

# Special Issue: Geographic Information Systems

## Foreword

In October 1987, we served as guest editors for the first special issue of *Photogrammetric Engineering & Remote Sensing (PE&RS)* devoted entirely to GIS. This, the tenth anniversary GIS issue, demonstrates ASPRS' continued commitment to publish some of the very best contemporary GIS research.

Our work on this edition of the journal provided an opportunity to reflect on the extraordinary changes that have occurred in GIS since the first Special Issue in 1987. In that issue, for example, several authors dealt with administrative, institutional, and management issues inherent in GIS; special attention was focused upon GIS in government. Since then, enormous changes have taken place. We saw the Federal Geographic Data Committee (FGDC) established to foster cooperation between dozens of federal agencies using GIS, and to facilitate collaboration between federal agencies, state and local governments, and other organizations in building an integrated National Spatial Data Infrastructure (NSDI). The FGDC and its partners are making significant strides towards implementing standards such as the Spatial Data Transfer Standard (SDTS) to ease data sharing and help assure data quality.

Virtually every state has established some type of policy-making body designed to promote and coordinate applications of GIS. Moreover, to better assist one another, the states have joined to create the National States Geographic Information Council (NSGIC). Every major municipality in the U.S. now uses GIS, and the technology is rapidly reaching local governments in the most rural areas of the nation.

It was apparent in 1987, that additional means to foster GIS education, research and professional discourse were sorely needed. Now, organizations such as the National Center for Geographic Information and Analysis (NCGIA) and the University Consortium for Geographic Information Science (UCGIS) serve as catalysts to expand and enhance GIS research. The NCGIA GIS Core Curriculum has aided many instructors in establishing GIS courses, and GIS is taught in most major colleges and universities. Nevertheless, demands for training continue to grow and we see NCGIA developing an initiative for GIS training in community colleges. Since 1987, several dozen books dealing with GIS and related topics have been published (although we would like to see more); excellent new professional journals, such as the *International Journal of Geographical Information Systems*; and magazines such as *GIS World* and *GeoInfo Systems* have appeared. Individuals interested in GIS can now attend a plethora of professional conferences. In addition to the long-standing annual meetings of ASPRS, ACSM and URISA, we have the annual GIS/LIS Symposium and, almost every year, application-specific GIS conferences sponsored by professional organizations such as the AWRA. Excellent annual GIS conferences sponsored by states (e.g., North Carolina, Minnesota, Arizona, and Wisconsin), and regional meetings such as the MidAmerica GIS Symposium regularly attract 300-600 participants.

In the 1987 GIS Special Issue of *PE&RS*, many papers touched on various aspects of technology, including advances in computing (hardware, software and communi-

cations), and database issues. What stunning developments have taken place in the interim! In computing, we have seen major enhancements in processor speed, parallel processing, data storage and operating systems, all assembled in ever-smaller "laptop" systems. GPS, known to only a few of us in 1987, has revolutionized GIS; major technological innovations in data conversion, digital orthophotography, and multimedia have had profound impacts in recent years.

During this same period, GIS software has become more user-friendly, offering greater functionality than ever before, and often providing sophisticated links to CAD, image processing, document imaging, and/or other software. Moreover, GIS vendors are cooperating through the Open GIS Consortium to promote interoperability and adoption of industry software standards. Overshadowing all else of course, is the Internet. One can hardly overstate the enormous impact of the "net" and the World Wide Web in facilitating access to, and sharing of, data, software, and information (below).

In the first *PE&RS* GIS Special Issue, many articles focused on applications of GIS technology. It is interesting, however, how many new areas of application emerged in succeeding years. Augmenting traditional areas of GIS application such as environmental and natural resources assessment, planning, transportation, and facilities management, we see significant developments in precision farming, biodiversity (e.g., "gap") analysis, global climate

## GIS Websites (all have http:// prefix)

Federal Geographic Data Committee  
[fgdc.er.usgs.gov/fgdc.html](http://fgdc.er.usgs.gov/fgdc.html)

USGS Node/National Geospatial Data Clearinghouse  
[nsdi.usgs.gov/nsdi/](http://nsdi.usgs.gov/nsdi/)

National Center for Geographic Information and Analysis  
[www.ncgia.ucsb.edu/ncgia.html](http://www.ncgia.ucsb.edu/ncgia.html)

University Consortium for Geographic Information Science  
[www.ucgis.org](http://www.ucgis.org)

National States Geographic Information Council  
[www.geo.drake.edu/nsgic/index.html](http://www.geo.drake.edu/nsgic/index.html)

The GIS Jump Station  
[www.esri.com/services/jumpstation/jumpstation.html](http://www.esri.com/services/jumpstation/jumpstation.html)

ASPRS  
[www.asprs.org/asprs](http://www.asprs.org/asprs)

Remote Sensing and GIS Resources  
[www.gis.umn.edu/rsgisinfo/rsgis.html](http://www.gis.umn.edu/rsgisinfo/rsgis.html)

Bill Thoen's GIS Links  
[www.csn.net/~bthoen/ores/gis/index.html](http://www.csn.net/~bthoen/ores/gis/index.html)

Yahoo GIS Index  
[www.yahoo.com/Science/Geography/Geographic\\_Information\\_Systems\\_GIS/](http://www.yahoo.com/Science/Geography/Geographic_Information_Systems_GIS/)

