

Ms. Horsman is a geophysicist and spatial analyst specializing in ground-penetrating radar, Geographic Information Systems (GIS), scientific data visualization, shoreline mapping, data management, programming, and remote sensing with applications in various fields including geology, paleoclimatology, meteorology, forestry, and conservation science.

EDUCATION

Certification as a GIS Professional (GISP), GIS Certification Institute (2011)

M.S., Environmental Science and Policy, Plymouth State University, Plymouth, NH (2008)
Thesis Title: The origin of several stream terraces in eastern Taylor Valley, Antarctica, from Ground Penetrating Radar: A test of the Glacial Lake Washburn delta interpretation

A.B., Geophysics, University of California, Berkeley (1993)

HONORS

USDA Certificate of Appreciation and SPOT award for providing exceptional GIS support (2010)

USDA Certificate of Appreciation for outstanding GIS support during a regional program (2010)

Achievement Rewards for College Scientists (1992)

Mineralogy Society Award (1991)

PROFESSIONAL EXPERIENCE

Ms. Horsman has expertise in six main technical areas as outlined below:

1. GIS analysis, data management, and cartography
2. Three-dimensional (3D) visualization of scientific data
3. Scientific programming and GIS application development
4. Ground-penetrating radar data collection, processing, and interpretation
5. Remote sensing imagery analysis
6. Reconstructions of past climate from ice cores

GIS ANALYSIS, DATA MANAGEMENT, AND CARTOGRAPHY

Environmental Sensitivity Index (ESI) Mapping: Since joining RPI in December 2012, Ms. Horsman has participated in shoreline classification for the following ESI projects used for coastal zone management, contingency planning, and hazardous material/natural disaster responses: Louisiana, West Peninsular Florida, Delaware Bay, and Washington/Oregon.

Marmot Peak Quadrangle, Geologic Map, Park and Chaffee Counties, Colorado: As a GIS contractor for the Colorado Geological Survey, Ms. Horsman edited geologic vector datasets and performed all cartography for a published geologic quadrangle map (Houck et al., 2012).

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine (USDA/APHIS/PPQ): Ms. Horsman served as a GIS Analyst for a six-state region of PPQ. She provided data management, QAQC, analysis, and mapping for several PPQ programs including: Grasshopper Monitoring and Suppression, Fruit Fly Exclusion and Detection, Imported Fire Ant Management, Emerald Ash Borer Management, and Smuggling Interdiction and Trade Compliance

(SITC). Her participation in the Grasshopper Suppression Program included acting as GIS Manager in the field for an Incident Response Team in 2010 where she managed a team of 3-5 GIS Technicians tasked daily with creating multiple maps for use in the field. She also coordinated with teams of pilots applying aerial insecticide treatments and provided them with polygonal datasets defining treatment areas for upload to their aircraft-mounted GPS units and incorporated the GPS data (spray tracks) they collected back into the GIS.

Central Shortgrass Prairie (CSP) Ecoregional Assessment: As a GIS Analyst at The Nature Conservancy (TNC), Ms. Horsman was the GIS team leader for a two-year conservation assessment project of the CSP. Her duties involved using GIS for analysis, cartography, and map production. The data she gathered for the project included spatial information on species locations, distributions, and/or suitable habitat; ecological systems; riparian systems and hydrography; and threats to targeted species and systems. The data came from a wide variety of sources including state agencies (Colorado Division of Wildlife, Nebraska Game and Parks Commission), federal agencies (DOD, USDA, USGS, USFWS, FEMA), non-governmental organizations (Natureserve, Colorado Natural Heritage Program), academic institutions (University of Kansas, University of Colorado), and industry. Ms. Horsman performed all spatial analysis including landscape connectivity/ecological integrity, ecological drainage unit (EDU) delineation, habitat modeling (regression and ecological niche factor analysis), and cumulative threats modeling. She also applied a spatial optimization program to the data to prioritize locations for conservation areas. For the final product documentation, Ms. Horsman created 67 high quality maps and 20 tables representing the results of her analysis (Neely et al., 2006).

