Small Utilities GIS Cooperative Feasibility Study Findings

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Rural Community Assistance Partnership

"Improving the quality of life in rural communities"

Ohio Rural Community Assistance Program

Administered by the
W.S.O.S. Community Action Commission
219 S. Front Street, P.O. Box 590
Fremont, Ohio 43420

Ohio RCAP provides free technical assistance to communities under 10,000 population. We assist with project planning, development and funding. Often, we work with communities to evaluate their rate structures and financial capacity. In addition to working with individual communities, we also offer several utility management classes each year to local officials and operators.

Ohio RCAP Receives Funding From the Following Agencies:

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OhioEPA

Division of Drinking and Groundwaters

USDA Rural Development

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

HHS:OCS

OHIO WATER DEVELOPMENT AUTHORITY

The next frontier?

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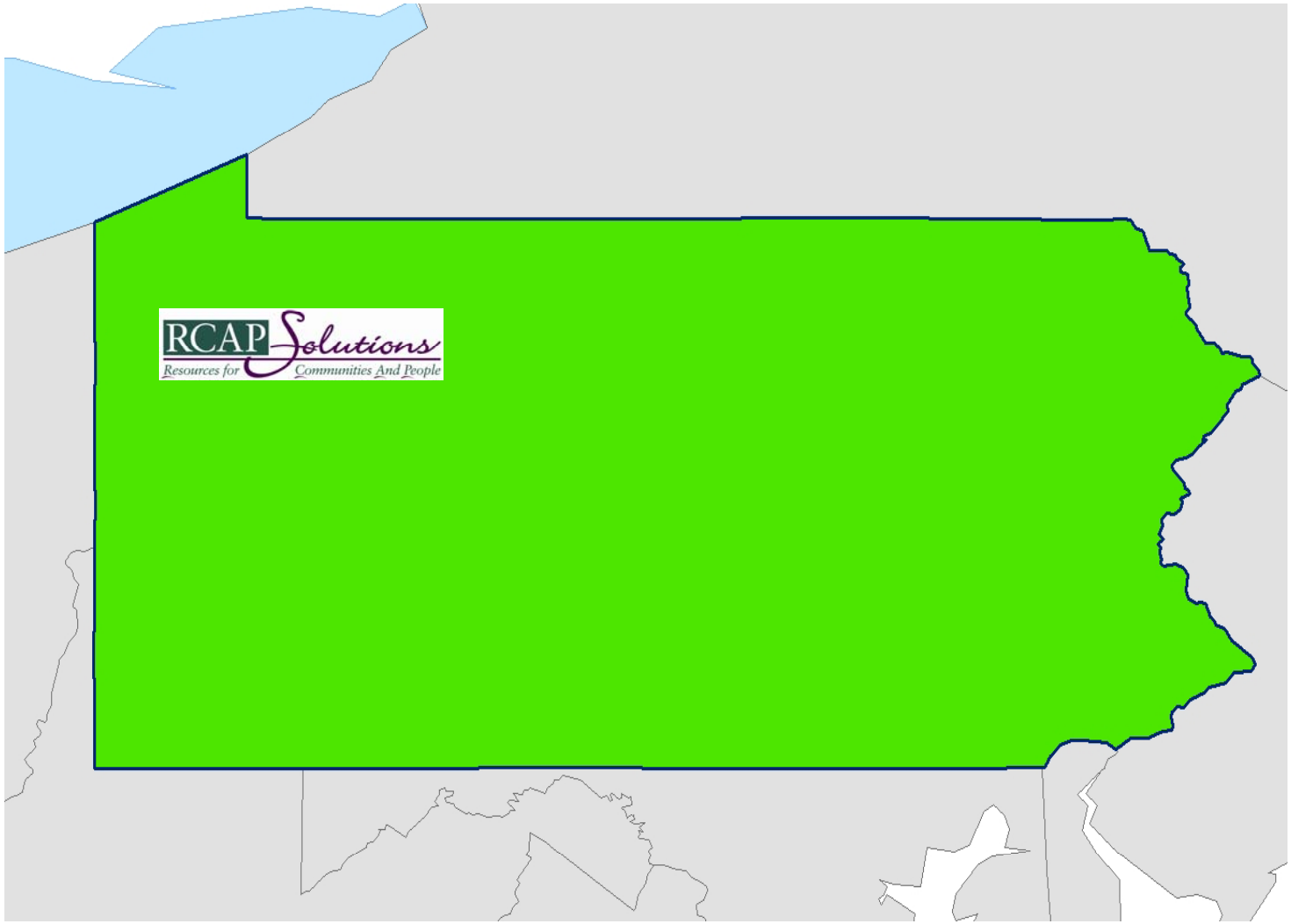

