Final Report
Cooperative Agreement 98HQAG3137
The Pennsylvania Interactive Watershed Atlas
2/01/00
Submitted by
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Project Background & Summary

The impact of rapid population migration, land development, and industrial growth has increased the importance of properly managing environmental resources. One of the most important environmental indicators and, in many cases the least visible, is watershed viability. Watersheds have become the focus of significant efforts on the part of the Pennsylvania Department of Environmental Protection (PADEP) and the US Environmental Protection Agency (USEPA). These agencies have developed programs related to the protection of watersheds and outreach activities aimed at educating the public and decision-makers about the importance of their local watersheds. The PADEP Watershed Notebooks have become an important addition to the agency's Internet site. The USEPA has developed Surf Your Watershed as an instrument to educate users of their Internet site. While these efforts have proved a significant addition to the current body of information related to watersheds, they do not dramatically contribute to the public's ability to visualize the information provided nor do they offer access to data/metadata for data sets from local/municipal and non-governmental organizations. It is this data that will have a more lasting and direct impact on watershed viability, development, and community interest. In addition, many communities and individuals are not knowledgeable about GIS and spatial data and cannot use the available data in their own environments. Therefore, it was imperative that every effort be made to create systems that will allow these populations to access and visualize this geospatial data without requiring the conscious use of a GIS or significant financial investments in equipment and software.

A major step toward making data and metadata available in general was taken in 1996 with the development of the Pennsylvania Spatial Data Access system. PASDA, a level C3 NSDI data clearinghouse, is an effort to provide access to and encourage the sharing of data statewide. PASDA is a World Wide Web based system that supports search, display, and retrieval of Federal Geographic Data Committee (FGDC) standard systems (GIS) data and imagery related to Pennsylvania's environment. PASDA was created to serve a broad and diverse audience by providing access to geospatial data and metadata using Isite software to perform a wide array of search functions including: keyword; topic; provider; and geography. In addition, PASDA also provides an active FTP site for

experienced users to download and use data on their own systems. In September 1999, PASDA was named the official state geospatial data clearinghouse for the Commonwealth of Pennsylvania. PASDA now operates under the auspices of the Pennsylvania Geospatial Information Council (PAGIC) which is comprised of 23 state government agencies and other data stakeholders.

The Pennsylvania Interactive Watershed Atlas, was being developed as an extension of the PASDA. The concept for the Atlas was developed by the Environmental Resources Research Institute of the Pennsylvania State University and was coordinated with the Pennsylvania Mapping and Geographic Information Consortium and the Pennsylvania Department of Environmental Protection. The purposes of the Pennsylvania Interactive Atlas were:

- To make data relevant to Pennsylvania's watersheds easily accessible to individuals, decision- makers, and community groups unfamiliar with GIS and spatial data.
- To compile and catalog through the creation of metadata, data sets related to Pennsylvania's watersheds.
- To promote the use and sharing of spatial data related to Pennsylvania's environment through outreach and education.
- To create a functioning framework by which other data and geographies will be represented.
- To develop a tool to educate individuals and stakeholder groups about GIS, spatial data, and watersheds.
- To encourage the continued development and sharing of data throughout the state.

The Atlas will contain three unique elements. First, an interactive mapping capability that will allow users to select, map, and view data through their web browser. Second, a searchable metadata catalog with links to data and preview maps

The Pennsylvania Interactive Watershed Atlas project was most successful in identifying data stakeholders and documenting data as well as in assisting in the coordination of data stakeholders.

In order to identify watershed data stakeholders, the project staff consulted a variety of sources. Several publications were available to assist in identifying groups. Internet resources and personal contacts led to additional contacts. Once the groups or individuals were identified, contact was made via phone and e-mail to discuss the project and set up a face to face meeting. Some of the groups contacted include:

- Alliance for Aquatic Resource Monitoring
- Delaware River Basin Commission
- Susquehanna River Basin Commission
- Juniata Clean Water Partnership

- PA Department of Environmental Protection
- Clearwater Conservancy
- Heritage Conservancy
- Canaan Valley Institute
- National Weather Service
- US Geological Survey
- National Park Service
- National Oceanic and Atmospheric Administration
- USGS Biological Resources Division
- Penn State University Department of Geography
- Chesapeake Bay Foundation
- Huntingdon County
- Bedford County
- Blair County
- PA Department of Conservation and Natural Resources
- Mifflin County
- Pennsylvania Alliance for Environmental Education
- Huntingdon Middle School
- US Environmental Protection Agency
- Delware Valley Regional Planning Commission
- Shaver's Creek Environmental Center

The second goal, to document and acquire data, has led to the acquisition and documentation of over 500 data sets. The data is currently being made available through the Pennsylvania Spatial Data Access (http://www.pasda.psu.edu) site.

The development of the interactive mapping tool has been more challenging. As described in Appendix B, the stability of the GeoMedia Web Map product, which was used to develop the interactive mapping component, has become an impediment to access. Currently we are endeavoring to secure additional funding to develop this function using an alternative, more stable mapping software.

The final element of the project was a coordination meeting held at the Penn Stater Conference Center in August 1999. This meeting provided an opportunity to discuss issues, needs, and initiatives. The meeting results can be found in Appendix A of this report.

Project Activities & Results

a. Data Stakeholder Identification

During the data stakeholder identification phase, numerous resources were used. The project team relied heavily on conference proceedings and attendance lists, various

annual reports and watershed group publications, and Internet searches. In addition, we frequently found that one contact would lead to two or three others. Due to the enormous number of names and groups we identified, we actually had to limit the number of contacts due to our own time and personnel limitations.

b. Data Acquisition and Documentation

Of the contacts we did make, we were able to acquire and document over five hundred data sets. Most contacts were quite willing to give us there data and grateful for the metadata services we offered. We discovered as expected that many of the data stakeholders did not have metadata for their data and were not FGDC literate to the extent that they felt comfortable creating their own documentation.

c. Online Mapping Component

See Appendix B.

d. Data Coordination Meeting

The data coordination meeting was highly successful and informative. Soza, Inc. provided facilitation services for the meeting which used Group Systems technology to capture comments and input from the attendees. Groups from across the Commonwealth as well as from other states attended the meeting and provided the project staff with vital input on their data needs and issues. In addition, presentations on successful project highlighted watershed based GIS efforts. These presentations included groups from PADEP, Wilkes University, Indiana University of PA, Clearwater Conservancy, French Creek Project, Stroud Water Research Center, Mackin Engineering, and PADCNR. For more detail, see Appendix A.

