GIS NEWS AND INFORMATION

August 1996 (No. 11)

Dedicated to CDC/ATSDR scientific excellence and advancement in disease control and prevention using GIS

I. Public Health GIS (and related) Events

☞ Seventh International Symposium in Medical Geography, University of Portsmouth, July 30-August 2. Contact: Graham Moon, University of Portsmouth, School of Social and Historical Studies, Milldam, Burnaby Road, Portsmouth PO1 3AS, UK or Internet: symposium@hum.port.ac.uk. The preliminary program is available on the Web at http://strabo.geog.port.ac.uk/conf/medical_geography.html.

☞ Meetings of the American Statistical Association, Chicago, August 4-8, 1996 [see selected GIS paper abstracts in the June edition of *GIS News and Information*, or complete subject listing in *Amstat News* <http://www.amstat.org/>].

☞ Annual Conference and Symposium on GIS and Water Resources, American Water Resources Association, Ft. Lauderdale, September 22-26, home page <http://www.uwin.siu.edu/~awra>, with selected topics such as pesticide contamination of aquifers, modeling selenium, nitrates in ground water and herbicide concentration estimation.

☞ NCHS Cartography and GIS Guest Lecture Series: "Integration of Epi-Info and ArcView GIS", Jayanth Devasundaram, Epidemiologist, State Health Department in Baltimore, MD, September 26, 1996, Envision 2:00-3:30 from NCHS to your location [CDC/ATSDR staff: please make Envision arrangements now].

☞ National Nonpoint Source Pollution Information/Education Conference, Chicago, October 22-24, sponsored by Illinois EPA, the Northeastern Illinois Regional Planning Commission and U.S.EPA: contact Christy Trutter 217-782-3362.

☞ VII International Meeting on Research Advances and Rabies Control in the Americas, CDC, Atlanta, December 9-13. For information, please contact Charles Ruppert, Chair, Organizing Committee, at Ph: 404-639-1050, Fax: 404-639-1058 or email <cyr5@ciddvd1.em.cdc.gov>.

☞ CDC and ATSDR Symposium on Statistical Methods- Statistical Bases for Public Health Decision Making: From Exploration to Modeling, Atlanta, January 28-30, 1997. Contact: Barbara McDonnell, Ph: (404) 639-3806 or email bgm4@epo.em.cdc.gov.

II. News from GIS USERS

(Please communicate directly with colleagues on any issues)

A. General News

1. Editor: CDC/ATSDR GIS User **Steve Morris** at Berkeley has a list of GIS resources with a section called "GIS Tools and Training" that has some interesting references to on-line tutorials. The list is available at: http://www.lib.berkeley.edu/UCBGIS/gisnet.html

2. From **Mike Qualls**, IHPO: The following is excerpted from a presentation by John Carver Scott, President, Center for Public Service

Communications, Arlington, Virginia, USA at the "UN/ESA/Chile Workshop on Space Technology to Prevent and Mitigate the Effects of Disasters for the Benefit of Developing Countries in the ECLAC Region", 1-5 July, 1996, Santiago, Chile: "Space-based Remote Sensing for Disease Surveillance and Prevention"- The example of a project in Chiapas, Mexico -- a cooperative effort of the Centro de Investigation de Paludismo and several teaching institutions in the United States, illustrated the complimentarity of space-based communications, global positioning and remote sensing technologies and other developing technologies, such as Geographic Information Systems (GIS). It is a model program that addresses a potential health disaster caused by malaria-carrying mosquitos and, for me, it would not be stretching definitions to call it an application of telemedicine.

With support from the National Aeronautics and Space Administration (NASA), this project developed a landscape approach to using remote sensing and GIS technologies to discriminate between villages at high and low risk for malaria transmission, as defined by the abundance of Anopheles albimanus mosquitos. Satellite data for an area in Southern Chiapas were digitally processed to generate a map of landscape elements. GIS processes were used to determine the proportion of mapped landscape elements surrounding 40 villages where data had been collected identifying an abundance of Anopheles albimanus mosquitos. Analysis of the data indicated that rainfall and growth of vegetation could be correlated with malaria vector production; that changes in these parameters can be monitored and quantified by remote sensors and thus; changes in mosquito populations could be predicted by the use of remote sensing images to monitor changes in these key environmental parameters. With data from 1985 and 1987, the program team successfully demonstrated that remotely sensed spectral data can be used to predict, with an accuracy of 90%, which rice fields would become heavy producers of malaria-carrying mosquitos two months before peak production. If employed on a large scale, this discovery can lead to economical and precisely targeted malaria control programs. John Scott can be reached at <jcscott@access.digex.net>, Phone: 703-528-0801, Fax: 703-528-0802.