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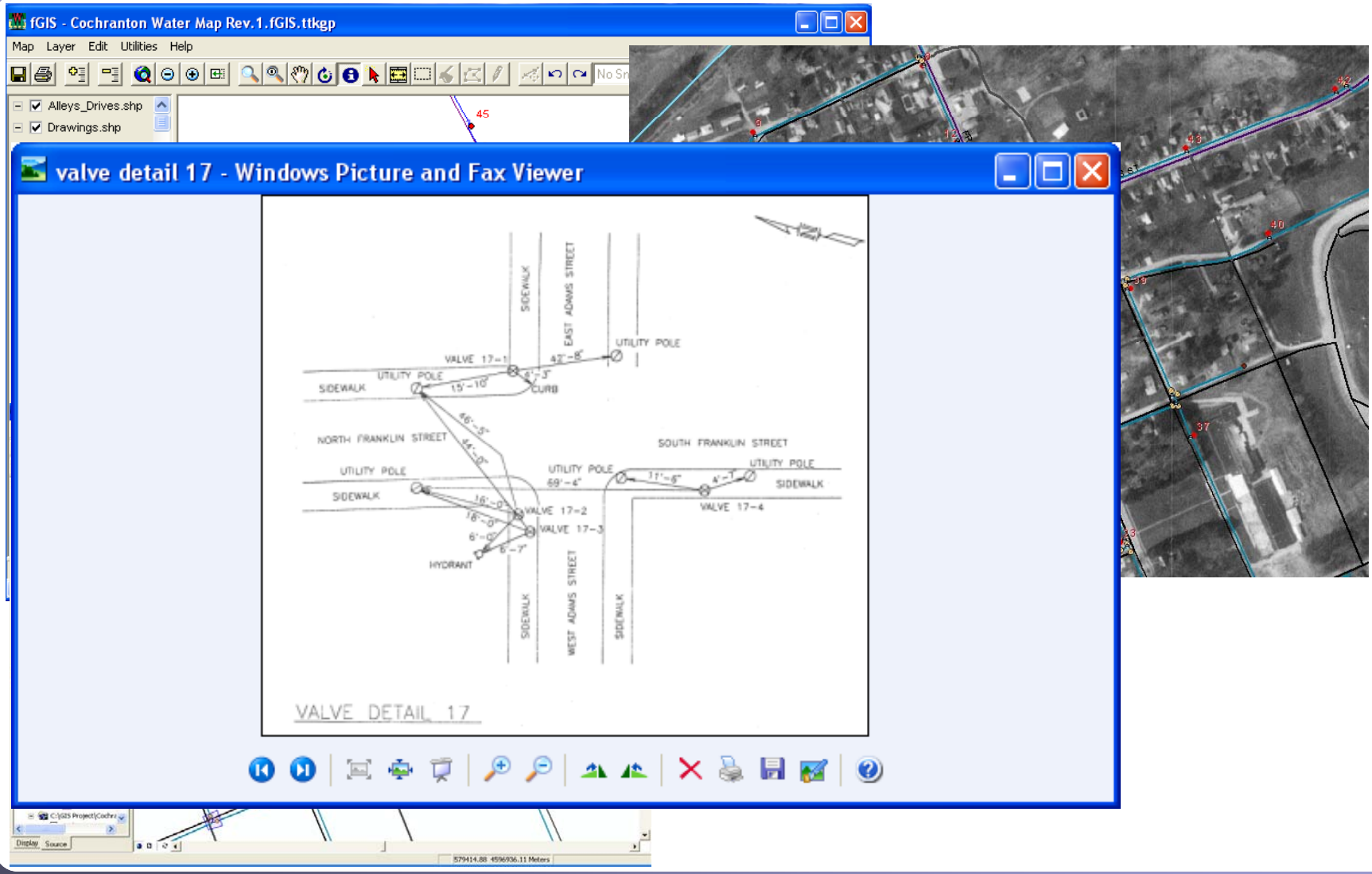

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Hi Fran, remember me?
I was just curious, do you ever use or maintain the GIS program I set up for you?

No, I couldn't remember how to use it, and we kind of gave up on it.