USGS GIS Links  
[info.er.usgs.gov/network/science/earth/gis.html](http://info.er.usgs.gov/network/science/earth/gis.html)

Geodata Information Sources  
[www.cgrer.uiowa.edu/servers/servers\\_geodata.html](http://www.cgrer.uiowa.edu/servers/servers_geodata.html)

TIGER  
[www.census.gov/geo/www/tiger/](http://www.census.gov/geo/www/tiger/)

change, social science applications, K-12 education, and implementation of digital spatial libraries. Three successful NCGIA-sponsored conferences have focused attention upon efforts to explicitly link GIS and modeling. The field of business geographics (e.g., marketing, routing, delivery, facility siting) has emerged as perhaps the biggest growth area in GIS applications in the 1990s.

So much has changed, yet some themes and issues important in 1987 still challenge us. For example, interest in GIS continues to grow; new communities of users are becoming acquainted with GIS and the demand for training at all levels seems never to be fully met. The topics of error in GIS, data quality and accuracy, all dealt with in the first Special Issue, remain important concerns today. Meanwhile, just as in 1987, and despite remarkable, recent technological advances and accomplishments, the "human dimensions" of GIS continue to perplex us. The many social, institutional, political, organizational and, increasingly, legal issues associated with GIS are yet to be adequately addressed.

Had we, in the Foreword to the 1987 issue, dared to speculate on the state-of-the-art in 1996, we certainly would have missed many of the items mentioned above. Nonetheless, there are some areas we suspect it is safe to suggest will be major themes in GIS as we look towards the 21st century. Clearly, we will experience significant changes stemming from advances in technology (e.g., computing and GPS). In addition, we will see important innovations in areas such as interactive GIS analysis on the Web, applications of expert systems, visualization and virtual reality, integration of GIS and modeling, and use of hypermedia in group decision-support. It seems certain, too, that we will finally see the promises of high resolution satellite imaging fulfilled. However, judging by our

past experiences, when we reach that 20th anniversary special GIS issue of *PE&RS*, we can predict that we will be reading about many things few of us can imagine today.

So, with pleasure we commend to your attention the eight articles in this issue. As usual, the topics are wide-ranging, spanning neural networks, modeling and GIS, terrain analysis, analog to digital data conversion, and a number of applications of GIS technology. We believe that these research reports include some of the finest state-of-the-art work in GIS. Thanks to the authors of the articles for providing especially quick turnaround as we worked on an unusually constrained timetable. Thanks also to the many reviewers who generously contributed their time to offer critiques, comments, and constructive suggestions that aided us immensely in making these selections. And thanks to all of the authors who submitted manuscripts for consideration. We regret that we were not able to include more, but some will certainly be appearing in future issues of *PE&RS*. Last, but certainly not least, we extend special appreciation to *PE&RS* journal staff members James Case (Technical Editor), Kim Tilley (Executive Editor) and Carolyn Staab (Manuscript Coordinator) for their assistance in bringing this issue to you.

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Merchant received a BA in Geography from Towson State University, Towson, Md., and both the MA and PhD in Geography from the University of Kansas. He has been engaged in basic and applied research in remote sensing and GIS since 1971. His research, funded by NASA, USDA, EPA, USGS, NBS and various state agencies, is currently focused upon 1) development of strategies for large-area land cover classification using digital multispectral satellite data, 2) spatial and contextual analysis of digital images, and 3) the design of spatial models that can be employed in GISs to aid in management of natural resources.

Merchant received the 1990 Alan Gordon Memorial Award presented by ASPRS to recognize career achievements in remote sensing and GIS. He joined ASPRS in 1974 and has been a *PE&RS* associate editor since 1986. He serves on the USGS/EROS Data Center DAAC Science Review Panel and the SPOT Image Corp. Academic Advisory Council. He is past chairman of the MidAmerica GIS Consortium, and was chair of the Planning Committee for the Mid-America GIS Symposia in Kansas City in May 1990 and May 1992.



**William J. Ripple** is currently director of the Environmental Remote Sensing Applications Laboratory (ERSAL) within the Dept. of Forest Resources at Oregon State University (OSU) in Corvallis, Ore. He serves as an associate professor with responsibilities in research, teaching, and advising graduate students. He also has adjunct appointments on graduate faculties in the Depts. of Forest Science, Geoscience, and Fisheries and Wildlife at OSU.

Ripple was born in Yankton, S.D., and holds a BS from South Dakota State University, a MS from the University of Idaho, and a PhD from Oregon State University. He has 20 years of experience in the research and applications of remote sensing and GIS for the study of natural resources.

Since joining the faculty at OSU in 1984, Ripple has received numerous grants from several agencies within the Dept. of Interior along with grants from NASA and the U.S. Forest Service. His research emphasis has been on forest vegetation and wildlife studies; he currently is involved in research on topics involving the northern spotted owl, fire ecology, biodiversity, and landscape ecology.

He has been a member of ASPRS since 1977 and has served on various national committees in addition to serving as president of the ASPRS Columbia River Region. He has authored over 50 scientific articles and has served as the editor for three different books on GIS. Ripple is an ASPRS Fellow and has served as a *PE&RS* associate editor for eight years.