3. From **Chet Moore**, NCID (Ft. Collins): Not a whole lot of note from our shop for the moment. We are well into several projects (La Crosse encephalitis, plague, Aedes albopictus), but not far enough along to report anything. One interesting activity might be worth noting. Representatives of several federal agencies (CDC, USDA/ARS, USDA/APHIS) and staff from Colorado State University recently met to discuss possible joint projects, resource sharing, and similar matters. With many groups actively involved in GIS/RS applications, it makes sense to share resources where possible. We anticipate a series of meetings over the next year or two. Chet can be reached at Tel.: 970-221-6423, FAX: 970-221-6476 or by e-mail at: cgm2@cidvbi1.em.cdc.gov.

B. Technical News

4. Editor: A note about S+SpatialStats (StatSci, a Division of MathSoft, 1-800-569-0123)- this is an advanced add-on module to S-Plus specifically designed for spatial analysis, including the analysis of point, lattice and geostatistical data. Many of the analytical techniques are based on work by Noel Cressie and by Brian Ripley. Point data are simple, unordered observations in (x,y), or (easting, northing) space associated with quadrat (density based) and nearest-neighbor analyses. Lattice data are areal, or polygon data, commonly evaluated for structure through spatial autocorrelation statistics. Geostatistical data are ordered, sample data in (x,y,z)-space commonly associated with kriging and other techniques of spatial interpolation. The 80+ statistical analytic functions are extensive. S+SpatialStats received

an outstanding review in the *AAG Newsletter*, vol. 31, no. 7, July, 1996 [for additional information: Andrew J. Krmenec krmenec@taiga.geog.niu.edu]. In a related article on the use of GIS in point pattern analysis, check out Joe Berry's "Analyzing Spatial Dependency Between Maps", *GIS WORLD*, Vol. 9, No. 6, June, 1966, 34-36.

5. Editor: Announcement received- Earth Interactions, an electronic journal jointly sponsored by the American Meteorological Society (AMS), the American Geophysical Union (AGU), and the Association of American Geographers (AAG), with support from NASA's Mission to Planet Earth, is soliciting papers for publication. Within this framework, the journal particularly encourages submissions that deal with interactions between the lithosphere, hydrosphere, atmosphere, and biosphere in the context of global issues or global change. Submissions introducing observational or modeled data sets that may be useful in the study of Earth system science and that include both a description of the algorithms and/or processing techniques used and a brief, representative sample of the information in the dataset are also appropriate. All submissions will be peer reviewed. The electronic medium in which the journal is published provides unique opportunities for data presentation, animation, and interaction, including "live math." Authors should strive to take maximum advantage of the capabilities of the electronic medium, but any electronic manuscript that deals with the subject areas of the journal will be considered for publication. Eric J. Barron is Editor-in-Chief of Earth Interactions. Technical support is provided by NASA's Goddard Distributed Active Archive Center (GSFC DAAC). Researchers involved in the broad areas covered by Earth Interactions are urged to consider this unique opportunity for presenting their results. Submissions can be made via the Internet at the following address: http://EarthInteractions.org/. Additional information is available from the GSFC DAAC at 301-286-5170 or millin@eosdata.gsfc.nasa.gov.

C. Internet News

(Selected items picked up from Internet by GIS Users)

6. From **Richard Coles**, NCHS: The Library of Congress plans to digitize and place on-line as many as 80,000 maps within the next five years. At the end of the project, a 20-terabyte database of historic American and European maps will be available to researchers over the Internet.

