Introduction

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The Digital Mapping Techniques '07 (DMT'07) workshop was attended by 85 technical experts from 49 agencies, universities, and private companies, including representatives from 27 state geological surveys (see Appendix A). This workshop, hosted by the South Carolina Geological Survey, from May 20-23, 2007, on the University of South Carolina campus in Columbia, South Carolina, was similar in nature to the previous ten meetings (see Appendix B). As in the previous meetings, the objective was to foster informal discussion and exchange of technical information. It is with great pleasure that I note that the objective was successfully met, as attendees continued to share and exchange knowledge and information, and renew friendships and collegial work begun at past DMT workshops.

Each DMT workshop has been coordinated by the Association of American State Geologists (AASG) and U.S. Geological Survey (USGS) Data Capture Working Group, the latter of which was formed in August 1996 to support the AASG and the USGS in their effort to build a National Geologic Map Database (see Soller, this volume, and *http://ngmdb.usgs.gov/info/standards/datacapt/*). The Working Group was formed because increased production efficiencies, standardization, and quality of digital map products were needed for the database—and for the State and Federal geological surveys—to provide more high-quality digital maps to the public.

At the 2007 meeting, oral and poster presentations and special discussion sessions emphasized: 1) methods for creating and publishing map products (here, "publishing" includes Web-based release); 2) field data capture software and techniques, including the use of LIDAR; 3) digital cartographic techniques; 4) migration of digital maps into ArcGIS Geodatabase format; 5) analytical GIS techniques; and 6) continued development of the National Geologic Map Database.

ACKNOWLEDGMENTS

I thank the South Carolina Geological Survey (SCGS) and their Director and State Geologist, William Clendenin, for hosting this meeting. It was a real pleasure to work with Erin Hudson and Scott Howard, who coordinated the events. I also thank Jennifer Krauser, Joe Koch, Chris Terry and Matt Nichols, Melissa Clare Beaty, Kimberly Meitzen, and Gary Taylor, for their hard work that ensured the meeting's success.

I also thank the members of the Data Capture Working Group (Warren Anderson, Kentucky Geological Survey; Elizabeth Campbell, Virginia Division of Mines and Geology; Rob Krumm and Barb Stiff, Illinois State Geological Survey; Scott McColloch, West Virginia Geological and Economic Survey; George Saucedo, California Geological Survey; and Tom Whitfield, Pennsylvania Geological Survey) for advice in planning the workshop's content.

And, last but not least, I thank all attendees for their participation; their enthusiasm and expertise were the primary reasons for the meeting's success.

PRESENTATIONS AND POSTERS

The workshop included 21 oral presentations and 30 posters. Many are supported by a short paper contained in these Proceedings. The papers describe technical and procedural approaches that currently meet some or all needs for digital mapping at the respective agency. There is not, of course, a single "solution" or approach to digital mapping that will work for each agency or for each program or group within an agency; personnel and funding levels, and the schedule, data format, and manner in which we must deliver our information to the public require that each agency design their own approach. However, the value of this workshop and other forums like it is through their roles in helping to design or refine these agency-specific approaches to digital mapping, and to find applicable approaches used by other agencies. In other words, communication helps us to avoid having to "reinvent the wheel."

During the course of the 11 annual DMT meetings, it has been my pleasure to meet, and work with, the many talented people who have authored papers in these Proceedings. As the

subjects addressed by the DMT meetings have become even more essential to the Nation's geological surveys, the demands placed on them have risen to the point where many authors scarcely have time to address their work fully. Predictably, less time is then available to compose written summaries of their work; I'm sure the readers (or at least other editors) can sympathize with this predicament. Therefore, I include with this Introduction a list of all presentations and posters (Appendix C). If the reader finds an interesting title that isn't recorded in these Proceedings, I encourage them to contact the authors directly. Further, some presentations and related information is available for download at *http://ngmdb.usgs.gov/Info/dmt/DMT07presentations.html*.

THE NEXT DMT WORKSHOP

The twelfth annual DMT meeting will be held in the Spring of 2008, on the campus of University of Idaho, in Moscow, Idaho. Please consult the Web site (*http://ngmdb.usgs.gov/Info/dmt/*) for additional information about this and other DMT meetings.

