One of the main goals is to implement a collaborative approach to spatial data in the province through the development of data sharing opportunities that will benefit a wide variety of organizations. Through data sharing, development of data standards and adoption of collaborative approaches to data collection and management significant benefits can be realized amongst both private and public sector organizations. Those who are interested in Ontario geospatial data will have the opportunity to discover how LIO is developing and fostering relationships.

Abstract Title: Building an Environmental Information System for Ontario

Presenter: Brad Hill, *Environment Canada Ecosystem Health Division, Ontario Region*

Environment Canada's Ontario Region (EC-OR) has developed an online application in order to harmonize information management (IM) activities within Ontario and contributes to broader information management systems on the environment, nationally and internationally.

The Ontario Region Information System for the Environment (ORISE) has adopted several guiding principles which enable it to serve as a discovery, access, visualization & decision support tool for monitoring activities.

This presentation will focus on the process of incorporating these principles into the ORISE architecture and how doing so allows EC-OR to present a fully distributed, interoperable web mapping application whose spatial, temporal, and document based information not only satisfies IM requirements, but is completely customizable in form and content by the data custodians.

Abstract Title: Open Technologies for Visual Framework Data Catalogs in Wisconsin

Presenter: AJ Wortley, *WI State Cartographer's Office*

In Wisconsin, the State Cartographer's Office is building a Clearinghouse framework for finding and accessing distributed geospatial data and services statewide. Our initial efforts resulted in growing statewide thematic catalogs, dubbed ControlFinder and OrthoFinder. This framework, built on Mapserver and open technologies, has now been extended to the Wisconsin Land Information Clearinghouse (WISCLINC). WISCLINC will network together emerging webmapping services and distributed geospatial information in support of state and federal portal efforts.

Continued outreach and education in support of open standards, the benefits of web services integration and interoperability, and quality documentation continue to be our mainstays as we encourage local participation in our efforts. Here we present current successes, imminent challenges, and future directions for facilitating access to comprehensive statewide geospatial resources to support state and regional mapping applications and decision support systems.

Abstract Title: The National Map - A Framework for Data Exchange

Presenter: Charles Hickman, *U.S. Geological Survey*

The U.S. Geological Survey and many cooperating organizations are currently developing the National Map (<http://nationalmap.usgs.gov>). This will be a current and continuously maintained nationally consistent set of seamless geographic and topographic base information that will serve as a foundation for integrating, sharing, and using data. It will provide Internet access to maps, imagery, and feature data updated through cooperative efforts with state and local governments and industry. Recent developments include a web accessible viewer linked to an expanding set of distributed web mapping services. State and county efforts in support of spatial data coordination are critical to the success of The National Map.

SPEAKER INFORMATION

Geographic Focus (Thursday, Oct. 28, 1:00-2:30 pm) Lake Erie and Lake Ontario

Moderator: Ian Parrish, Ontario Ministry of Environment

Room: Duluth

Abstract Title: GIS and Web Technology for Wetland Planning

Presenter: Patrick Lawrence, University of Toledo

A recent project completed by local and regional partners with the Open Space and Wetlands Action Group of the Maumee Remedial Action Plan (www.maumeerap.org) aims to provide an updated and improved classification and inventory of four major wetland types found within Lucas County in northwest Ohio. This area is experiencing a range of land use changes including urban sprawl from the City of Toledo and related industrialization, recreational uses and other human activities. Remote sensing and Geographic Information Systems (GIS) techniques and methods were employed in order to create determine the types and locations of coastal, riparian, prairie and wet-forest wetlands. Available satellite imagery from Landsat for multiple dates in 1999 and 2000 were analyzed utilizing several tools from ERDAS Imagine including Knowledge Engineer in order to identify characteristic spectral signatures indicative of the wetland features. Additional spatial GIS information was developed for wetland classification including land elevation (DEM), soil types, hydrology and assessed agricultural lands, which incorporated with ARCVIEW. In order to assist with community decision-making and raise public awareness related to wetland issues and the development of the wetland inventory and classification all project products have been made available via the web by use of ARC/IMS (<http://wetlands.utoledo.edu/index.html>)

Abstract Title: Data Rich, Information Poor: Maximizing the Usefulness of Existing Data Through Standards

Presenter: Tanya Trivedi, Fisheries & Oceans Canada

The Great Lakes play an important role in the physical, social and economic life of North America. However, over the years, the environmental quality of the Great Lakes has substantially degraded. The complex nature of the environmental problems facing the Great Lakes requires a rehabilitation approach that is multi-disciplinary and multi-faceted. To develop such an approach, scientists from different disciplines need to share their data. GLLFAS, a sub-department of Fisheries & Oceans Canada has set its focus on the Bay of Quinte, Lake Ontario which is listed as an AOC (Area of Concern) site. For the past 37 years many scientists have collected data on multiple trophic levels in the Bay of Quinte. These data exist in many different formats. Rehabilitation efforts have been impeded because these data are not readily available to scientists in a standardized format. Data integrity is achieved through standardization of data sets which allows for sound decision support systems. Facilitation of sound decision-making not only requires that the individual measurements be standardized but also requires a standardized approach to database design. This allows multi-disciplinary, disparate data sets to be integrated thus permitting easy exchange and comparison of data. We will present our challenges and successes of the database development process and the implementation of standards across scientists with different focuses on the Bay of Quinte AOC site.