7. From **Mike Qualls**, IHPO: This message is to announce the existence of a new listserver (IAG-List) established by the Institute of Australian Geographers. IAG-List is intended to serve as a forum for discussions and information relevant to Australian geographers and interested others. The list is open to anyone who wishes to join. Contributions from academic and applied geographers, non-geographers, and independent scholars are welcome! To subscribe to IAG-List, send a command to maiser@ssn.flinders.edu.au asking it to sign you on. Do NOT include a subject header. Include only one (1) line of text saying: SUBSCRIBE IAG-List <Your email address>. If you have a mail signature, make sure that it is turned OFF before you send the message. MAISER will process your subscription and send you an acknowledgment. Contact: Dr. Iain Hay, School of Geography, Population and Environmental Management, The Flinders University of South Australia, GPO Box 2100, Adelaide, SA 5001, AUSTRALIA, Ph. 61 (0)8 201 2386, Fax. 61 (0)8 201-3521.

8. From **Mike Mungiole**, NCHS: The FGDC (Federal Geographic Data Committee) is interested in identifying organizations who have 1) experience with the FGDC metadata standard, 2) dedicated Internet connectivity, 2) PC (or Mac) and UNIX workstation access, and 3) personnel to collate, refine, and build FGDC metadata records. Please send your name, address, phone number,

and email contact information to ddnebert@usgs.gov if you have such capabilities. Doug Nebert, Federal Geographic Data Committee Secretariat.

9. From **Arlene Siller**, NCHS (followup to developments of the MABLE/Geocorr, geographic correspondence engine, presented in *GIS News and Information*, No. 10): We have made a couple of end-of-fiscal-year final touch enhancements to the MABLE/Geocorr application (URL: http://www.oseda.missouri.edu/plue/geocorr). We have added a link to a doc with background information about each of the geographic layers used in MABLE - its called the MAGGOT (Master Area Geographic Glossary Of Terms) file. The 2nd was easy: we added a link to MAPQUEST's on-line address finder service. This really cool, TIGER-based application allows you to enter a street address for anywhere in the US (TIGER coverage at least) and have it return you a map showing the street network about the address with a big red star AT the address at the center of the map. Printed (real small, you may need a magnifier) at the top center over the map are the latitude, longitude coordinates of the address. This can be very useful for geocorr users who want to take advantage of the application's not-well-advertised ability to select geography within an n-mile (or kilometer) radius of a user-specified point.

Using MAPQUEST [www.mapquest.com] you can do a "manual" lookup of an address and upon returning to geocorr enter those coordinates into the form fields for the lat and long coordinates of the "specified point". If you don't really care about a correlation list, but are just interested in the population of the n-mile circle, you can just select "state" for both the source and target geocodes. The output will then consist of a single line (assuming your circle does not cross state boundaries, otherwise, 1 line per state) which will include the sum of the weight variable - total 1990 pop by default -for the selected areas. In other words, it makes it pretty easy to figure out the population within an n-mile radius of a location. If you are willing and able to do some post-processing you can also use this to do other interesting applications (geocorr may do these itself some day if we get funded for extensions). In this case you could specify "census block" as the source geocode and, say, state for the target, together with a location (x-y coordinate of an address lookup, or other.) Then have it generate a .csv file which you load into your spreadsheet (or possibly read into SAS.) What you now have is a file with the population, x-y centroid, and distance from the specified point on each record. You could easily aggregate the pop counts for any one or set of radii that are of interest. If you are interested in other geographic units for the area simply select those as well from the source geocodes list, and now you can get sub-aggregates for these areas (such as place or ZIP codes.) You can also use this as a somewhat expensive and not-totally-reliable geocoding service. Enter the coordinates of the address you look up and then specify a small radius - say .25 miles. Select census block and whatever-other-geocodes you want to assign to the address (if you want tract/BNA you're set, because selecting block implies select tract.) Select these as the source geocodes, with state as the target code. Now you get a report back with all the blocks in the small circle. Look for the line with the smallest value for DISTANCE -- this is the census block with centroid closest to the address. In most cases, the geocodes on this line will be the ones that apply to the address. You might want to check out other "close" blocks to see if the codes are different. In many/most cases they will not be, unless your point is close to a boundary. Of course, once you have these geocodes it's easy to go to a census file and link demographic attributes of the neighborhood (like median hh income, percent poor, pct owner-occupied units, etc.) Contact: John Blodgett, Urban Information Center / Office of

Computing, University of Missouri - St. Louis, 8001 Natural Bridge Rd., St. Louis, Mo 63121-4499; Phone: (314) 516-6014/6000 FAX: 516-6007.