What I learned from the PA DEP GIS Pilot Study (and other Ohio RCAP experience)…

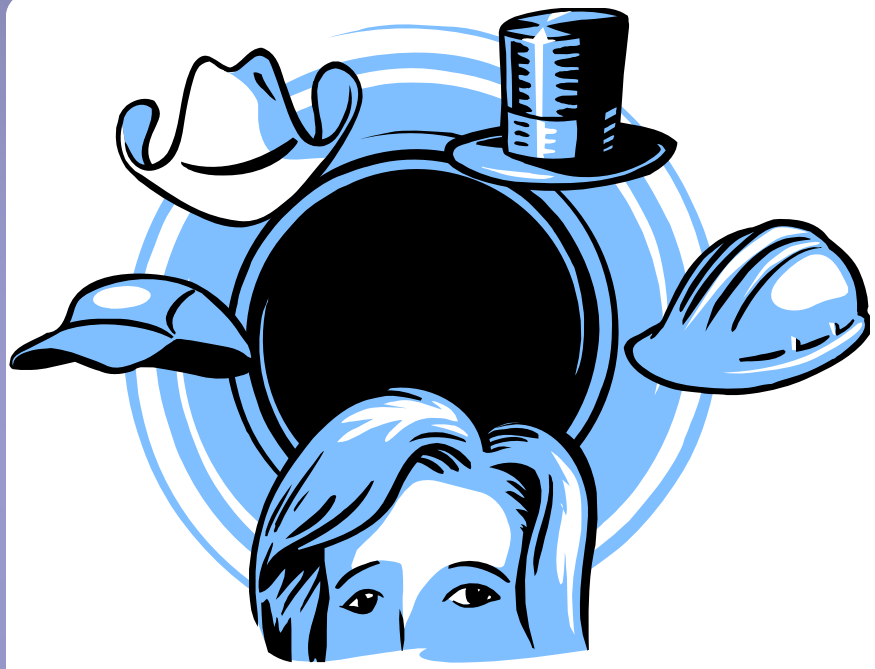
- Many small communities do not have up-to-date maps.
- In fact, they may not have vital information about their underground assets recorded anywhere.
- When operators retire, a lot of institutional memory will go with them.
- Low or no cost GIS programs can be started for communities, and mapping can be accomplished on a shoe string.

What I've learned …

- **But**, there are a lot of barriers to implementing and maintaining a GIS program in small communities.
- Villages and small cities usually do not have in-house engineering or planning staff.
- Some (probably many) small communities lack up-to-date computers and people with the computer skills or savvy to work through problems.
- If a community has nothing invested in the program, they are less likely to maintain it.

The challenge in rural communities…

- These communities usually cannot afford to hire in-house GIS professionals. Smaller populations and customer bases mean tighter budgets.
- Employees in small communities often wear several hats and do not have time to tackle big new projects or learn new software. They are probably already underpaid.
- It can be hard enough to find qualified operators in rural areas, let alone ones that are proficient with GIS software.



- These communities will benefit from GIS, but their GIS needs are somewhat different from large cities.