Map of Deformation Caused by Earthquakes in California: While working as a geophysicist at the U.S. Geological Survey (USGS), Ms. Horsman produced maps illustrating damage caused by deformation due to the 1992 Landers and 1994 Northridge earthquakes in California. These maps were created using MapInfo and Adobe Illustrator and showed shaded topography along with locations and magnitude of displacement of geodetic monuments, locations of damaged engineered structures, surface cracking, liquefaction, and landslides.

3D VISUALIZATION OF SCIENTIFIC DATA

Advanced Simulation Capability for Environmental Management (ASCEM): As part of the Visualization team at Lawrence Berkeley National Laboratory, Ms. Horsman created 3D visualizations and time-series animations of datasets from the Savannah River F-Area Site as part of the U.S. Department of Energy (DOE) ASCEM project. The visualizations contained a variety of datasets including aerial imagery, topography, roads, rivers, structures, monitoring wells, geologic interpretation, and time-series of measured contaminants. Ms. Horsman used the open source software VisIt for all visualizations and wrote scripts in Python for manipulating tools and animations in VisIt (Williamson et al., 2011).

Visualization of Well Failures in Diatomite Reservoirs: For work on a project to analyze well damage in California diatomite reservoirs induced by compactable formation deformation, Ms. Horsman produced visualizations used for identification of failure mechanisms. Her visualizations of ground subsidence, production and injection data, and well failure locations helped improve understanding of casing damage due to reservoir compaction (Myer et al., 1996).

Site Characterization of the Proposed Yucca Mountain Waste Repository Site: During the geologic site characterization phase of the proposed Yucca Mountain Waste Repository site, Ms. Horsman created a 3D geological model from borehole lithology and used fault horizons as interpolation boundaries. She then produced 3D visualizations of the geologic model as fence diagrams (slices) shown along with topography, surface streams, fault horizon surfaces, and tunnel locations.

Simulation of Infiltration in Fractured Rock at the Idaho National Engineering Lab (INEL): Using the results from a simulation of hydrologic flow in fractured rock, Ms. Horsman created 3D visualizations

showing borehole lithology, fence diagrams of a volumetric interpolation of lithology, tracer and selenium concentrations in boreholes, neutron data, and locations of fractures in wells. She also created animations of the changes in selenium and tracer concentrations through time.

SCIENTIFIC PROGRAMMING AND GIS APPLICATION DEVELOPMENT

Improved Geolocation and Earth Incidence Angle Information of the SSM/I Sensors: Ms. Horsman wrote scripts in Matlab and IDL for analyzing and measuring error in the results from improved geolocation algorithms and for producing figures for publication (Berg et al., 2013). She also helped debug and modify the geolocation programs written in C and FORTRAN.

ASCEM: Tools, operators, and algorithms can be written in C++ to enhance the VisIt visualization software. While working on the ASCEM project, Ms. Horsman wrote operators to perform a modified Delaunay Triangulation on lithologic data and to load and parse project-specific data. She also wrote scripts in Python for creating animations and scenes in VisIt.

STARFire, A Spatial Planning and Analysis System for Wild Fire Management: As part of a team in the Department of Forestry Economics at Colorado State University (CSU), Ms. Horsman helped develop a stand-alone GIS-based software application used by the National Park Service for forest fire Appropriate Management Response (AMR). The application was initially written using Visual Basic 2008 and ESRI MapObjects, and later using VB .net and ESRI ArcObjects.

Meteorological Boundary Layer Studies: Ms. Horsman wrote scripts in Matlab for analyzing multi-dimensional climate model data and radiosonde observations to gain a better understanding of planetary boundary layer dynamics.