10. Editor: There are many different sources of commercial satellite imagery. As an example, EOSAT (in Lanham, MD) distributes multispectral image data acquired by U.S. Landsat, Indian Remote Sensing (IRS), and Japanese Earth Remote Sensing (JERS) satellites. The IRS-1C satellite, launched December 1995, provides: a) 5-meter panchromatic data and a 5-day revisit capability, b) 25-meter multispectral data with visible, near-infrared and shortwave infrared bands, and c) 180-meter wide field sensor data, collected in a 740-km wide swath, with 5-day repeat coverage. EOSAT also distributes JERS and European Remote Sensing (ERS) synthetic aperture radar image data as well as high-resolution panchromatic image data acquired by the IRS and Russian satellites. Explore EOSAT and their various products at http://www.eosat.com.

11. Editor: In a recent development, environmental reports that have been exclusively available to incumbent members of Congress and their staff -to form positions on environmental issues- are now publicly available for the first time. These reports are now accessible through the Committee for the National Institute for the Environment (CNIE) and cover a variety of themes, including energy, environmental pollution and water quality. The National Institute for the Environment (NIE) was established this past year. These Congressional Research Service reports are part of CNIE's new electronic, on-line, National Library for the Environment. I think you will find these informative. The Net address of the library is www.cnie.org/nle. The development of an on-line encyclopedia of the environment and a section on in-depth environmental issues is in progress.

III. GIS Outreach

(Editor: All other solutions are welcome and will appear in the next edition)

☎ From **Gib Parrish**, NCEH: Can any of you help with the answer to this question? Apart from area codes, I'm not familiar with the geographic distribution of telephone numbers. Question posed to Gib: We are interested in geocoding BRFSS data using the respondent's telephone number. Do you know if doing this is feasible at any level below the county?

Response from **Owen Devine**, NCEH: Only if you can obtain a geographic file of telephone numbers to match to or some method of cross referencing between telephone numbers and available areas such as census block or tracts.

Response from Mr. McGee (who earlier posed the question): We are pursuing this with Dale Kulp of Genesys and the Gallup Organization. It looks like we can do this very well for listed telephone numbers using cross directories. In the case of unlisted numbers the coding would be done on the basis of telephone exchanges. An exchange is a bank of 10,000 numbers which can be allocated to census tracts according to some proportional distribution. We'll see!

☎ From **Mark Oberle**, PHPPO: A colleague from the University of Costa Rica is on sabbatical at Princeton. Luis Rosero-Bixby, PhD, is preparing a proposal on the demographic correlates of reforestation in Costa Rica. He has detailed census tract data from multiple Costa Rican national censuses (enumeration in CR is much better than in the USA) and wants to correlate these data with corresponding satellite data on vegetation to see what demographic characteristics correlate with reforestation practices over time. From what he tells me there are a number of groups in CR working on satellite data and not always collaborating well. I was wondering if you have any contacts he might follow up with in the USA who might help him with access to satellite data,

especially older satellite data that I understand may now be declassified. He especially needs access to older vegetation data that may not be generally available. Luis can be reached at email <lrosero@lotka.princeton.edu> or by phone (through 8/31) at 609-258-5514.