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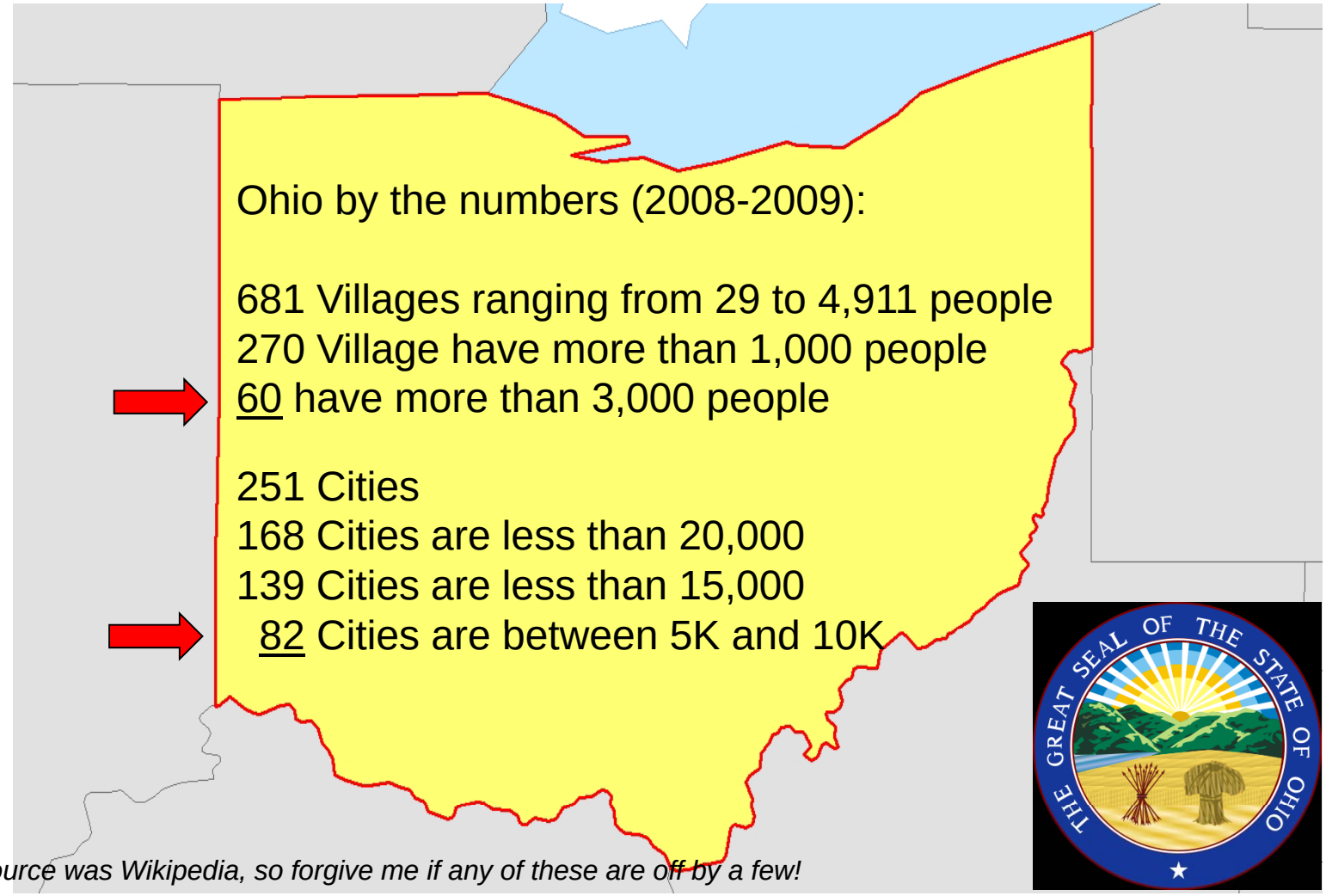
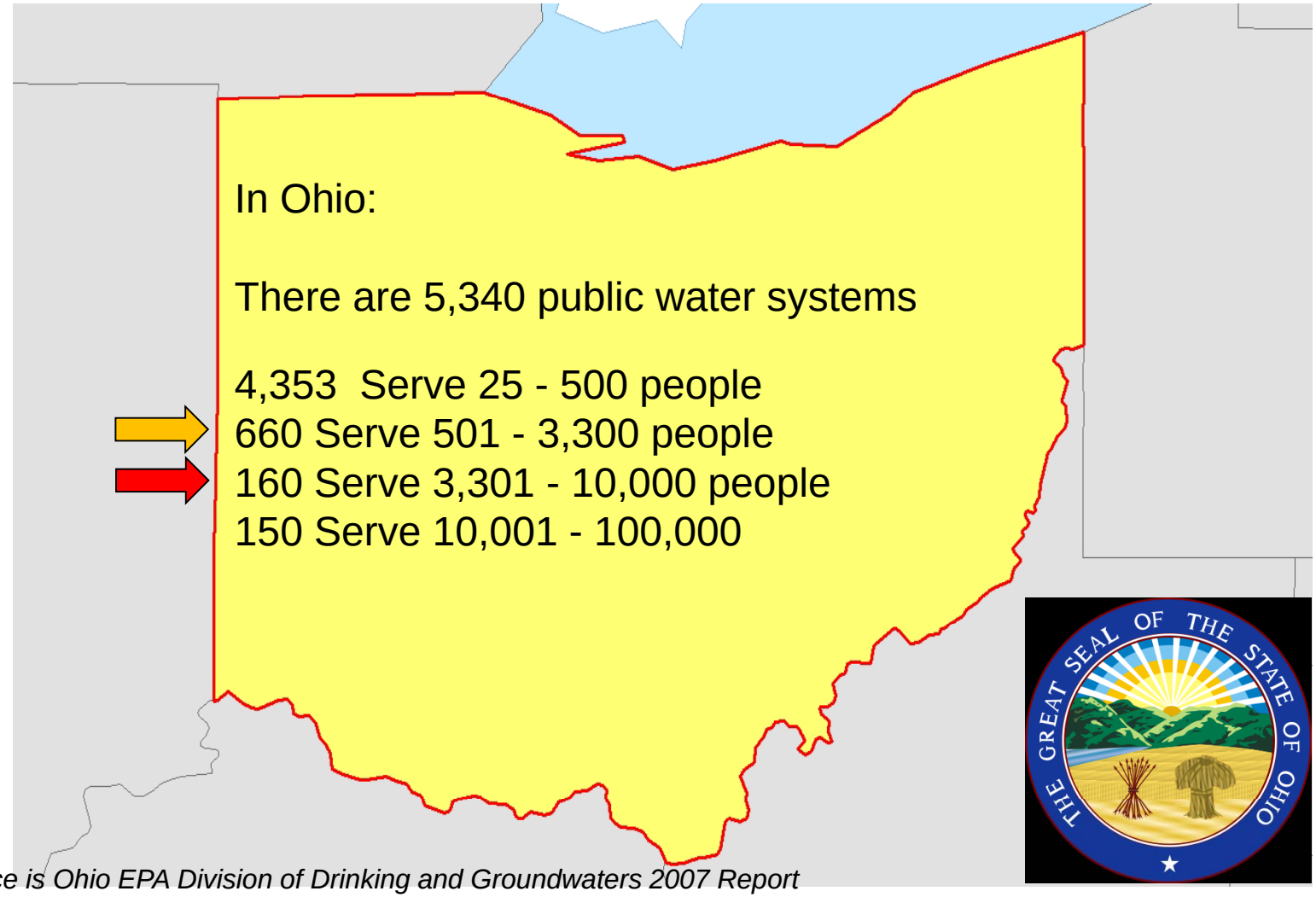


Ohio by the numbers (2008-2009):

681 Villages ranging from 29 to 4,911 people
270 Village have more than 1,000 people
60 have more than 3,000 people

251 Cities
168 Cities are less than 20,000
139 Cities are less than 15,000
82 Cities are between 5K and 10K

My source was Wikipedia, so forgive me if any of these are off by a few!