Appendix A. List of workshop attendees

[Grouped by affiliation]

Alaska Division of Geological and Geophysical Surveys
Kenneth Papp

Arizona Geological Survey/USGS
Stephen Richard

Arkansas Geological Commission
Jerry Clark
Doug Hanson
Nathan Taylor

Bureau de Recherches Geologiques et Minieres
Francois Robida

British Geological Survey
Ian Jackson

C Tech Development Corporation
Reed Copsey

California Geological Survey
George Saucedo

Colorado Geological Survey
Nicholas Watterson

Colorado State University / National Park Service
Ron Karpilo
Stephanie O'Meara

CSIRO
Simon Cox

ESRI
Steve Mulberry

Geological Survey of Canada
Boyan Brodaric

Geological Survey of Japan
Toshie Igawa
Koji Wakita

Georgia Geologic Survey
Mark Cocker

Geoscience Australia
Lesley Wyborn

Idaho Geological Survey
Jane Freed
Loudon Stanford

Illinois State Geological Survey
Jane Domier

Indiana Geological Survey
Robin Rupp

Kingston University
Mike Smith

Louisiana Geological Survey
Robert Paulsell

Michigan Geological Survey
John Esch

Minnesota Geological Survey
Harvey Thorleifson

Missouri Geological Survey
Chris Vierrether

Montana Bureau of Mines and Geology
Susan M. Smith

National Park Service
Andrea Croskrey
Georgia Hybels
David Shelley

Natural Resources Canada
John Broome
Parm Dhesi
Dave Everett
Mike Sigouin

Nevada Bureau of Mines and Geology
Jennifer Mauldin

New Mexico Division of Geology and Mineral Resources
Glen Jones

North Carolina Division of Land Resources
Jeff Reid

Ohio Division of Geological Survey
James McDonald

Oregon Department of Geology and Mineral Industries
Mark Sanchez

Pennsylvania Geological Survey
Stuart Reese
Thomas Whitfield

Portland State University
David Percy

South Carolina Department of Natural Resources, Hydrology
Lee Mitchell

South Carolina Geodetic Survey
Lewis Lapine
Matt Wellslager

South Carolina Geological Survey
Melissa Clare Beaty
Will Doar
Scott Howard
Erin Hudson
Jennifer Krauser
Ralph Willoughby

U.S. Geological Survey
Gregory Allord
Stafford Binder
Bill Carswell
Jonathan Craigue
Mary DiGiacomo-Cohen
Chris Garrity
Jordan Hastings
Bruce Johnson
Gary Merrill
Randall Orndorff
Lisa Rukstales
David Soller
Nancy Stamm
Will Stettner

University of Alabama
Douglas Behm

University of North Carolina, Charlotte
Randi Clapham

University of Minnesota
Paul Morin

University of Nebraska-Lincoln
Paul Hanson

University of South Carolina
Kimberly Meitzen

USDA - Natural Resources Conservation Service
Jim Fortner

Utah Geological Survey
Kent Brown
Basia Matyjasik

Virginia Division of Mineral Resources
Elizabeth Campbell

Washington Division of Geology and Earth Resources
Chuck Caruthers
Anne Heinitz
Karen Meyers

West Virginia Geological Survey
Jane McColloch
Scott McColloch

Wisconsin Geological & Natural History Survey
Kathy Roushar

Wyoming State Geological Survey
Allory Deiss
David Lucke
Phyllis Ranz

Appendix B. Previous Digital Mapping Techniques Workshops.

1997:

Hosted by the Kansas Geological Survey, Lawrence, Kansas, June 2-5. 73 technical experts attended, from 30 state geological surveys, the USGS, and the Geological Survey of Canada.

Soller, D.R., editor, 1997, Proceedings of a workshop on digital mapping techniques: Methods for geologic map data capture, management, and publication: U.S. Geological Survey Open-File Report 97-269, 120 p., available at *http://pubs.usgs.gov/of/of97-269/*.

1998:

Hosted by the Illinois State Geological Survey in Champaign, Illinois, May 27-30. More than 80 technical experts attended, mostly from the state geological surveys and the USGS.

Soller, D.R., editor, 1998, Digital Mapping Techniques '98—Workshop Proceedings: U.S. Geological Survey Open-File Report 98-487, 134 p., available at *http://pubs.usgs.gov/of/of98-487/*.

1999:

Hosted by the Wisconsin Geological and Natural History Survey in Madison, Wisconsin, May 19-22. 91 selected technical experts from 42 agencies, universities, and private companies attended, including representatives from 30 state geological surveys.

Soller, D.R., editor, 1999, Digital Mapping Techniques '99—Workshop Proceedings: U.S. Geological Survey Open-File Report 99-386, 216 p., available at *http://pubs.usgs.gov/of/of99-386/front.html*.

2000:

Hosted by the Kentucky Geological Survey in Lexington, Kentucky, May 17-20. 99 technical experts from 42 agencies, universities, and private companies attended, including representatives from 28 state geological surveys.