Project Challenges & Implementation Issues

a. People

The partnership with PAMAGIC was a positive force in the project. PAMAGIC maintains significant credibility with local government entities and has an extensive and diverse membership that benefited the project. In addition, significant contributions were made by the PA Department of Environmental Protection, the PA Department of Conservation and Natural Resources, the Susquehanna River Basin Commission, and the Delaware River Basin Commission. Kimberly Burns-Braidlow of the FGDC, provided an excellent presentation during the data coordination meeting. In addition, the Clearwater Conservancy provided excellent insight into watershed stakeholder groups and needs.

b. Technology and Software

The major problem with the project was the instability of the GeoMedia WebMap product. Significant time was invested in the creation of the "Atlas" but in many ways was lost since the product continuously failed during remote tests. The data and metadata, which is served through the PASDA website, has been used extensively.

Impacts & Continuing Efforts

The coordination meeting and the year-long data collection effort raised awareness of issues related to watershed based data. This acknowledgment that watershed stakeholders are both important data users as well as data creators has increased the interest of the project staff to secure further funding to expand the project. Many attendees of the meeting felt it would be vital for additional meetings to be held to further address the issues raised and to meet the data needs of watershed groups. If further funding is secured the project team will have a solid basis to re-engage these groups and to improve communication and use of GIS data among interested groups. In addition, educational materials now available through PASDA may assist these stakeholders in using GIS data and metadata.

Appendix A

Pennsylvania Watershed Atlas Meeting
Agenda - 17 Aug 1999
Penn Stater Conference Center
University Park, PA 16802

Meeting Objective

PURPOSE: To discuss geospatial activities, issues, and needs in relation to Pennsylvania watersheds.

GOAL: To chart possible future geospatial actions.

AGENDA:

> 10:15 AM
>> Sign in (Categorizer) Please provide your name, organization, address, email, phone, and fax.
> 10:30 AM

Presentations (Categorizer)

11:30 AM

Visions for PA Watershed

12:00 PM

Lunch

1:00 PM

Geospatial data catalog (Categorizer) What is your vision?

1:30 PM

Data access (Categorizer) What is your vision?

2:00 PM

Education and outreach (Categorizer) What is your vision?

2:30 PM

Group Presentations

3:30 PM

Next Steps (Categorizer) What are our next steps? What do
we do now?

3:50 PM

Adjourn Meeting

SIGN IN (Categorizer)

Participant Instructions:
Please provide your name, organization, address, email, phone, and fax.

1. Brian J. Hill, French Creek Project, Box 172 Allegheny College, Meadville, PA 16335, (814) 332-2946, (814) 333-8149 (fax), Frenchcrik@aol.com
2. Kim Burns-Braidlow, FGDC 590 National Center, Reston, VA 20192, kburns@usgs.gov 703.648.5549 (v), 703.648.5755
3. Marty Gutowski PASDA 302 Walker University Park, PA 16802 gutowski@essc.psu.edu 814.863.4562
4. Bill Manner, Pa. DEP - Northeast Watershed Coordinator, HC 1 Box 95B, Swiftwater, Pa. 18370; 570-895-4044; manner.bill@dep.state.pa.us
5. Jason Shenk-ORSER 204 Church Hall Middletown, PA jrs31@psu.edu 717-948-6755
6. Dave Ondrejik, National Weather Service, 227 West Beaver Ave #402 State College, PA 16801, daveo@supercel.met.psu.edu, 814-234-9412 ext 234, 814-234-9635
7. Chris Pfeiffer, PASDA, 141 Land and Water, University Park, Pa, cxp7@psu.edu, 814-863-8792
8. Janet B. Thorne, Executive Director, Hollow Oak Land Trust, P. O. Box 741, Moon Township, PA 15108; e-mail: holt@trfn.clpgh.org; phone: (412) 264-5354, fax: (412) 264-5354
9. Candie C. Wilderman Environmental Studies Department, Alliance

for Aquatic Resource Monitoring, Dickinson College, Carlisle, PA 17013 wilderma@dickinson.edu, 717-245-1573, fax 717-245-1971

10. John Livengood, IUP, 590 School St. Indiana, PA 15701 KDLF@grove.iup.edu (724)465-4613

11. Jen Novak, Allegheny Watershed Network/PA Environmental Council, 64 S. 14th St., Pittsburgh, PA 15203, awn@sgi.net, (412) 481-9400, (412) 481-9401

12. Paul J. Kinder, Jr., Canaan Valley Institute, P.O. Box 673, Davis, WV 26260, 1-800-922-3601, pkinder@mail.canaanvi.org, www.canaanvi.org

13. Desiree Henning Dudley, PA DEP, SERO, 555 North Lane, Suite 6010 Lee Park, Conshohocken, PA 19428, (610) 832-6102, fax (610) 832-6133, Henning.Dudley.Desiree@dep.state.pa.us

14. Roxanne Shiels ClearWater Conservancy 2555 North Atherton St. State College PA 16803 ph 814-237-0400 fax 814-237-4909 email rcshiels@yahoo.com

15. Kerry Wedel, Center for Watershed Stewardship, 227 E. Calder Way, University Park, PA 16801, klw14@psu.edu, 814-865-3334 (p), 814-865-1378 (f)

16. Terry R. Fabian, Deputy Secretary for Field Operations, PA DEP, PO Box 2063, Harrisburg, PA 17105, phone 717-787-5028; email fabian.terry @dep.state.pa.us

17. Scott Hoffman, US Geological Survey, WRD, 840 market street lemoyne, pa, 17043, ph:(717)730-6945, FX: (717) 730-6997

18. Scott B. Dane, PASDA, Data Manager, sbd3@psu.edu or sdane@pipeline.com, 814-863-3531, University Park, PA

19. Eric Jespersen, PaMAGIC/Rettew Associates, 48 Christman Rd, Drums, PA 18222,ecj@epix.net,570-788-4634

20. Tracey Walrath, Penn State University, 101 Land and Water Bldg, txw159@psu.edu, (814)865-9753

21. Michael E. Moore,DCNR- PA Geological Survey,PO Box 8453, Harrisburg, PA 17105, mmoore@dcnr.state.pa.us, 717-783-7258, 717-783-7267

22. Dave Hockman-Wert, Juniata Clean Water Partnership, RD 1 Box 7E, Huntingdon, PA 16652, dhwert@yahoo.com, (814) 627-5391, (814) 627-5182

23. Ryan Baxter, PASDA, The Pennsylvania State University, 141 Land & Water Research Building, University Park, PA 16802, reb186@psu.edu, 814-863-8791

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25. James McGonigle, Stroud Water Research Center, 970 Spencer Road, jmcgonigle@stroudcenter.org, 610-268-2153, 268-0490

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28. Deb Nardone, Juniata Watershed Coordinator, Chesapeake Bay Foundation, RD #1 Box 7E, Huntingdon, PA 16652, (814) 627-5082, Fax: (814) 627-5182, Email: dnardone@savethebay.cbf.org