GROUND-PENETRATING RADAR DATA COLLECTION, PROCESSING, AND INTERPRETATION

Glaciofluvial and Glaciolacustrine Sediments in the Dry Valleys, Antarctica: In 1999-2000 and in 2006-2007, Ms. Horsman was part of a team of scientists that conducted ground-penetrating radar (GPR) and GPS surveys of sediments in the Dry Valleys of Antarctica. For her Master's thesis, she processed and interpreted data collected on terraces that were previously believed to be lacustrine deltas (Horsman, 2008). Ms. Horsman also helped process and interpret GPR data collected on subglacial depositional features (eskers), terminal moraines, and lateral moraines.

Lacustrine Sediments in Squam Lake, New Hampshire: As part of her Masters research, Ms. Horsman collected, processed and interpreted GPR profiles of lake-bottom sediments and the bedrock below.

Barchan Dunes at Killpecker Dunes, Wyoming, as Potential Mars Analog Sites: Ms. Horsman provided GPS support and GPR data processing for a team using GPR to determine presence of ice in the active Barchan Dunes in the Red Desert of Wyoming. The studies were conducted to determine the effectiveness of using the site as an analog for determining the presence of ice in dunes on Mars.

Glacial Till in Loch Vale, Colorado: Ms. Horsman was contracted by a research group at Colorado State University to conduct a pilot study of the use of GPR for determining depth to bedrock on steeply sloped glacial till in Loch Vale, Colorado.

REMOTE SENSING IMAGERY ANALYSIS

Spatial Patterns of Forest Fuels Using AVIRIS Hyperspectral Imagery: Ms. Horsman was trained to use ENVI software for hyperspectral and multispectral imagery classification. As part of a team from CSU and the U.S. Forest Service (USFS), she applied her training towards the classification of forest structure from AVIRIS imagery. Ms. Horsman displayed the analysis results in maps that were then used for

validation, fire behavior modeling, and forest treatment planning. Ms. Horsman has also used ENVI and ERDAS Imagine for image georeferencing and orthorectification and for classification of forest canopy cover from aerial photography.

Earthquake Deformation Patterns Revealed by Interferometric Synthetic Aperture Radar (InSAR):

Interferograms from SAR data acquired before and after earthquake events reveal patterns of deformation caused by earthquake activity. Ms. Horsman modified programs in C and FORTRAN originally created by the Centre National d'Etudes Spatiales (CNES) for processing InSAR datasets and applied them towards datasets acquired in the vicinity of earthquakes that occurred in southern and central California.

RECONSTRUCTIONS OF PAST CLIMATE FROM ICE CORES

Reconstruction of Atmospheric Circulation Patterns from a Mount Logan Ice Core: While a graduate student at the University of New Hampshire, Ms. Horsman used a form of Principle Components Analysis (PCA) called Empirical Orthogonal Function (EOF) analysis for studying patterns of variability in Arctic and North American paleoclimate. The chemical composition of an ice core collected from Mount Logan in the Yukon was measured and time-series datasets were created for the major ions found in atmospheric aerosols. Although the Mount Logan ice core was collected and processed in 1980, Ms. Horsman analyzed the time-series using EOF in Matlab and interpreted the results for past atmospheric circulation patterns. Based on the composition and the nature, marine or terrestrial, of aerosols present in a segment of ice core, inferences can be made regarding the origin of the air mass at the time it was recorded. Ms. Horsman also has experience collecting ice cores in the field and processing them in a freezer lab.