IV. Special Reports

(Submissions are open to all)

Editor: GIS at Regional, State and Local Levels: Selected Observations at the 9th annual GIS Conference, Towson State University, Baltimore, June, 1996- Plenary speakers this year included Larry Ayers (Intergraph), John Bossler (Ohio State U.), Joel Morrison (Geography Division, Census Bureau, pinch hitting for Bob Marx- both Bob and Joel are CDC/ATSDR GIS Users!) and Thomas Horton (Reporter, Baltimore Sun). **Ayers** commented that about 70 percent of the GIS software market is Windows NT and DOS, with the former growing rapidly. PC GIS markets are growing while mainframe and supercomputers are declining. Data access over the Web is the way of the future but security issues are the next hurdle. **Bossler** noted that of the 57,000 USGS 7.5' quadrangles that cover the U.S., about 5 percent are in digital form. Ohio has a FGDC (Federal Geographic Data Committee) partnership grant to digitize state quads with 85 percent of the effort spent on hypsography (relief or contours). Ohio will be the first state with wall-to-wall digital quads. As to GPS, centimeter precision is here, anytime, as one can always access a minimum of five satellites. Fourteen more Russian satellites are soon to be available. Ohio States' GPSVan™ can provide relative mean square error accuracy within 50 centimeters. **Morrison** discussed the approaching Year 2000 Census (see related discussion in the previous edition, No. 10, p. 11, *GIS News and Information*). **Horton** focused on problems associated with the Chesapeake Bay and its 64,000 sq. kilometer watershed. The Bay is shallow, only 21' deep, and drainage sensitive. It is a drainage repository for land about 15 times it size and is experiencing eutrophication from nitrogen runoff, some of which originates as far away as the Ohio River Valley. As a concerned ecologist, Horton called for GIS assistance in change detection (land use, pollution, drainage, nitrate disposal, etc.).

V. Public Health GIS Literature

(This section may include literature citations, abstracts, etc., and submissions are open to all)

❒ **Janet Heitgerd, Je Anne Burg and Henry Strickland** (CDC/ATSDR GIS Users!), "A Geographic Information Systems Approach to Estimating and Assessing National Priorities List Site Demographics: Racial and Hispanic Origin Composition." *International Journal of Occupational Medicine and Toxicology*, 4(3), 1995, pp. 343-363. Abstract: Demographic studies used to investigate whether minorities are more likely to live near hazardous waste sites have resulted in varying conclusions. Some reasons for these inconsistencies may be due to the design of studies used to collect and compare demographic information. In the research reported here, a Geographic Information Systems (GIS) approach to characterizing total population, by race and Hispanic origin, for areas within a mile of 1,200 National Priorities List (NPL) sites across the United States, was used. An intra-county statistical comparison was made between racial and Hispanic origin subpopulations living within one mile of a site and the subpopulations living in the same county, but more than one mile from the site. These results show that the percentage of the population reporting in a minority category is higher in areas nearer the NPL sites. We believe that a GIS approach is most appropriate for obtaining site-specific information and should be

used as a tool in future demographic studies of areas near environmental hazards.

❑ Editor (Readers new to GIS often inquire about an overview article to bring them up to speed. I want to recommend one that is timely): **Keith Clarke**, **Sara McLafferty** and **Barbara Tempalski** (CDC/ATSDR GIS Users!), "On Epidemiology and Geographic Information Systems: A Review and Discussion of Future Directions," *Emerging Infectious Diseases* [Perspectives], 2(2), April-June 1996, pp. 85-92. Abstract: Geographic information systems are powerful automated systems for the capture, storage, retrieval, analysis, and display of spatial data. While the systems have been in development for more than 20 years, recent software has made them substantially easier to use for those outside the field. The systems offer new and expanding opportunities for epidemiology because they allow an informed user to choose between options when geographic distributions are part of the problem. Even when used minimally, these systems allow a spatial perspective on disease. Used to their optimum level, as tools for analysis and decision making, they are indeed a new information management vehicle with a rich potential for public health and epidemiology.

❒ Editor (The use of Bayesian methods has a growing place in GIS analysis. The following paper may be of interest regarding Bayesian approaches, proximity-based vs risk-based assessment and/or the use of U.S. EPA's TRI [Toxic Chemical Release Inventory] data): **Lance Waller** (CDC/ATSDR GIS User!), Thomas Louis and Bradley Carlin, "Bayes and Empirical Bayes Methods to Assess Environmental Justice," *Proceedings of the Section on Statistics and Environment*, American Statistical Association, annual meeting, Orlando, August 13-17 and ASA Winter Conference, Raleigh, January 5-8, 1995, pp. 21-28. Abstract: Environmental justice reflects the equitable distribution of the burden of environmental hazards across various sociodemographic groups. The issue is important in environmental regulation, siting of hazardous waste repositories, and prioritizing remediation of existing sources of exposure. We propose a statistical framework for assessing environmental justice. The framework includes a quantitative assessment of environmental equity based on the cumulative distribution of exposure within population subgroups, and a dose-response function. This approach avoids arbitrary definitions of "exposure" such as "living within one mile of a waste site". We discuss both frequentist and Bayesian approaches for inference that account for uncertainty in exposure and response.