29. John Benhart, Jr. Dept. of Geography & Regional Planning Indiana University of PA (IUP) Rm 10 Leonard Hall 421 North Walk Indiana, PA 15705-1087 Jbenhart@grove.iup.edu Phone: (724)357-7652 Fax: (724)357-6479

30. R, John Dawes, Consultant Heinz Endowment Environmental Program, R.D. 1, Alexandria, PA 16611 ph. 814 669 4847, FAX 814 669 1323, e-mail rjdawes@aol.com

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32. Mike Mayhak, Mackin Engineering Company, 117 Industry Drive, RIDC Park West, Pittsburgh PA 15275 (412)788-0472 FAX: (412) 787-3588 E-mail: mam@mackinengineering.com

33. Warren R. Huff, Delaware River Basin Commission, 25 State Police Drive, PO BOX 7360, West Trenton, NJ 08628-0360, 609/883-9500 ext.237, 609/882-9522 fax, whuff@drbc.state.nj.us

34. Helen Olena, Pa. Department of Environmental Protection, P.O. Box 2063, Harrisburg, PA 17105-2063, (717) 772-1828, Olena.Helen@dep.state.pa.us

35. Dale Bruns, GeoEnvironmental Sci. & Eng. Dept., Wilkes University, PA GIS Consortium, Wilkes-Barre PA 18766, 570-408-4610, 570-408-7861, dbruns@wilkes.edu

36. Bill Toothill 143 Stark Learning Center Wilkes-Barre, PA 18766 btoothil@wilkes.edu 570.408.4616 fax 570.408.7861

Presentations (Categorizer)

1. great job, Kim
2. No more funding until fall 2000?
3. what range/type of organizations are participating with NSDI/FGDC?
4. These small grants may be useful to our watershed organizations.
5. Good overview!
6. Everyone creates metadata, it's just not always FGDC compliant and/or comprehensible to others
7. Kim, please make the metadata training material available to the group when completed.
   pls provide solid contact information to all 1999 grantees

8. From Kim - The 2000 grant program will be announced in the fall with proposals selected in the early spring for dissemination in early summer. Organizations that are participating with FGCD include not only fed. agencies but states, counties, academia, private industry and professional societies.

9. Terry, what is the Web site for the Earth Week land use imaging map?

10. Where can we access information about the ArcView NGO grant program?

11. DEP's Land Cover poster is not on the website! Sorry! For a hard copy, call Helen Olena at (717) 772-1828.

12. From Kim - I'll e-mail this group when the metadata training material is available, as well as when the communication tool box for state policy makers is available. The communication tool box should prove to be a valuable resource to present to your local officials when asking for increases of resources to support your GIS efforts.

13. Another ArcView grant program to conservation organizations can be found @ www.esri.com/conservation.

14. What relationship between riparian buffer initiatives and watershed programs at DEP?

15. conservation above- meaning watershed groups, land trusts, etc.

16. Terry Fabian, Can you provide guidance as to how the DCNR endorsed product produced by W.Va. Univ. on watershed characterization will be incorporated into the DEP GIS initiative.

17. To DEP - Will the info that underlies the EPICS GIS system on DEP's website be made available for download, so that watershed organizations/data users can incorporate it into their own GISsystems? Presently, one can only view DEP's data, not incorporate it into a local system.

18. to IUP: Have you coordinated your water data-collection efforts with USGS, NAWQA program in the Allegheny-Monongahela river basins?

19. Since a large percentage of stream impairment is from NPS, riparian buffers play an important role in WQ improvement. The central office bureau activities are coordinated with our regional watershed coordinators. Riparian buffers should be a part of the local watershed planning efforts and can be considered in many of our grant programs(319, WRAP, Ches.Bay etc).

20. How do you identify communities that are willing to participate in your watershed planning education projects?

21. The currrent EPICS system will become obsolete as our total MIS comes on board this fall. I'm not sure the extent to which your larger data issue will be resolved. Nelson.kimberly@dep.state.pa.us might be better able to answer your question. I'll check with her as well.

22. How does the Upper Susquehanna-Lackawanna Project mesh with the Congressional monies that were obtained by McDade several

years ago ? Those funds were specific to the Lackawanna but intended to plan for and address similar issues.

23. Bill Toothhill - What were some of the other research foci of your project?
24. Mike M. - Are there specific data type requirements for river conservation plans? Data accuracy requirements? Data format and dissemination guidelines?
25. Mike - What's the buffer distance from the river?
26. Mike, You mention goals of the "client". Who are the clients?
27. Mike - Could you list (again) the grants and other activities that have followed your study?
28. From Mike -- For 26 & 27 : See my handout for more details re:clients/grants. For 25: buffer varies by project, usually 1000-2000 feet, sometimes with additial transportation/demographic buffer up to 2 miles. For 24: DCNR has required data in Arc/Info export format; we've usually tried for 2000-scale with 40ft accuracy, in state plane feet, NAD83.
29. Roxanne... what is your source of funding for the Spr Creek Community project ?
30. Kim - What is considered a small grant? Can you list a range of dollars?
31. Roxanne - What range of reactions do you get from various munis... in terms of their diversity of views on growth control, etc.
32. for Roxanne - are you getting good cooperation from the county planning commissions in the areas ??

Geospatial data catalog (Categorizer)

Participant Instructions
What is your vision?

Group 1

1. We think that are three visions are very similar, related - one system with 3 components
2. thumbnails of what data looks like- in other words, make metadata more visual, graphical
   love this idea
   Helps user visualize data extent.
   If they are images make sure they are small. Best to use GIF format.
3. some datasets (like those "in production") will only be useful to others after personal contact or discussion- for instance, we may use data developed at wildly different scales for visual presentations only- wouldn't want anyone to use for analysis - fitness of data? who decides what is fit?

who decides
List projects that have used a data set.
Fitness of geographic data or attributes. One may be great the
other garbage

Group 2

1. Be flexible to new technology (open GIS technology)
   And be flexible enough to support old technology.
2. Needs to be user friendly re access and search.
3. Generate data in "compliant" form.
4. Need incentive for people to document their data.
5. Need central repository for metadata.
   PASDA makes sense for this
6. Address liability issues associated with metadata.
   Realize regardless of what you do and how careful you are some one
   will be able to sue you.

Group 3

1. A condensed metadata format is needed explaining key
   characteristics (datum, projection, scale,format) in addition to
   full-blown metadata.
2. Metadata submission should be in standardized format accessible with
   a browser.
3. Metadata should be in database format such that queries could be
   done based on keywords (i.e. scale, projection, property,
   ...accuracy)
4. Metadata should be linked to a spatial feature (polygon, vector, point)
   such that spatial searches of metadata could be performed.
5. Need to be able to visually examine the data, prior to download,
   using only a browser.
6. Metadata on applications, educational materials (slides,
   powerpoint...), activities can be searched

Group 4

1. Since there are often multiple data sets that cover the same areas, it
   would be very helpful to have access to material that explicitly
   compares them to guide the user in making choices regarding the most
   appropriate sets to use.
2. There needs to be enough supporting on line materials so that people
   with limited technical resources can access and utilize the data. This is
   a high priority and may involve being able to manipulate data sets on
   line.
3. Different projections are always a problem and it would be useful to

either have standardized projections or possible a web site where projections could be converted.