SELECTED PUBLICATIONS AND ABSTRACTS

- Berg, Wesley K., Mathew R. P. Sapiano, Jennifer Horsman, and Christian D. Kummerow, "Improved Geolocation and Earth Incidence Angle Information for a Fundamental Climate Data Record of the SSM/I Sensors", *IEEE T. Geoscience and Remote Sensing* 51(3-1): 1504-1513, March, 2013
- Houck, Karen J., Jonathan A. Funk, Robert M. Kirkham, Christopher J. Carroll, and Alyssa D. Heberton-Morimoto with Cartography by Jennifer L. Horsman, "Marmot Peak Quadrangle Geologic Map, Park and Chaffee Counties, Colorado", published map of the Colorado Geological Survey, 2012, <http://geosurveystore.state.co.us/p-1425-marmot-peak-quadrangle-park-and-chaffee-counties-colorado.aspx>
- Berg, W., M. Sapiano, C. Kummerow, J. Horsman, and F. Weng, "A Fundamental Climate Data Record of Intercalibrated Brightness Temperature Data From SSM/I and SSMIS", poster at IGARSS 2011, Vancouver, Canada, July 24-29, 2011
- Williamson, M., J. Meza, D. Moulton, I. Gorton, M. Freshley, P. Dixon, R. Seitz, C. Steefel, S. Finsterle, S. Hubbard, M. Zhu, K. Gerdes, R. Patterson, Y. T. Collazo et al., *Advanced Simulation Capability for Environmental Management (ASCEM): An overview of initial results*, Vol. 13, pp 175-199, Technology and Innovation, 2011
- Hubbard, S., B. Faybishenko, M. Freshley et al., *ASCEM Phase I Demonstration Plan*, ASCEM-SITE-102010-0, December 2010
- Prentice, M. L., S. A. Arcone, J. L. Horsman, E. A. Medley, J. D. Toner, R. Sletten, and K. Shoemaker, "Response of the Ross Sea Ice Sheet to the Last Deglaciation: New Evidence from Taylor Valley, Antarctica", poster at AGU Fall 2009 Meeting, San Francisco, CA, December 16, 2009.
- Prentice, M. L., S. A. Arcone, M. G. Curren, A. J. Delaney, J. L. Horsman, S. L. Letsinger, E. A. Medley, and J. R. Gaynor, "Stratigraphy and Geomorphology of Late Pleistocene Moraine at the Mouth of Taylor Valley, Antarctica: Implications for the Melting History of the West Antarctic Ice Sheet

- During the Last Deglaciation”, poster at AGU Fall 2008 Meeting, San Francisco, CA, December 17, 2008.
- Horsman, J. L., “The origin of several stream terraces in eastern Taylor Valley, Antarctica, from Ground Penetrating Radar: A test of the Glacial Lake Washburn delta interpretation”, unpublished Master of Science Thesis, Plymouth State University, August 31, 2008, Plymouth, New Hampshire.
- Arcone, S. A., A. J. Delaney, M. L. Prentice, and J. L. Horsman, “GPR Reflection Profiles of Sedimentary Deposits in Lower Taylor Valley, Antarctica”, 12th International Conference on Ground Penetrating Radar, June 15-19, 2008, Birmingham, UK.
- Delaney, A. J., J. L. Horsman, M. L. Prentice, and S. A. Arcone, “Multi-frequency ground-penetrating radar method for revealing complex sedimentary facies”, 4th International Workshop on Advanced Ground Penetrating Radar, June 27-29, 2007, Naples, Italy.
- Horsman, J. L., M. L. Prentice, S. A. Arcone, and A. J. Delaney, “Late Pleistocene-Holocene Lacustrine Deltas in Eastern Taylor Valley, Antarctica: Implications for Lake Levels from Ground-Penetrating Radar”, oral presentation at AGU Fall 2007 Meeting, San Francisco, CA, December 12, 2007.
- Neely, B., S. Kettler, J. Horsman, C. Pague, R. Rondeau, R. Smith, L. Grunau, P. Comer, G. Belew, F. Pusateri, B. Rosenlund, D. Runner, K. Sochi, J. Sovell, D. Anderson, T. Jackson and M. Klavetter. 2006. Central Shortgrass Prairie Ecoregional Assessment and Partnership Initiative. The Nature Conservancy of Colorado and the Shortgrass Prairie Partnership. 124 pp. and Appendices.
- Prentice, Michael, Arcone, Steve, Ackert, Robert, Delaney, Allan, Kurz, Mark, Horsman, Jennifer, and Fredin, Ola, "Stadial-scale drift stratigraphy for the West Antarctic ice-sheet", GSA Annual Meeting, November 5-8, 2001.