Soller, D.R., editor, 2000, Digital Mapping Techniques '00—Workshop Proceedings: U.S. Geological Survey Open-File Report 00-325, 209 p., available at *http://pubs.usgs.gov/of/of00-325/*.

2001:

Hosted by the Geological Survey of Alabama, in Tuscaloosa, Alabama, May 20-23. 108 technical experts from 48 agencies, universities, and private companies attended, including representatives from 31 state geological surveys.

Soller, D.R., editor, 2001, Digital Mapping Techniques '01—Workshop Proceedings: U.S. Geological Survey Open-File Report 01-223, 248 p., available at *http://pubs.usgs.gov/of/2001/of01-223/*.

2002:

Hosted by the Utah Geological Survey, in Salt Lake City, Utah, May 19-22. More than 100 technical experts from 40 agencies, universities, and private companies attended, including representatives from 30 state geological surveys.

Soller, D.R., editor, 2002, Digital Mapping Techniques '02—Workshop Proceedings: U.S. Geological Survey Open-File Report 02-370, 214 p., available at *http://pubs.usgs.gov/of/2002/of02-370/*.

2003:

Hosted by the Pennsylvania Geological Survey, in Millersville, Pennsylvania, June 1-4. Nearly 90 technical experts from 36 agencies, universities, and private companies attended, including representatives from 22 state geological surveys.

Soller, D.R., editor, 2003, Digital Mapping Techniques '03—Workshop Proceedings: U.S. Geological Survey Open-File Report 03-471, 262 p., available at *http://pubs.usgs.gov/of/2003/of03-471/*.

2004:

Hosted by the Oregon Department of Geology and Mineral Industries, in Portland, Oregon, May 16-19. Nearly 100 technical experts from 40 agencies, universities, and private companies attended, including representatives from 22 state geological surveys.

Soller, D.R., editor, 2004, Digital Mapping Techniques '04—Workshop Proceedings: U.S. Geological Survey Open-File Report 2004-1451, 220 p., available at *http://pubs.usgs.gov/of/2004/1451/*.

2005:

Hosted by the Louisiana Geological Survey, in Baton Rouge, Louisiana, April 24-27. More than 100 technical experts from 47 agencies, universities, and private companies attended, including representatives from 25 state geological surveys.

Soller, D.R., editor, 2005, Digital Mapping Techniques '05—Workshop Proceedings: U.S. Geological Survey Open-File Report 2005-1428, 268 p., available at *http://pubs.usgs.gov/of/2005/1428/*.

2006:

Hosted by the Ohio Geological Survey, in Columbus, Ohio, June 11-14. More than 115 technical experts from 49 agencies, universities, and private companies attended, including representatives from 27 state geological surveys.

Soller, D.R., editor, 2007, Digital Mapping Techniques ‘06—Workshop Proceedings: U.S. Geological Survey Open-File Report 2007-1285, 217 p., available at *http://pubs.usgs.gov/of/2007/1285/*.

Appendix C. List of oral and poster presentations, and discussion sessions.

Oral Presentations:

OneGeology - noble aspiration or pragmatic solution (... or both?)
By Ian Jackson (Director of Information, British Geological Survey), John Broome (Head, ESS Data Management Policy & Strategy, Natural Resources Canada), and Harvey Thorleifson (Director, Minnesota Geological Survey)

The U.S. National Geologic Map Database
By David R. Soller (U.S. Geological Survey), Harvey Thorleifson (Minnesota Geological Survey), and Nancy R. Stamm (U.S. Geological Survey)

USDA-NRCS National Soil Information System
By Jim R. Fortner (USDA - Natural Resources Conservation Service)

Importance of Historical Elevation Data
By Gayle H. McColloch, Jr. and Jane S. McColloch (West Virginia Geological Survey)

Discussion Session - "The National Map: Products and Services"
By William Carswell and Stafford Binder (U.S. Geological Survey)

Geologic Map Production During the 70s at the U.S. Geological Survey
By Will Stettner, Linda Masonic, and Paul Mathieux (U.S. Geological Survey)

Open Access Journal Publication: methods of implementation and copyright issues using the Journal of Maps as a case study
By Mike J. Smith (Kingston University)

New Developments in Data Management Policy & Strategy in the Earth Sciences Sector/Geological Survey of Canada
By John Broome (Head, ESS Data Management Policy & Strategy, Natural Resources Canada)

BGS information: The highs (and lows) of 2006/07
By Ian Jackson (Director of Information, British Geological Survey)