I think this is an excellent idea! As a "user" only, I'm always faced with this problem.

Please remind users that reprojecting data degrades the quality of the data.

I think that the projection should be identified for each data set. PASDA could recommend that data sets be posted in geographic format. Beyond that, no standards should be set.

If reprojecting the data degrades the quality, maybe the metadata could address this and give non-technical people an explanation of the extent of degradation

4. Question (no consensus in group): Would it be more valuable for people themselves to create metadata or for PASDA to take charge of creation of metadata?

Creator of data should have metadata responsibility. PASDA staff do not (I assume) know all the specifics for each data set they post.

5. Effective searching is really important.
6. User needs access to lists of similar data sets -- could be accomplished through good search methods.

Maurie's comment causes me to wonder if there will be a source of data access for watershed groups. This is really needed. Is the current PADEP database (EASI v. anyone el

Group 5

1. Demonstrate the value of metadata to those producing data sets.
2. Since local gov organizations must deal with and produce data that crosses their borders how can we get them not to get upset? State funding? Force them?
3. Convince data producers understanding that without metadata they cannot properly market their data for sale.
4. Projection data in the metadata must be complete, users need more than projection type and datum, need easting/northings, reference latitudes, etc.

Data access (Categorizer)

Participant Instructions
What is your vision?

Group 1

1. Build a demonstration of the "Virtual Lab" for a watershed- can you really do it? (pull info from PennDot, DEP, etc. etc.)

Many watershed groups are doing this already -- Check with groups that have Rivers Conservation grants through DCNR

2. We are trying to decentralize decision making while somewhat centralizing data management - why tinker with Laissaire Faire? (So we can't spell it!)

Centralizing data management is so valuable to others.
I hope that a data centralization for volunteer generated data is seriously being considered. I think that PASDA is the best palce for this. Does anyone like the PADEP volunteerl database (EASI v. nonEASI)??

3. Must allow data to be checked out, changed and then checked back in

need unique data set ID that provcides simple tracking of chain of development for data sets

Group 2

1. Need statewide standardization of data and software, possibly using state funding as an incentive.

Here's the political boundary again, what about a watershed that crosses a state boundary? Undoubtably the "standards" will not be the same. What is needed is a broader standard that simply statewide.
There is an incentive to develop the data locally, but no incentive to provide metadata, so the state funding should be targetted to assist local governments with their needs and require them as part of the grant program to provide information about data sources and accuracy and/or require certain format in order to qualify for reimbursement from state.

2. Need data translation by software to a standard form.
3. Need free and easy access to data, thereby minimizing creation of non-standard systems.

Group 3

1. Data should be viewable prior to download using a browser
2. Spatial "clipping" or subsetting of data shoud be possible (i.e. where you need a watershed and streams etc.but data is stored by county or state)
3. Geospatial Information Council needs to coordinate data collection and documentation with users..

Group 4

1. We agree with the vision as stated.
2. We would anticipate that there will be some difficulty compiling data

on a watershed basis from multiple municipalities, etc. There needs to be technical support for this process.

 Will need financial support in addition to technical.
 A big issue is gaps: some counties have good data, others within the watershed are missing layers. How can we even the playing field, so to speak.

3. Metadata needs to be hot-linked to data layers and vice versa.
4. Incentives will need to be developed to motivate communities to participate.

Group 5

1. Many rural areas cannot access PASDA effectively. Rural area's phone lines are simply too noisy to allow the download of large data-sets.
2. Offer data on alternative media for those without effective internet access. Must be cheap and quickly delivered.
3. Offer historical data sets. Maintain historical data sets.
4. Define accuracy of each data set or establish a set of standards for different types of data.
5. Produce a long range schedule of what data will be available when.

Education and outreach (Categorizer)

Participant Instructions
What is your vision?

Group 1

1. Allow local input into the Altas - why do we care about a particular watershed or what work are we doing in "X" watershed
2. The Atlas should inventory watershed or stream projects (whether they be local, state, or federal) - allow users to ask- who is working on "X", or historically, what has happened in "X" watershed
3. watershed and GIS education should be provided to all taxpayers not just K-12
4. Educate people to think in terms of watershed boundaries instead of political boundaries by leveraging the public investment we have already put into the development of spatial data

Group 2

1. Make a GIS package to link GIS to PDE environment/ecology standards and science/technology standards.
 This might fit with the Governor's Link to Learn Initiative and

would be a logical proposal for a player such a Penn State to state

2. Involve educators in design of product or training course. Support course with intermediate unit training. For example, like Project Learning Tree or Project Wet.
3. Build on 1st National GIS Day, November 17.
   I see you are falling for the ESRI propaganda.
4. Federal Dept. of Commerce and PA Dept. of Community and Economic Development should facilitate GIS training to local municipal decisionmakers/planners.

Group 3

1. Education needs to expand to all GIS users and decision-makers. Educational materials on potential uses of GIS for watersheds, counties, townships, etc. need to be developed.
2. Better communication between groups needed to avoid redundant work. Better sharing of applications and procedures is needed.
   A project starts, they know nothing about

Group 4

1. There needs to be a funded effort of education and outreach to assure full use of the catalog by potential users and to ensure communication between users so that efforts can be shared.
2. Atlas information needs to be extremely simple for classroom use.
3. Community people, professionals, college students, etc. also need to be targets of an outreach and educational effort.
4. Importance of the atlas needs to be articulated clearly and simply for all potential users.
5. PArt of the educational outreach should include ideas on how data can be utilized to take action towards solutions.
   The community-focused teacher professional development ops work here.

Group 5

1. Allow schools to do geographic searches for both local data sets and data producers
2. Break down curriculum categories into grade levels.
3. Facilitate trading of data sets and curriculum materials between schools and school districts through the commonwealth and beyond.
   Provide comment section, so that teachers can evaluate and say this is good or this stinks.
4. Make sure those using the data understand where it came from, who produced it, what resources it took to product the data, etc.

Try to convey how long and how much money it took to produce data.

Next Steps (Categorizer)

Participant Instructions
What are our next steps? What do we do now?

