



Integral Consulting Inc.  
319 SW Washington Street  
Suite 1150  
Portland, OR 97204

telephone: 503.284.5545  
facsimile: 503.284.5755  
estrandhagen@integral-corp.com

## **Erik R. Strandhagen, GISP**

### **Senior Scientist**

#### **PROFESSIONAL PROFILE**

Erik Strandhagen is a certified professional in geographic information systems (GIS) with more than 10 years of professional experience conducting GIS analysis and managing environmental data. Mr. Strandhagen specializes in advanced gridding analysis and integrated calculations of chemical body mass and volume for groundwater and geologic 3-dimensional subsurface site models. His subsurface models have been peer-reviewed by EPA and vetted by other regulatory agencies. He also manages numerous GIS projects as well as GPS data collection and processing.

Mr. Strandhagen holds a master of science degree in geography with an emphasis in hydrology, geomorphology and advanced temporal and spatial data analysis. His skills include GIS design, spatial analysis, computer programming, data management, remote sensing image interpretation, hydrologic modeling, geostatistics, 3-dimensional modeling, cartographic design, and data visualization. Prior to entering consulting, he performed GIS work for National Science Foundation Grant Research, the Oregon Department of Transportation, and Lane County, Oregon. Mr. Strandhagen is the recipient of two national awards in recognition of his innovative GIS environmental analyses conducted during his graduate and undergraduate years. Mr. Strandhagen is also experienced in print and digital cartographic atlas publications.

#### **CREDENTIALS AND PROFESSIONAL HONORS**

M.S., Geography, University of Oregon, Eugene, Oregon, 2005

B.S., Geography, University of Oregon, Eugene, Oregon, 2002

Certified GIS Professional (GISP) #00053984, GIS Certification Institute, 2006, Renewed 2011

#### **PROFESSIONAL AFFILIATIONS**

Member of American Society of Photogrammetry and Remote Sensing (ASPRS)  
Past President (2009) and Executive Board Member (2008-2010) of the Columbia River  
Region of the ASPRS

## CONTINUING EDUCATION AND TRAINING

EVS Pro and MVS Advanced Training Class, 2008

Remote Sensing and GIS of Wetlands ASPRS Workshop, 2008

GPS Mapping for GIS with TerraSync and Pathfinder Office, 2007

ESRI Advanced Techniques for Labels and Annotation, 2005

## RELEVANT EXPERIENCE

*Portland Harbor CERCLA RI/FS, Portland, Oregon*—GIS lead for sediment remedial investigation report that contains more than 600 maps. Manage GIS project support that includes map production, spatial analysis, and database management. Provide global positioning system support that consists of the pre- and post-processing of field data and conversion to GIS and input to the project database.

*Geostatistical Modeling of DDx Mass and Volume, Portland, Oregon*—Developed a 3-dimensional model of total DDx (i.e., DDT and its metabolites) contamination in river sediment using EVS-Pro and ArcGIS software to support an engineering evaluation and cost analysis. Developed an innovative GIS geoprocessing methodology to generate 3-dimensional dredge prisms to estimate volumes of sediment to be removed for specific cleanup levels. The model was geostatistically analyzed to determine optimal locations for additional sediment sampling to augment a traditional data gap analysis. Created several fly-through animations to communicate the modeling and analysis results to the stakeholders. The resulting modeling and analysis spatially illustrated the site and estimated the volume and mass of contamination, which provided a planning and collaboration tool for building consensus with regulatory agencies. Current phase of work involves revising the EVS model with additional EE/CA DDx data in order to estimate vertical and horizontal concentration boundaries as a basis for a removal action area.

*Aquifer Storage and Recovery Feasibility Study, Umatilla, Oregon*—Developed a 3-dimensional geologic and groundwater model to support a large-scale agricultural aquifer storage and recovery (ASR) feasibility study using EVS-Pro and ArcGIS software. Created a volumetric subsurface model employing spatial data that included well borehole logs and well groundwater elevations from the feasibility study. The model domain covered an area of approximately 20 square miles and included five complex geologic layers to a depth of 250 ft. The geologic block model of the project basin correlated with the feasibility study's preexisting 2-dimensional cross-sectional diagrams. Groundwater elevations were interpolated to model the existing groundwater aquifer's potentiometric surface. Developed an innovative quantitative technique to animate the conceptual response of the existing potentiometric surface to the aquifer recharge process. The model was also used to calculate the volume of existing groundwater per unit change in the potentiometric surface (i.e., 10 ft of hydraulic head) within the ASR basin. Several animations of the geology and ASR process were used in meetings with a variety of stakeholders. The resulting model and groundwater volume estimates provided an effective planning and collaboration tool that

showed the feasibility study results in an intuitive animation for technical and nontechnical audiences.