Source is Ohio EPA Division of Drinking and Groundwaters 2007 Report

In Ohio:

In 2000, there were 723 public sewer systems

255	under 1000 population
208	between 1K and 3K
52	between 3K and 5K
111	between 5K and 10K
45	between 10K and 15K

There are also 82 municipally owned electric utilities, the majority are in Villages.

Source is US EPA and AMP

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Beyond an Up-to-date Map: How Can GIS Potentially Help Small Utilities?

90 – second promotional video from recent EfficientGovNow grant competition sums it up nicely (can be viewed on at http://www.youtube.com/user/efficientgovnow).

Examples of potential uses for GIS in small communities and utilities would include:

- Asset management plans – something US EPA is encouraging.
- Quickly identify the location, depth, size, materials, age, and condition of all utilities at any point.
- View utility maps over all sorts of other map layers, including zoning, floodplains, roads, parcels, soils, census data, political boundaries, etc.
- Enter new service connection points and service lines, locate existing service connections from coordinates in the GIS using a GPS unit, and in some instances linking the information to customer billing databases.
- Quickly access and print scanned images of original engineering blueprints, photos, inspection reports, hand drawings, equipment manuals, etc.
- Quickly identify service areas and addresses that would be affected by closing a specific valve or by a line break.
- Track critical maintenance or inspection.

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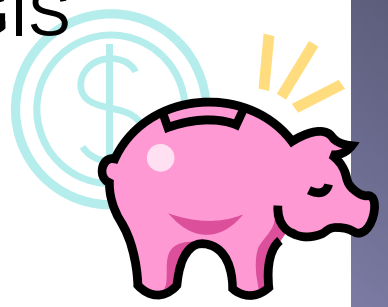
WHY Investigate Creating a GIS Co-Op for Small Communities?

What is the advantage of a shared GIS Service for Rural Communities?

- It's a relatively untapped market - there are lots and lots of small communities and utilities with no GIS program.
- Create economies of scale when you add them together.



- Similar sized communities and utilities will have more in common with each other than with large cities or counties – and the GIS program can be tailored accordingly by having enough of them share in a program.
- Better suited end-user interfaces/products.
- Shared GIS professional(s) - no development of local GIS expertise.

Anticipated Benefits

- Significant cost-savings versus implementing individual programs
- Easily access and update maps and asset inventory data
- Institutional memory will be preserved when operators and other personnel retire or leave.
- When personnel do leave, the service can provide training to new hires.
- The community will not have to worry about ‘losing’ the data or hiring an IT specialist to maintain a database and servers.
- Multiple locations (such as a water plant, wastewater plant, and City Hall) do not have to be networked together. Data can be securely accessed and updated from any location or hand-held device with an Internet connection.
- Participants can authorize specific information to be shared with others, such as an engineering consultant, county planning office, port authority, etc.
- Access to better equipment, such as higher accuracy GPS units and large format plotters for printing maps, would be expected.
- Having a GIS Specialist on-call to fix problems, work on new projects or initiatives, or create and print large-format maps.
- Eventually, we hope communities will be able to link their websites to a live mapping application enabling residents to view select information, such a zoning maps, general areas of water and sewer service, etc.

Objectives of a Cooperative GIS Service for Rural Communities

- Make GIS accessible and affordable
- Make interfaces as user friendly as possible.
- GIS is a tool to help local governments and small utilities.
- Avoid making operators GIS Technicians.

- Start with utilities, planning for future of other community assets to be added.
- Be sure to include functions and programs that will be helpful to municipal staff, but do not overwhelm them with data entry to maintain the system.

We have high expectation for the Internet-based GIS Program:

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1. Viewing Maps of Utility Systems in order to see the locations of utility system assets such as water lines, water meters, hydrants, and valves.
2. Panning and Zooming
3. Viewing Utility System Data in Table Form in order to see attribute information about each utility system asset, such as the diameter of a water line, what it is made out of, what company manufactured it, when it was installed, when it was repaired, etc.
4. Turning Map "Layers" On and Off in order to view utility system features in relation to other geographic features including streets, aerial photos, soils, floodplains, political boundaries, railroads, streams, and lakes, as well as additional layers such as parcels, zoning, sidewalks, edge of pavement, structures, and building footprints that may be available depending on county.
5. Searching Utility System Data in order to locate utility assets based on specific attributes, such as valve type, water line diameter, hydrant manufacturer, or any other information.
6. Querying Utility System Data based on more than one attribute at a time in order to find utility system assets that share multiple attributes.
7. Editing and Adding to Utility System Data in order to continually update information over time.
8. Conduct Planning and Analysis Based on GIS Data in order to more efficiently respond to problems and plan for projects and maintenance.
9. "Hyperlinking" Files such as drawings and customer billing information to the database
10. Extracting Data for use with GIS software or a mobile GPS device.
11. Making Data Available as "Live Maps" to Designated Third Parties such as regional planning commissions or engineering firms.
12. Color-Coding Map Symbols based on Key Attributes to enable quick recognition of active versus inactive meters, valves overdue for exercising utility features in need of repair, or other utility feature attributes deemed significant to highlight in this manner.
13. Potentially Linking Customer Billing and Asset Management Software to the web-based GIS.
14. Valve isolation queries, identification of customers affected by service interruptions.
15. Basic work order tracking system.