1. We need to make the data more accessible to the users.
2. Standardized data.
3. standards statewide
4. Continue meetings like this one today.
5. PASDA must take the lead on developing the connection for volunteer generated data.
6. Provide metadata and educate on the need for quality metadata.
7. Provide local conservation/watershed groups with canned program (video?) on GIS values that can be presented to municipal decisionmakers.
8. Must allow feedback of previous users to be seen.
9. Build watershed oriented search engine to query metadata.
10. better metadata creation software
11. Review suggestions, prioritize, pick the important ones and implement
12. Just do it! Give PASDA the mandate.
13. More meetings like this
14. Penn State should continue/expand GIS training on a regional basis to raise general awareness and specific awareness among GIS practioners.
15. Although there is plenty of GIS based knowledge in this room, there is a definate need for this experience to be translated into easy to understand instructions for average users
16. Make PA enhancements to FGDC metadata:
     cost field
     data set critiques
     unique data set ID #

17. Provide the metadata caloge and make it easy to navigate.
18. 1. Identify all organizations/agencies/etc. that are related to watershed research. 2. Contact them and try to get them to cooperate in joint efforts for data sharing.
19. Appoint me as GIS Czar.
      hear, hear!!
      And make sure my salary exceeds $250,000/yr.
20. Survey counties and municipalities to learn existing data parameters; look for standards.
21. Identify individuals willing to work on the formulation of these ideas

and form a Working Group to continue effort. This group can provide info. to all users as to progress. Eventually lead to a plan with objectives etc.

22. if pa is going to be a technological leader in this field, then do it right the first time around! designation/resources/funding etc. must be charged to a selected group to get the data clearinghouse in order and correct or accurate to a standard and agreed to procedure.
23. Bring everyone up to date on what is already available in an easy to use format and then build from there.
24. support the development of open GIS
25. Need a standardized metadata system established to submit data
26. Must find an easy way to convert all data into same projection,etc.
27. ensure all PA state agencies are using same standards to create data, metadata.
28. Spread the word and build support for these efforts among more stakeholders. Sounds like some additional funding will be necessary to pull this off.
29. I like the comment in no.12
30. I would like to see some applications of "canned" watershed models: BASINS, W.V. model, others; to identify on practical basis some data access and cataloging issues, including metadata and quality of original data
31. Need clearinghouse for data, metadata, and education
32. What is GIS? Aren't there suppose to be cookies?
33. More internet-based gis...simple spatial operations, clipping etc. Makes it easy to maintain one master dataset.
34. How do I write metadata? Obviously, the creation of metadata is a very foreign process for me and others.
35. Maintain and offer a list of who has used what datain the past.
36. This day has been typical of most GIS initiatves. We talk about data, we see some presentations of the results. There are few resources to get people from one to the other. There is too much duplicationof effort. We need a clearing house for tips, tricks, comments scripts, and other resources to get people up and running quickly. Projections is a good example, there is lots of talk about the problems reprojecting data sets. If you know the projection of the data, ereprojecting is no big deal. We need a place where people can come tyo find that type of info.
37. Get a pilot project up and running to help build support for the full blown project.
38. much more training at all levels is needed.
39. Provide awards/recognition to municipal planning departments that demonstrate use of effective use of GIS consistent with state standards.
40. Develop a standard easy to use meta data entry form and distribute it to all licensed arcview users.

41. Must have more meetings to get more free lunches at the Penn Stater!!!!!
42. College interns are walking out with better abilities in this arena than the state employees charged with collecting/maintaining this information for "official" purposes. Train your staff persons adequately first and foremost!
43. Your open GIS conference might have some session(s) with a focus on issues from watershed perspective
44. Program was informative. May want to do regionally.
45. Encourage release of completed but "hostage" data (e.g., Allegheny County's)
46. Build a database of publications and studies that have used data sets downloaded from PASDA.
47. Take an active role in educating public officials and educators about GIS and the importance of standardization
48. Look at EPA's new STORET as WHAT NOT TO DO! They required metadata for all new data sets. Old data will be archived and not readily available. Let's face it, any data is good if its the only data. Suggest we try for a web clearinghouse. This goes beyond state boundaries!!!
49. Settle on any standards soon, so that data and resources can be organized and shared in the appropriate way. i.e., avoid backtracking.
50. The state might consider hiring a GIS person...
51. Require standardization of Ginformation
52. Give everyone a summary of the atlas proposal so we have a better idea of what you want to achieve.
53. All the river basins cross state lines, PA can take a leadership role, BUT must NOT define standards in statewide "isolation"
54. Need to facilitate progress on state-wide standards; integration of DCNR GIS and DEP GIS; role of web-based GIS to data access issues
55. Why not a GIO.
56. if the watershed approach to environmental problems is going to work, than get the maps designed and out for public dissemination asap. then the groups who physically "live" there and buy into their community to make the exact corrections for future use.
57. why don't we just have penn state take over the Commonwealth! Too late it has already happened.
58. Need to disseminate a good summary of what's been done so far and the vision of what is to be done in the near future. I'm not sure I know where we are.
59. Stae needs to adopt GIS standard and enforce it at least in it's own departments.
60. Good workshop, keep the dialogue going; need to reach out to local communities and govt. not just technical experts in the field

61. watershed is useful as public eye and organizational tool, not going to be data sets created strictly for watersheds

Appendix B

On-Line Mapping
## with GeoMedia WebMap v2.0

Goal and Target Audience

The Internet provides a remarkable resource for information sharing. This project explores the possibilities of tapping into that resource in order to provide on-line mapping capabilities to individuals who would not otherwise have access to geographic data. The goal of this project, then, is to produce prototype on-line mapping applications filling specific needs of a target group of users.
While geographic information systems (GIS) technology is often available to large organizations involved in environmental advocacy, many smaller groups, such as those focusing on small watershed catchment areas, often do not have access to GIS. Even when these groups do have access to data and technology, they often do not have the expertise to make use of it. For these reasons, we have chosen to direct our prototype applications towards users such as these. This document introduces two such applications. Before moving into a description of those applications, we provide a brief discussion of the software that we used.

The Software and How it Works

There are a number of new software technologies that support this type of internet-based mapping application. For our purposes we chose to go with a package known as GeoMedia WebMap, produced by Intergraph. However there are several components to this technology. The web-based applications developed for this project used Visual Basic Script (VBScript), with libraries provided by GeoMedia (also an Intergraph product), and then served over the Internet using GeoMedia WebMap. WebMap provides server-side processing, and then passes an active CGM file to the local web browser. This allows the user to interact with the file on their own PC using an ActiveCGM control (produced by InterCap) in Microsoft's Internet Explorer (IE).