The National Cooperative Geologic Mapping Program and Insight Into the Future of Geologic Map Production
By Randall C. Orndorff (U.S. Geological Survey)

Discussion Session – "Can we develop National guidelines or standards for database format and content?"
A discussion of commonly-used practices, and whether guidelines can, and should be developed. Led by Dave Soller (U.S. Geological Survey)

Geologic Field Mapping Using a Ruggedized Tablet Computer
By Kent D. Brown, Douglas A. Sprinkel, Basia Matyjasik, and J. Buck Ehler (Utah Geological Survey)

South Carolina Virtual Reference Station Network - Centimeter Positional Accuracy in Real Time for South Carolina
By Lew Lapine and Matt Wellslager (South Carolina Geodetic Survey)

Workflow and distribution of USGS manuscripts and illustrations
By Greg Allord (U.S. Geological Survey)

Introduction to the NGMDB "Phase 3" Prototype Data Portal
By David R. Soller (U.S. Geological Survey), David Percy (Portland State University), Steve Richard (Arizona Geological Survey), and Jon Craigue (University of Arizona/ U.S. Geological Survey)

3D Volumetric Visualization with EVS and MVS
By Reed Copsey (C Tech Development Corporation)

The challenge of efficiently building closed volumetric 3D geological models that are scientifically rigorous: an Australian perspective
By Richard Lane and Lesley Wyborn (Geoscience Australia)

Classrooms, Museums and Mapping in Antarctica; What new techniques mean to you
By Paul J. Morin (University of Minnesota)

Proposed Arc Geology Version 1
By Gary L. Raines, Jordan T. Hastings, and Lorre A. Moyer (U.S. Geological Survey)

Progress Report on Development of GeoSciML
By Steve Richard (Arizona Geological Survey) and the IUGS CGI Data Model Collaboration Working Group

Exchanging observations and measurements: a generic model and encoding
By Simon J.D. Cox (CSIRO Exploration & Mining, Australia)

Discussion Session —"ESRI products and Geodatabase implementation" —Loudon R. Stanford (Idaho Geological Survey) and Steve Mulberry (ESRI Atlanta) provided a presentation on "Idaho Geologic Map Data In a Statewide Geodatabase: Design, Data Management Tools, and Online Distribution". Steve Mulberry (ESRI), provided an overview of ESRI products, and addressed questions posed by the attendees.

Discussion Session - Digital Cartography —Discussion of technical issues related to cartography, methods for communicating/sharing this knowledge (e.g., Cartographic Resources website), and an update on implementation of the FGDC Standard for Geologic Map Symbolization. Led by Dave Soller (U.S. Geological Survey)

Poster Presentations (listed alphabetically, by agency):

Alaska Mapper, a Web-based tool to access land ownership and other state-wide geospatial data
By Kenneth R. Papp (AK Division of Geological & Geophysical Surveys) and Peter Parker (AK Department of Natural Resources)

The IUGS CGI Concept Definitions Working Group
By Steve Richard (Arizona Geological Survey) and the IUGS CGI Data Model Collaboration Working Group

Geology of Mount Magazine State Park and Vicinity, Logan County, Arkansas
By Scott M. Ausbrooks, Charles G. Stone, and Boyd R. Haley; digital compilation by Jerry W. Clark (Arkansas Geological Commission)

Geologic Report of Little River County, Arkansas
By William D. Hanson and Benjamin F. Clardy; digital compilation by Tiffaney Celis (Arkansas Geological Commission)

Geology of the Crater of Diamonds State Park and Vicinity, Pike County, Arkansas
By William D. Hanson, J. Michael Howard, and Benjamin F. Clardy; digital compilation by Nathan H. Taylor (Arkansas Geological Commission)

Virtual Geologic Field Trip to Rocky Mountain National Park, Colorado
By James R. Chappell, Ronald D. Karpilo, Jason Isherwood, Heather I. Stanton, Philip Reiker and Stephanie A. O'Meara (Colorado State University)

GeoSciML Testbed 2 Demonstration
By Boyan Brodaric (Geological Survey of Canada), Bruce Johnson (U.S. Geological Survey, and Francois Robida (BRGM)

Mapping Halifax Harbour - the making of a GSC Bulletin
By Gordon B.J. Fader, Robert O. Miller and Phil O'Regan (Geological Survey of Canada)

Seamless Digital Geological Map of Japan 1:200,000, and its application
By Toshie Igawa, Koji Wakita, and Shinji Takarada (Geological Survey of Japan)