In 2007, Ohio RCAP assisted Ohio EPA with the Drinking Water Needs Survey

- 4 out of 10 randomly selected small communities (under 10,000 service population) on the eastern side of the state said they were interested in obtaining a GIS program.
- 2 had gone as far as to begin pricing it.
- None had immediate plans to move forward. They were stuck on cost, lack of expertise among staff with GIS, and how to begin selecting a good consultant.

In May 2008, the Ohio Dept. of Development announced a unique grant opportunity.

- Local Government Services and Regional Collaboration Grant
- Purpose: to encourage community partnerships for improved delivery of services.
- For feasibility studies only.

So, in June 2008….

Hi, remember me?
Do you (still) have an interest in implementing GIS in your community to help manage your infrastructure?

- 8 Villages, 4 Small Cities, and 6 Rural Water and Sewer Districts said yes.
- The Village of Carrollton volunteered to be the lead applicant.
- Some other communities were added to the study later.

So, in June 2008….

Hi, would you be interested in helping us investigate an idea to create a shared GIS Service for small communities?

- RCAP put together the grant proposal "**Small Utilities GIS Cooperative Feasibility Study"**
- The Ohio University Voinovich School was selected to conduct the study. The team there was led by David Simon and Zach Holl.

OHIO UNIVERSITY

Voinovich School of Leadership and Public Affairs

In September 2008 we learned that our Feasibility Study Proposal was selected for funding.

Planning began in December 2008, and the study was initiated in early 2009. It was completed within the year.

Village of Carrollton WWTP

Purposes of the Proposed Cooperative:

1. Assist multiple local utilities and municipalities in initially collect data and convert it into GIS format.
2. Provide a web-based mechanism that would allow these entities to view, manipulate, and edit this data after it is collected.
3. Provide the training and technical support required in order for these entities to utilize the web-based GIS tools.
4. Provide these forms of assistance without requiring each member entity to have sophisticated GIS software or high levels of knowledge about GIS.
5. Provide these forms of assistance to entities in more than one geographic region.

Other Goals and Expectations Going Into the Study

- This shared GIS Service would be made available to any interested rural community or utility in the State of Ohio.
- Expect larger Villages and small Cities (over 1,000 customers) would benefit more from GIS that smaller systems.
- Expect larger Villages and small Cities are willing to pay more on a per customer basis than smaller systems.
- Very small systems were included because a group of them in the same county participated in a joint Source Water Protection Plan, but otherwise we would not expect very small systems to desire GIS unless there are collaborations with other entities.
- Costs would basically be distributed among members based on the number of utility customers.

The Feasibility Study included:

- GIS Needs Assessment for Participating Utilities
- Finding out if anyone else is already doing this, and interview them
- Make Recommendations on Software/Hardware and Staffing Requirements
- Investigate possible organizational models
- Develop Implementation Plan and Cost Estimate
- Figure out how to pay for both start-up and continued operation, looking at both external funding sources and fee structures for members
- Create experimental web-based GIS
- Research potential funding sources for start-up
- Prepare final report

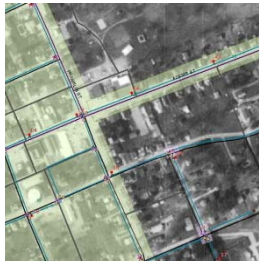
The 190 Page Final Report included:

- Detailed summary of recommendations.
- Detailed list of implementation and on-going operation costs, and the estimated cost savings to utilities
- Bid specifications or a list of qualifications if the service were to be bid out
- Plan of action and schedule to implement recommendations
- Challenges or impediments, including legal issues for implementation.
- Description of future activities or additional services that could be developed if the service is successfully created.

GIS Cooperative: Two Distinct Areas of Possible Service

Initial Data Collection

Centralized GIS Service to View, Query, Update, Share, Link and Save Data



Ohio University Report Conclusion about Feasibility:

- Yes, it is feasible.
- The technology is now readily available for a web-based service.
- It is feasible to implement without placing a high burden on users.
- There are many examples of multiple governments sharing services, and there are organizational models that can work.

- A big challenge will be the data collection, because there is so much to collect, and there needs to be a minimum number of communities with data collected and ready before a shared web-based service could be provided.