In the diagram at right, then, the user would be working on the Local PC. They would use the Internet to access the web page on the Server. The Server would process their request for a map, and send a small file (the ActiveCGM) back to the Local PC. Then the user can explore that file on the Local PC, by zooming and
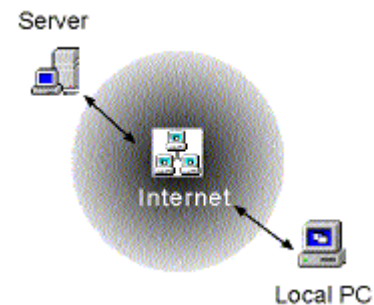
panning, and getting added information from pop-up boxes by passing the mouse over key features.
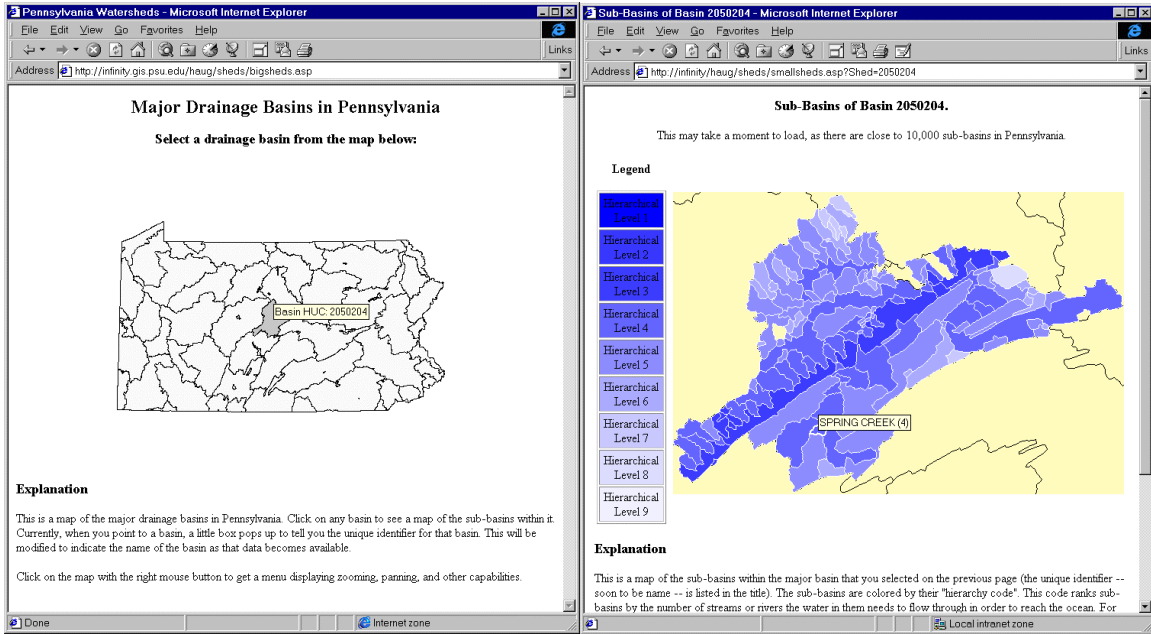
Prototypes

Basin Demographics
The first example provides the user access to census demographic data within sub-basins of interest. As mentioned above, this application is targeted at watershed conservation activists who do not have ready access to GIS software.
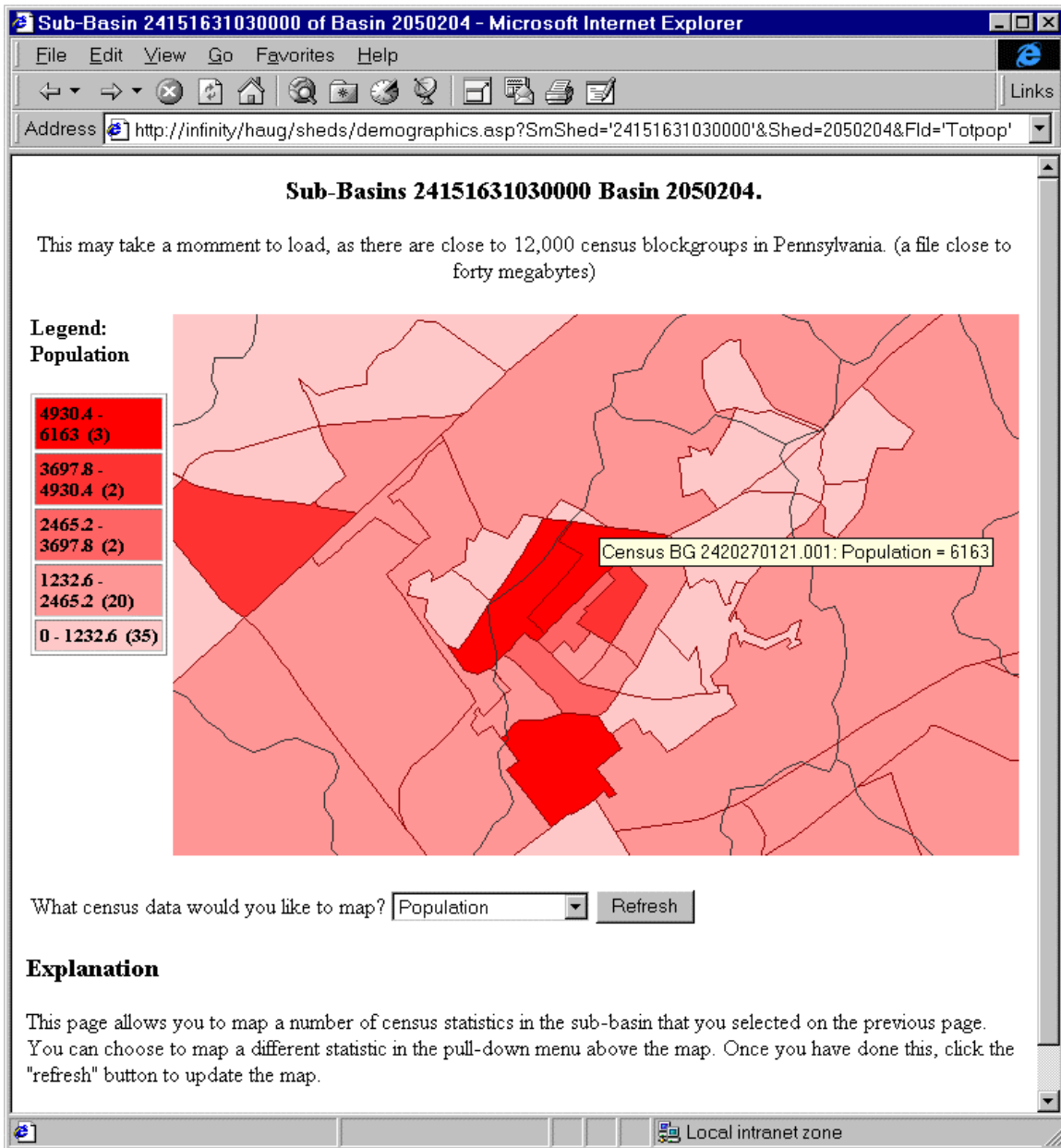The entrance page (below) is clearly documented, and leads to a simple map of large watersheds for the state of Pennsylvania with pop-up identifiers that show when the cursor moves over each basin.
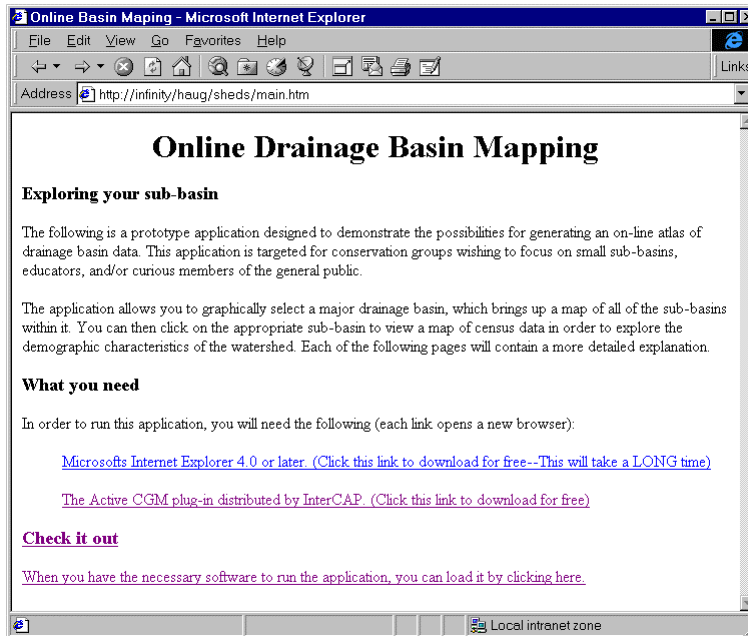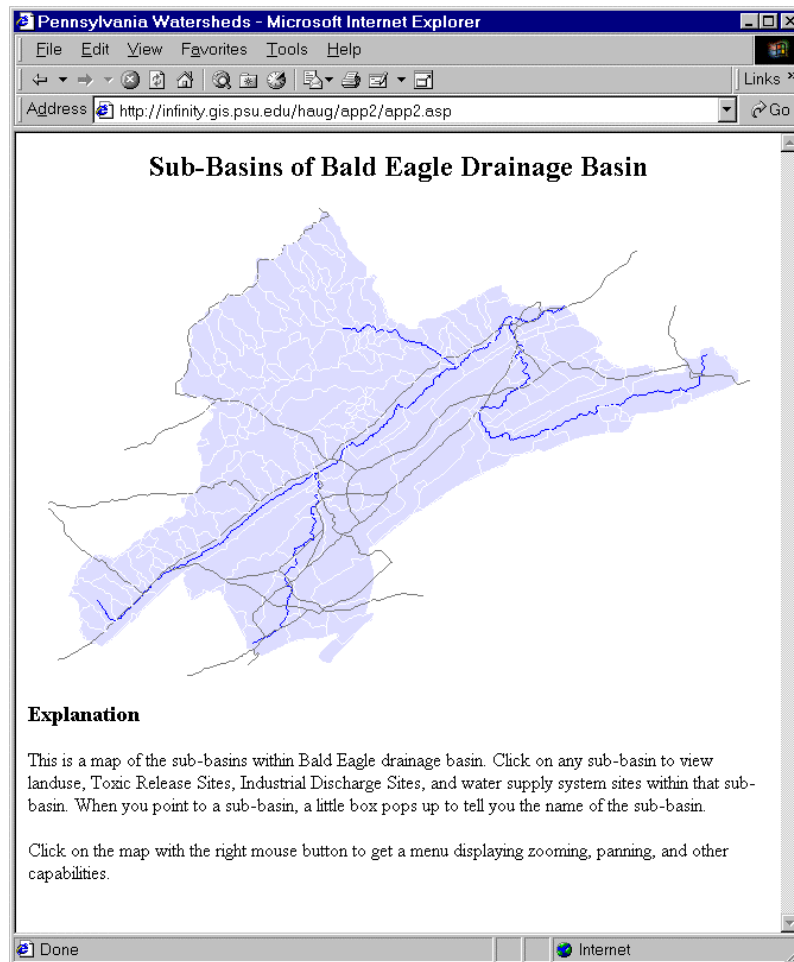