❑ Editor (The use of data from the U.S. EPA Toxic Release Inventory (TRI), with all of its limitations, can nonetheless be useful in trying to assess environmental justice themes. The following study, featuring county and census tract level spatial statistical analyses, will familiarize CDC/ATSDR GIS Users with the range of analytic issues one can be expected to confront in TRI analysis): William Bowen, Mark Salling, Kingsley Haynes and Ellen Cyran, "Toward Environmental Justice: Spatial Equity in Ohio and Cleveland," *Annals of the Association of American Geographers*, 85(4), December 1995, 641-663. Abstract: A growing body of research documents the inequitable impact of environmental hazards on poor and minority communities. This paper uses the United States Environmental Protection Agency's Toxic Release Inventory for 1987-1990 and the 1990 Census of Population and Housing to analyze the spatial distribution of toxic industrial pollution and demographic groups in Ohio. In apparent support of the previous body of research, we report high correlations between racial variables and level of toxic release at the county level. The highest levels of toxic release in Ohio occur in the state's most urban counties, fourteen of which contain approximately 90 percent of the state's minority population. However, a census-

tract examination of the most urban of these counties, Cuyahoga, reveals no relationships between race and toxicity. The tract-level data do provide some evidence of income-environment inequity, and these findings prompt several methodological advisories for further research. The principal conclusion of the paper is that spatial scale is critical in studies of industrial environmental hazards and environmental justice. [Bowen can be contacted at the Levin College of Urban Affairs, Cleveland State University, Cleveland, OH, 44115-2403].

VI. Related Census, DHHS and Other Developments

GIS initiatives in President Clinton's 1997 budget proposal: Most of these proposals are targeted for four agencies including the Departments of Interior (DOI), Commerce (DOC), NASA and the U.S. Forest Service (USFS). Part of DOI's budget is aimed at USGS and the development of a digital national atlas. The provision of USGS geospatial data for Census 2000 would also be supported. Incidentally, the National Biological Survey, originally an independent entity within DOI, is now part of USGS. The DOC's National Environmental Satellite, Data and Information Service (NESDIS), located within the National Oceanic and Atmospheric Administration, is targeted for funding, especially to support its satellite and remote sensing obligations. NESDIS has also transferred its Landsat 7 system to NASA. NASA's funding would target its Mission to Planet Earth program. Support would be provided for the Earth Observing System (EOS) which contains significant remote sensing and GIS elements. [For more detailed information and costs, see http://www.gisworld.com].

Appreciation to CDC/ATSDR GIS Users

As the responsible party for the CDC/ATSDR GIS Users Group, I want to share my personal good news and appreciation. I am honored to have recently received the 1996 CDC and ATSDR Honor Award in **Communication Services**. The award reads "For helping CDC/ATSDR establish a leadership role in understanding and facilitating the application of Geographic Information System technology in public health, through enhanced communication and collaboration." I wish to thank each of you for your consistent and kind participation in helping to make this a successful endeavor.

Final Thought

Did you know that even though practically all of us can quote 98.6^0F. as readily as 1492 or 1776, 'normal human body temperature is 98.2^0F.' It just happens that the original sampling was done in degrees Celsius, and then rounded to the nearest whole degree. Then 37^0C. was converted to 98.6 and the rounding was ignored (extracted from John Allen Paulos, *A Mathematician Reads the Newspaper*, Basic Books, 1995, and cited in the *AAG Newsletter*, vol. 31, no. 3, March 1966).

Charles M. Croner, PhD, Editor, ***GIS NEWS AND INFORMATION***, Office of Research and Methodology, National Center for Health Statistics <cmc2@nch09a.em.cdc.gov>

End of Summer '96...stay in GIS touch