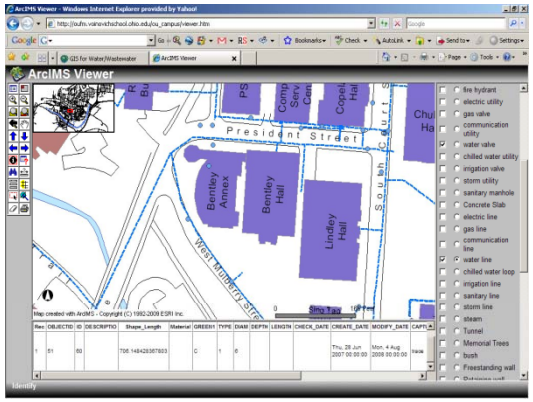
Ohio University Report Recommendations:

- Choose a Council of Governments (COG) as the organizational model. The COG will
  - Designate a fiscal agent
  - Designate an entity to manage the COG's activities and oversee its services
  - Subcontract with a private firm or university to provide the web based GIS Services.
- Target the Cooperative Size to be at least 100,000 combined utility connections.

- Implement the COG in four phases over a three year period
  - First two years for data collection – start before COG is established.
  - Recruit more members, and begin developing web-based service in 2nd year. Goal is 100K-125K combined connections.
  - Formally establish the COG in the second year and begin the web based service.
  - Phase 4 in the third year is first normal – no start up costs.

Findings: GIS Technology and Expertise Costs

- OU is basing cost estimates using ESRI products (ArcServer, ArcGIS, ArcPad).
- OU used data from Carrollton to alpha test an ArcServer program and estimate the amount of time needed to collect data.
- They ran tests using dial-up connections, which worked OK.
- They were able to develop detailed cost estimates for total hardware, software, and hosting.
- They obtained salary information based on their own experience and based on industry standards to estimate the costs of having GIS specialists on staff.



Findings: Carrollton's Data Collection for Alpha Testing

- Carrollton has approximately 1,600 customers (3,200 combined water and sewer accounts).
- Wanted accurate data (within 1-3 feet), but not survey-grade data.
- Purchased a Magellan Mobile Mapper CX with extra warranty and training. This unit gets sub-foot accuracy with post-processing. It came with ArcPad software.
- Carrollton's intern was able to complete the basic mapping using a GPS unit all above ground water and sewer infrastructure, and other drawings for underground infrastructure. She completed everything in 220 hours, including service shut-off valves. She did not pop manhole lids or enter all of the attribute data.
- Total cost for the GPS Unit plus the Intern was less than $14,000.

Carrollton and RCAP looked at GPS units from Magellan, Trimble and TopCon. For more information, see Sherry after the presentation!

Recommendation: Data Collection

- A great deal of discussion surrounded “How to collect the data”.
- An ‘army of interns’ was first considered. There are many issues with that model.
  - Recruiting time and costs
  - Training
  - Outfitting with equipment
  - Consistency in data collection/Quality Control
  - Lag times between semesters
- Ultimately, a combination of entry-level, full-time Mapping (GIS) Technicians with strategic placement of a few interns was selected to balance the cost.

A consultant (or university) would be hired to train and provide QA/QC for the work of these mapping technicians and interns.

Findings: Organizational Models

- OU did find GIS Co-ops and Councils of Governments (COG's).
- All of them were spearheaded and are operated by a larger entity such as a County or Regional Planning & Development Office that already had GIS expertise in-house.
- Other members contribute money to help pay for software and equipment.
- The lead agency maintains GIS data sets and provides maps to members on request. Some have set up on-line Viewers.
- However, none of these in 2009 offered a means for the member organizations to actively maintain the data in the GIS program.
- The larger entities running the program appear to be making the most use of and receiving the most benefit from the system.

Council's of Governments (COG's) are allowed by the Ohio Revised Code. Several other states have provisions that enable the creation of COG's for multiple governments, school districts and other public entities to jointly establish organizations to provide a service or directly serve the members.

Findings: Data Collection Costs

- Based on data collection accomplished in Carrollton on a per customer basis, rather than on a per point basis.
- Carrollton's intern was very efficient, and spent an average of 4.08 minutes per account (8.08 combined water and sewer) total, including all GPS use, post processing, and digitizing.
- Estimates the cost of data collection for 100,000 combined customers at $336,163 (or $3.36 per utility customer). The cost was revised to assume some grant funding, bringing this down to $2.54 per utility customer.

The intern in Carrollton did an experiment to see if it was more efficient to collect data for one utility at a time, or for both water and sewer at the same time as she went up and down the streets. She found that collecting everything at the same time, rather than retracing steps, was more efficient.

Findings: Start-Up Costs

- Total Year 2 cost is estimated at $253,245. This includes ¼ FTE of RCAP's time, legal services, an audit, a GIS Technician, and the host site operation costs.
- Phase 3, which spans Year 2 and Year 3, for the COG creation, totals $41,480. This includes RCAP's time, printing, postage, meeting expenses, legal costs and labor to establish accounting procedures.