By "clicking" on the basin of interest on the state-wide map, the user is brought to a map of sub-basins within that basin. Each sub-basin is shaded according to the number of streams or rivers that the water will need to flow through to reach the ocean. Thus the darker sub-basins have a larger amount of water passing through them.

File Edit View Go Favorites Help

Address http://infinity.gis.psu.edu/haug/sheds/bigsheds.asp

Major Drainage Basins in Pennsylvania

Select a drainage basin from the map below:

Basin HUC: 2050204

Explanation

This is a map of the major drainage basins in Pennsylvania. Click on any basin to see a map of the sub-basins within it. Currently, when you point to a basin, a little box pops up to tell you the unique identifier for that basin. This will be modified to indicate the name of the basin as that data becomes available.

Click on the map with the right mouse button to get a menu displaying zooming, panning, and other capabilities.

Done   Internet zone

File Edit View Go Favorites Help

Address http://infinity/haug/sheds/smallsheds.asp?Shed=2050204

Sub-Basins of Basin 2050204.

This may take a moment to load, as there are close to 10,000 sub-basins in Pennsylvania.

Legend

Hierarchical Level 1
Hierarchical Level 2
Hierarchical Level 3
Hierarchical Level 4
Hierarchical Level 5
Hierarchical Level 6
Hierarchical Level 7
Hierarchical Level 8
Hierarchical Level 9

SPRING CREEK (4)

Explanation

This is a map of the sub-basins within the major basin that you selected on the previous page (the unique identifier -- soon to be name -- is listed in the title). The sub-basins are colored by their "hierarchy code". This code ranks sub-basins by the number of streams or rivers the water in them needs to flow through in order to reach the ocean. For

Local intranet zone

By "clicking" on the sub-basin of interest, the user can view demographic data from the latest census within that area (following page). The user can interactively choose the variable being mapped, as well as zooming and panning. This gives watershed activists an opportunity to learn about the demographics within the sub-basins that they are interested in preserving.