*Geostatistical Modeling of Nickel Mass and Volume, Coos Bay, Oregon*—Developed a 3-dimensional model of nickel concentrations in nearshore sediments using EVS software. Performed statistical regression analysis to determine site-specific nickel background concentrations. Modeled 3-dimensional contours for nickel concentrations above background levels. The contoured nickel concentration boundaries were used as the basis for defining remedial action areas and estimating mass and volume within these areas. Completed the 3-dimensional modeling in an expedited period and facilitated approval by a large party of stakeholders.

*Stratigraphic Mapping, Columbia Basin*—Developed a model of an unconfined aquifer that included a five-layer suprabasalt sediment sequence using EVS-Pro software. The final model portrayed the position of the water table relative to the suprabasalt layers throughout the study area. This project was completed in an expedited period, both on time and under budget.

*GIS Data Development, Lane County, Oregon*—Assisted in the development and maintenance of GIS data in an SDE Geodatabase running on SQL server. Additional undertakings include the development of an ArcPublisher interactive desktop mapping application and provision of GIS training, oversight, and procedural user support.

*Lead Graduate Researcher, University of Oregon*—Lead researcher for a proposed *Atlas of Yellowstone*, working in collaboration with the Yellowstone Center for Natural Resources. Compiled, edited, and analyzed GIS data to produce topics-based layouts.

*Lead Graduate Researcher, University of Oregon*—Lead researcher for Oregon Department of Transportation All Roads Framework Contract. Effectively directed data model migration from ArcInfo coverage to SDE Geodatabase. Administered and maintained SDE Geodatabase running on SQL server.

*GIS Instructor, University of Oregon*—Responsible for all logistics of the class, choosing the text, developing lecture materials and lab exercises, and assessing students. Advised students on spatial analysis-centered independent projects.

*National Science Foundation Grant Researcher, University of Oregon*—Accomplished the complete conversion of 1948 natural resources land cover maps using ArcInfo Workstation into a digital database for spatial analysis of land cover change over time. Methodology included a variety of commands involving multi-function AMLs, air photo interpretation, classifying land-cover of study area and documenting tasks to standardize procedures. Research received Association of American Geographers 2002 Illustrated Paper Competition First Place National Award.

**PUBLICATIONS**

Strandhagen, E., W.A. Marcus, and J.E. Meacham. 2006. Views of the rivers: representing streamflow of the Greater Yellowstone ecosystem. *Cartographic Perspectives*, 55(Fall):54–59, 80–83.

**PRESENTATIONS/POSTERS**

Strandhagen, E., and D. Livermore. 2010. 3-Dimensional geologic modeling for the Umatilla Basin Aquifer Storage and Recovery Project. 18th Annual GIS in Action Conference, Portland, OR.

Strandhagen, E., E. Dodak, and D. Livermore. 2008. Modeling and analyzing mass and volume of DDx contamination in sediment for environmental remediation. American Society of Photogrammetry and Remote Sensing Annual Conference, Portland, OR.

Strandhagen, E., W.A. Marcus, and J.E. Meacham. 2006. Views of the rivers: Visualizing temporal detail in multi-decadal records of regulated and non-regulated streamflows. 37th International Binghamton Geomorphology Symposium on the Human Role in Changing Fluvial Systems, Binghamton, SC.

Strandhagen, E. 2004. Views of the rivers: representing streamflow of the greater Yellowstone ecosystem. Cartography, GIS and Remote Sensing Specialty Groups Illustrated Paper Student Competition, Association of American Geographers Annual Meeting, Philadelphia, PA. MS Thesis Research received Association of American Geographers 2004 Illustrated Paper Competition First Place National Award.

Strandhagen, E. 2002. Compiling and visualizing historical land cover data for the Sierra Nevada. Cartography, GIS and Remote Sensing Specialty Groups Illustrated Paper Student Competition, Association of American Geographers Annual Meeting, Los Angeles, CA.

Strandhagen, E. 2002. Opal Creek wilderness & scenic recreation area, tourist mapping for an educational-land stewardship organization. International Cartography Association, Mountain Cartography Workshop, Mt. Hood, OR.