Lake Huron

Moderator: James Schardt, USEPA

Room: Nicolet

Abstract Title: The Great Lakes GIS: A Habitat-based Decision Support System for the Great Lakes Basin

Presenters: Christine A. Geddes and Edward S. Rutherford, University of Michigan School of Natural Resources & Environment, Institute for Fisheries Research

In the Joint Strategic Plan for Management of Great Lakes Fisheries (1981, revised in 1997), United States and Canadian federal, state, provincial, and intertribal agencies agreed to share data, particularly through compatible, automated information systems. To facilitate sharing of data and holistic management of the Great Lakes basin, a GIS of aquatic ecological units is being assembled. The Great

Lakes GIS includes map-delineated spatial units and associated habitat and biological attribute data for terrestrial, tributary, nearshore, and offshore ecosystems. As the project progresses, firm protocols are evolving to facilitate the transfer of data and information among agencies, states, or nations. While significant progress has been made, incompatibilities in current policies and the lack of spatial standards impede development of the Great Lakes GIS. In the absence of basin-wide standards, delineations for shoreline, administrative, and ecological units (e.g., watershed) are inconsistent within and between agencies, and among projects. Moreover, spatial registration systems (i.e., projections/coordinate systems) vary among ongoing, basin-wide GIS projects, creating cross-compatibility issues. These problems should be addressed to set Great Lakes basin standards and foster greater collaboration among project leaders.

Lake Michigan

Moderator: David Hart, University of Wisconsin-Madison

Sea Grant Institute

Room: Cadillac

Abstract Title: NPS Great Lakes Inventory & Monitoring Program Gateway

Presenters: Ulf Gafvert and Mark Hart, NPS, Great Lakes Inventory & Monitoring Network (GLKN)

The Great Lakes Network (GLKN) is one of 32 networks across the United States with a mandate to monitor the ecological health of the national parks. Working with the natural resource staff in its nine partner parks, which stretch from northern Indiana to northern Minnesota, GLKN has initiated a monitoring program that will use data from program-funded research as well as existing and on-going data from partner agencies. The Network contracted the Institute of Water Research at Michigan State University to assist GLKN in developing an ArcIMS website that will facilitate the availability and use of all the Network's data products.

Initial work on the website involved interface development and integration of existing partner data on water quality, land use, and climatic data, which will provide valuable support and context for future Network-supported monitoring data.

Lake Superior

Moderator: Valerie Brady, University of Minnesota-Duluth,

Natural Resources Research Institute

Room: Brule

Abstract Title: Standardization of genetic markers and databases

Presenter: Wendylee Stott, Great Lakes Science Center-USGS

Parallel, multi-jurisdictional genetic research on the potadromous 'coaster' ecotype of brook trout (*Salvelinus fontinalis* Mitchill) in Lake Superior has sparked the need for data sharing and standardization among research labs and management agencies. Marker standardization among collaborating labs using shared reference samples has enabled standardization of genotype scoring and interpretation, as well as developing a shared toolkit for assessing genetic structure and diversity. This effort has been complemented by the development of a lake-wide genetic database for data sharing among labs, greatly enhancing the resolving power of localized studies. The resultant database of standardized genetic data will facilitate monitoring and adaptive management efforts, and should prove to be similarly useful for genetic analysis of the species throughout its range.

EXHIBITOR INFORMATION

Featured Commercial Exhibitors

RDX 2004 features many commercial, government and non-profit exhibitors, all involved in different aspects of Great Lakes data exchange. Visit all of the displays in the East Foyer and in the Columbus ballroom (4th level). Details on our commercial vendors (*listed in alphabetical order*) are below.

Air-Land Surveys

Air-Land Surveys (ALS) is a Michigan-based photogrammetric mapping firm, serving private and public sector clients since 1967. They provide aerial photography, digital orthophotography, mapping, and surveying services to clients throughout the United States. Visit their web site at www.airlandsurveys.com

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EarthSoft

EarthSoft, Inc. has written EQuIS (Environmental Quality Information System), which is the most widely used environmental data management system in the world. EQuIS is used in Australia, the U.S., U.K., and many other places, by the regulatory community, industrial property owners, many consultants, and is supported by many analytical labs. Visit their web site at www.earthsoft.com

pangaea INFORMATION TECHNOLOGIES LTD.

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Before you leave, please take the time to fill out the RDX 2004 Conference evaluation form, included in your RDX bag. There will be a drop box for the forms by the coffee break tables in the East Foyer. Thank you!

Conference Proceedings

The final RDX 2004 Conference proceedings will be posted on the RDX web site at rdx.glc.org. This information will also be mailed on CDs to all of the conference attendees.

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