Sub-Basins 24151631030000 Basin 2050204.
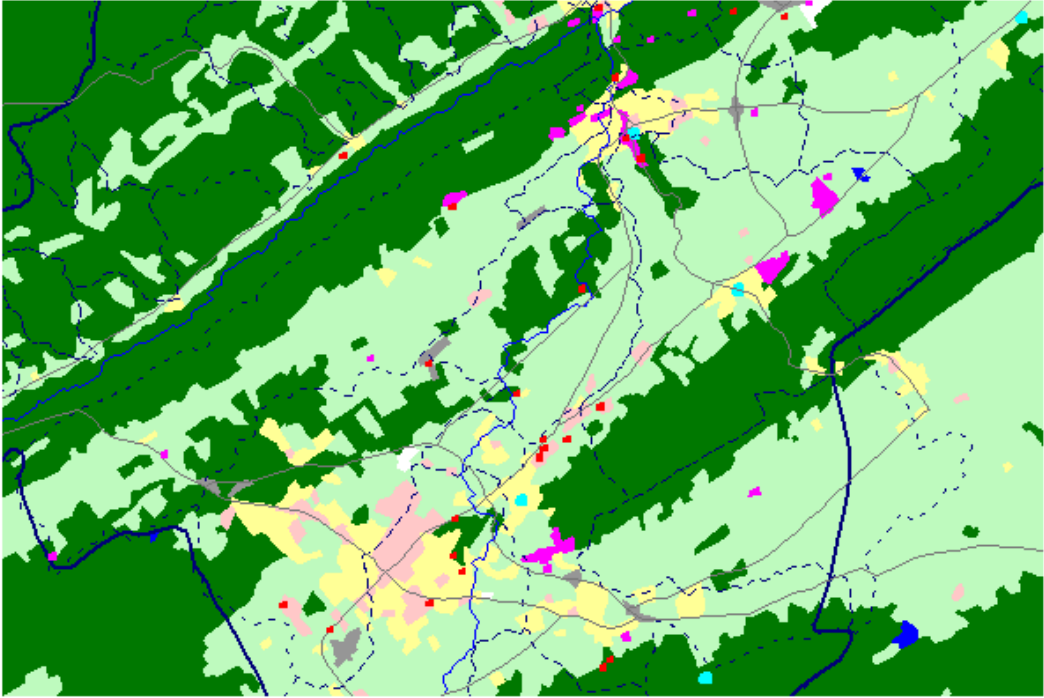
This may take a momment to load, as there are close to 12,000 census blockgroups in Pennsylvania. (a file close to forty megabytes)

Legend:
Population

Legend	Value Range
	4930.4 - 6163 (3)
	3697.8 - 4930.4 (2)
	2465.2 - 3697.8 (2)
	1232.6 - 2465.2 (20)
	0 - 1232.6 (35)

Census BG 2420270121.001: Population = 6163

What census data would you like to map? Population ▾   Refresh

Explanation

This page allows you to map a number of census statistics in the sub-basin that you selected on the previous page. You can choose to map a different statistic in the pull-down menu above the map. Once you have done this, click the "refresh" button to update the map.

Local intranet zone

Bald Eagle Drainage Landuse

The second prototype application maps landuse, toxic release sites, industrial discharge sites, and water supply systems. While the first example allowed users to explore the human elements of a drainage basin, this application allows the user to look for potential environmental problems based on proximity of toxic sites to water supply sources.

The entrance page is essentially the same as the one pictured in the previous applications. It leads to the page at left. For the purposes of this prototype application, we did not put together the landuse data for the entire state, but only for a single sub-basin.

However, the state-wide coverage could be accessed by adding a state map that allows users to pick their drainage basin (once again, similarly to the first application).

When the user clicks on a sub-basin within the Bald Eagle drainage basin (our demonstration area), they are taken to a landuse map illustrated by the one on the following page. This map has a pop-up box that provides the landuse in specific areas (if they have trouble reading the legend), or specific information about potentially hazardous sites, such as toxic release, industrial discharge, and mine locations. In addition information about water supply sites can be retrieved through this same method.

This application could be extended to allow the user to click on a particular site to get even more in depth information. However, that capability is not currently implemented.

File Edit View Favorites Tools Help

Address http://infinity/haug/app2/landuse.asp?Shed='SPRING%20CREEK'

THE SPRING CREEK SUB-BASIN

Forest		Agriculture		Residential/Urban	
Transportation/Utilities		Commercial		Industrial/Mines	
Wetlands		Open Water		Drinking Water Supply	

Industrial Discharge/Toxic Release Sites

Explanation

The map and legend above are pretty self-explanatory. The pop-up box provides added information, including specifics regarding industrial discharge, toxic releases, and water supplies.

Click on the map with the right mouse button to get a menu displaying zooming, panning, and other capabilities.

Done   Local intranet

Potential Problems

While this prototyping project has been relatively successful in helping us to understand what approaches to web-based mapping may work best, we have encountered a number of problems that should be addressed. Some of those problems may be due to the software that we are using. Others are more general.

Unstable Technology

The most pressing problem with the prototype applications developed in this project is that they are highly unstable. The GeoMedia WebMap server crashes on a regular basis and requires either the services, the system, or both to be restarted. This type of problem also seems to appear on the Intergraph example web site, which leads us to believe that this is not a problem to our specific hardware and software configuration.

Compatibility Standards

Another problem that may relate to the specific technology that we chose to use is that it is not compatible with one of the major web browsers on the market. As stated earlier, we used VB Script to generate our web mapping applications, and Netscape does not support VB Script. A more universally accepted technology should be used for production oriented Internet mapping applications.

Data Problems

Another of the problems that we ran into was that the data available for serving is not particularly clean. The main problem is that much of the data seems to have put together for very specific uses, and is not particularly easy to adapt to more general use. For instance, the basins data does not contain a tabular field listing the name of the large basins within the state of Pennsylvania. There is a coverage that contains these basin names, but the boundaries do not correspond to those of the sub-basins, and therefore the two coverages cannot be used together.

A second example of the types of problems that we had with the data comes from the landuse date for the second prototype application. This data is broken out into map sheets that appear to have been generated by different people. The map sheets are not edgematched, so they cannot be appended together. In addition, the attribute data for different sheets are coded differently. Some are in all capital letters, some are upper and lowercase, and sometimes slightly different wording is used for the same category. Finally, the field sizes of these attribute data are different in different sheets, and this it is difficult to even concatenate the tabular data together into one file.

These types of problems are not conceptually difficult to fix, but they end up adding significant time and expense to the generation of web-map applications. The data need to be extremely clean for this type of use, because non-expert users will not catch even the most obvious errors.

Conclusion

As pointed out earlier, this project has been successful in helping us to identify what we want to see in web-based mapping applications, and in pointing out the limitations of the technology that we tested. The ActiveCGM approach does not look promising at this time, although a number of its features are attractive. If we decide to further pursue web-based mapping, I would suggest that we do so using a more flexible and stable development environment such as Java. This, of course, would require much more investment in programming expertise, and would take longer to get up and running. However, if web-based mapping is a priority for PASDA, it may pay off in the long run to develop some in-house expertise in this area. The one danger in this approach is that a new more stable and flexible technology may emerge at any time and make that investment obsolete. Jason Schenk's work could prove to be a more productive route as well, but I think the design principles need to be simplified in order to meet a non-expert user's needs. There is no doubt, however, that the technology will improve, and I recommend that PASDA continue to pursue on-line mapping and geographic analysis as a service it can provide to its users.