Integrated Geological Map Database and Geological Information Index
By Koji Wakita, Shinji Takarada, and Yasuaki Murata (Geological Survey of Japan)

On-line FIncs System for the Management and Delivery of Fluid Inclusion Data
By Terrence P. Mernagh, Dale Percival, Evgeniy N. Bastrakov, and Lesley A.I. Wyborn (Geoscience Australia)

The Australian Landslides Data Model
By Monica Osuchowski (Geoscience Australia), Rob Atkinson (Social Change Online), Simon Cox (CSIRO Division of Exploration and Mining), and Nick Ardlie and Stuart Girvan Australia)

The Australian Mineral Occurrence Data Exchange Model
By Adele Seymon and Bruce Simons (GeoScience Victoria), Oliver Raymond (Geoscience Australia), Gary Andrews (Northern Territory Geological Survey), Terry Denaro (Geological Survey of Queensland), Greg Jenkins (Primary Industries and Resources SA, Government of South Australia), Peter Lewis (Geological Survey of New South Wales), James Llorca (GeoScience Victoria), Marcus McClenaghan (Mineral Resources Tasmania), Alistair Ritchie (GeoScience Victoria), Jafar Taheri (Mineral Resources Tasmania), Ian Withnall (Geological Survey of Queensland), Andrew Wygralak (Northern Territory Geological Survey), and Lesley Wyborn (Geoscience Australia)

Idaho Geological Survey Digital Geologic Map Data Model v3.1b: ESRI Geodatabase Schema Diagram
By Loudon Stanford (Idaho Geological Survey) and Steve Mulberry (ESRI)

Developing a Web Site To Provide Geologic Data and Map Products for Allen County, Indiana
By Robin F. Rupp, Jennifer Olejnik, Nancy R. Hasenmueller, Marni D. Karaffa, A. Chris Walls, Prem Radhakrishnan, and Nathan K. Eaton (Indiana Geological Survey)

A map of glacial striae observations for Ireland compiled from historic records
By M. J. Smith (Kingston University), J. Knight (University of Exeter), and K. Field (Kingston University)

GIS tools for 3-D surficial mapping in Ohio
By James McDonald, Richard R. Pavey, Erik R. Venteris, and Joseph G. Wells (Ohio Geological Survey)

Relative Earthquake Induced Hazard Maps and Identified Landslide Hazard Map for Six Counties in the Mid-Willamette Valley, Including Yamhill, Marion, Polk, Benton, Linn, and Lane Counties, Oregon
By William Burns, R. Jon Hofmeister, Rudie Watzig, and Yumei Wang (Oregon Department of Geology and Mineral Industries)

Landslide Mapping Using LiDAR Data Technology
By Mark A. Sanchez (Oregon Department of Geology and Mineral Industries)

Mapping Potential Geologic Hazards for Proposed Highway Construction Projects in Pennsylvania: Route 15 in Lycoming County
By Stuart Reese (Pennsylvania Geological Survey)

Old mapping and new LiDAR.....a reality check
By Tom Whitfield (Pennsylvania Geological Survey)

USDA-NRCS National Soil Information System
By Jim R. Fortner (USDA - Natural Resources Conservation Service)

Combining mixed sources, unknown projections, and varying resolutions with state line faults to create coherent source and assessment unit outlines for the 2007 USGS Illinois Basin Oil and Gas Assessment
By Joseph A. East (U.S. Geological Survey)

Progress Report on Database Development for the Geologic Map of North America
By Christopher P. Garrity and David R. Soller (U.S. Geological Survey)

The National Geologic Map Database
By David R. Soller (U.S. Geological Survey), Harvey Thorleifson (Minnesota Geological Survey), and Nancy R. Stamm (U.S. Geological Survey)

The FGDC Standard for Geologic Map Symbolization
By David R. Soller and Taryn Lindquist (U.S. Geological Survey)

Divisions of Geologic Time - Major Chronostratigraphic and Geochronologic Units
By the Geologic Names Committee of the U.S. Geological Survey

Congaree River Floodplain Inundation Model: Developing A Decision Support Tool for Congaree National Park, South Carolina
By Kimberly M. Meitzen (University of South Carolina)

Creating an Integrated Geologic Data System in Virginia
By Elizabeth Campbell (Virginia Division of Mineral Resources)

Compilation and Production of the 1:500,000-scale Geologic Map of Washington State, and Some Aspects of 1:24,000-scale Map Production at the Washington Division of Geology and Earth Resources
By J. Eric Schuster, Charles G. Caruthers, Anne C. Heinitz, and Karen D. Meyers (Washington Division of Geology and Earth Resources)