Regardless of the organizational structure, by-laws have to be created, some type of agreement to join needs to be written, and the governing structure and oversight board have to be established.

Findings: Operating Costs

- Phase 4 (Year 3) – O&M for the GIS Data Host Site was estimated at $236,482 for 100,000 to 125,000 customers. At the upper end of that range, the cost would be $0.1577 cents per utility connection per month (if all were charged equally).

- The potential organizational costs for administering a COG and providing a GIS Technician in the field to revisit existing members adds $99,681, which would add another $0.0665 cents to each connection per month. *This did not fully account for fiscal agent costs.*

- **Total comes in under $0.25 per connection per month.**

Five out of eleven communities that responded to the financial part of the survey indicated they would pay in this range.

Findings: Total Costs and Possible Funding

- $819,946 for the three-year effort.
- $254,437 budgeted as grant or in-kind from RCAP/WSOS.
- That leaves 69% coming from members during that period. For 100,000 combined customers, this would average $5.66 per utility connection (this includes collecting the data, creating the COG, and almost two years of GIS Data Hosting).
- Potential grant sources include OWDA R&D fund, ARC, future RCDI, perhaps others.

Sherry's note: I was less worried about the total start-up costs, because I believed this project would be competitive for some grant funding. I was more worried about the on-going operation and maintenance costs that will be out of pocket.

Recommendations: Paying for it!

- Pool groups of communities together for certain grants, based on eligibility requirements. In most cases, these will require some sort of local match, such as ARC funding.
- Try to get grants that do not restrict eligibility based on income or location to pay for software, hardware, legal costs, and other consulting fees that would serve the entire organization. OWDA R&D for example.
- For individuals that want to move forward with data collection, but need assistance:
  - Consider rolling the cost into a larger project that is going to be funded by USDA, OEPA, or OWDA.
  - RCAP Safe Water Fund is a last resort (4% interest for 10 years)

A key finding of the study is that data collection needs to happen sooner than later. There is no point in having a shared GIS service is there is no data to host. Finding ways to fund this or convincing some to pay for it out of their O&M budgets is crucial.

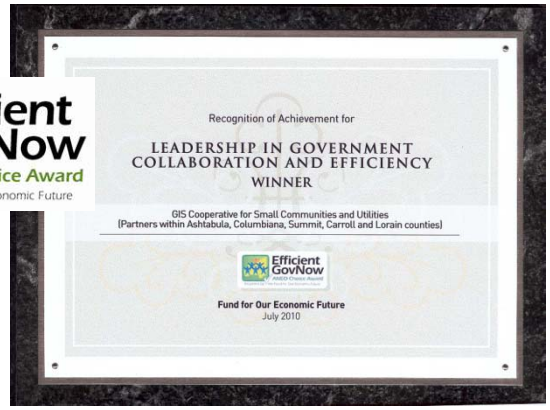
Areas of Concern Moving Forward:

- We have been cautious in estimating the amount of time for data collection, particularly rural water districts.
- Concerned that perhaps survey grade GPS units are warranted for at least portions of the data collection effort (manholes and individual service shut-off valves). Fortunately, GPS units are getting better and cheaper.
- Concerned about getting the right level of Quality Control/Oversight by a GIS Consultant to help us collect data.
- No fiscal agent costs are included in any of the budgets. Our guestimate is under $10,000 per year.
- Need to further investigate and confirm that a COG is the best organizational model.
- Local communities must be willing to invest time to help with data collection.
- Concerns about equity. How should municipalities be charged for managing other assets with the GIS Program that Rural Water and Sewer Districts would not have?

Our biggest challenge will be getting enough communities to make a firm commitment. Especially in these tough economic times, even if the utility or administrative staff want it, they have to get the support of their board or council.

We Are Moving Forward!

- RCAP was recently helped 6 communities in Northeast Ohio win a grant through the EfficientGovNow competition that will pay for almost half of their data collection costs.



- Another proposal to pay for half of the data collection in 12 other communities was submitted for ARC funding.
- We are now beginning to recruit others. Some have already partially collected data. Others are starting from scratch.
- Potentially communities that will not fit under these grant programs can use left over construction project funds if they have a major project going on that was funded through OEPA or USDA-RD.
- Try to group enough communities to comprise at least one year's worth of work and within a reasonable drive of each other to create an entry level GIS Mapping Tech position, otherwise interns will be used.

Creating the Shared Internet-Based GIS Service

- Currently assembling a Technical Advisory Committee – anyone want to join??
- We will prepare a ‘Request for Proposals’ before the end of the year to hire a consulting firm to develop and host the site, and provide some level of technical support.
- We are budgeting for a GIS Technician to provide direct support to members.
- We expect to formally create an organization to own and administer this shared GIS service early next year.
- We continue to seek grant funds.
- We are talking to RCAP’s in other states about participating in the program, or creating similar programs.

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Thoughts?
Questions?
Ideas?

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