Core Team

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Jennifer Wheeler, GIS Analyst, Arkansas GIS Office

Stakeholders

Arkansas Secretary of State
Arkansas GIS Office
Arkansas Cities and Counties
Arkansas Voters
Arkansas Citizens

NSGIC's Geo-Enabled Elections Project
NSGIC partnered with states and subject matter experts to develop Best Practices for integrating GIS in electoral systems.
This pilot study helps inform the Best Practices.
Learn more on **elections.nsgic.org.**

PROJECT BACKGROUND

Thanks to the involvement of the Arkansas Secretary of State Elections Division, The Arkansas GIS Office, and our state's GIS vendors, many counties in Arkansas are well-positioned to support geo-enabled elections and, in many cases, are already doing so. Additionally, framework GIS data such as addresses, roads, and election boundaries have been created and maintained at the state level, further supporting a geo-enabled elections environment.

Unfortunately, not all counties have the resources or capabilities to realize the benefits of GIS in elections management fully. Compounding these difficulties, for those counties who do, there may not be full integration of GIS resources into the election administration workflow managed within the state's central system provided by Elections Systems & Software (ES&S). With these understandings, our desired outcomes for this project have been threefold.

Firstly, we employed some of the best practices identified in Phase I of the Geo-Enabled Elections project to clean and standardize voter data in Cross, Fulton, and Grant counties. Doing this helped us perform a spatial data audit of precinct assignments in those counties.

Secondly, after the spatial data audit was completed in Fulton county, we created precinct splits where none had been mapped. This exercise allowed us to examine the process and challenges of mapping splits should this become a state-level goal.

Finally, we researched the technical requirements for utilizing the GeoElections function in ES&S' platform with the idea of testing it in one of the three counties.

As a final point, it is essential to note that we selected the three counties as a matter of insight of how these activities are performed when supported by GIS vendors, or no vendor or in-house GIS support.

Champions

Shantell McGraw, Elections Coordinator, Arkansas Secretary of State
Raynetta Hansberry, Elections Coordinator, Arkansas Secretary of State
Kayla Sansom, Elections Coordinator, Arkansas Secretary of State
Teresa Horton, Faulkner County Elections Commission
Matt Charton, Director of Geospatial Services, DataScout
James Hartshorn, Vice President, Eagle Forestry Services, Inc.

Pilot Project Goals and Key Outcomes

1. Clean and standardize voter data in three counties.
We gave special attention to address structure and content so that voters' locations can be more easily geocoded and reviewed. We found that all three counties had relatively few issues with the formatting of addresses in their voter data if taken alone. All three counties were inputting the addresses in the correct fields and in a manner consistent with other voter addresses in the county. This is not the case in some counties where addresses were input in the wrong fields or where there was little syntax standardization. The issues we did face were related to the geocoding of those addresses where the geocoding data (streets and address points) could not easily be related to the voter addresses. For the most part, this is because the original creators of the address and street data, and processes completed to aggregate the data, often use differing naming conventions and city and zip code attribution based on United States Postal Service (USPS) files. A typical example is a road or address point with the name of County Road xxx, while the voter address is CR xxx.

2. Perform a spatial data audit.
Using a more accurate geocode of the voters, we reviewed election geography assignments in the three counties. We used GIS to create reports with a mismatch between the names of the election geographies on the map compared to the election geography names in the voter list. The three counties reviewed all their relevant geographies, such as Election Precincts, School Districts, State Senate and House Districts, Justice of the Peace Districts, and Congressional Districts.

The initial reports for all three counties contained numerous "false positives" due to the geocoding issues previously mentioned. In many cases, these false positives were easy to spot when symbolized on the map overlayed with streets. Two of the three counties completed the audit in full. One county was relatively well-staffed, has a GIS vendor, and began this project having already done its review. The other county, which does not have a GIS vendor but has a relatively small number of registered voters, reviewed all the reports, and made corrections where necessary. A Core Team Member from this pilot project, primarily assisted with this. In this case, all the "false positives" were removed from the reports before being delivered, which significantly reduced the number of records to be reviewed by the election official. One county was unable to complete the review. While they have a GIS vendor, their other elections duties and possible lack of internal resources likely kept them from completing the review. Consequently, it appears there are some remaining errors in their election precinct assignments, which are used for reporting purposes. Despite this, it does appear this county reviewed and made corrections in their more consequential election geographies that inform which ballot a voter receives.

3. Map precinct splits in Fulton County.
While precincts for each county are mapped statewide, precinct splits (parts) are not. This exercise helped us to learn more about the difficulties of mapping precinct splits at the state level. The critical insight gained from this work was the need for topology between election geographies. In most cases, there is not a perfect alignment between these geographies as topology was not enforced during the last redistricting. This lack of topology created slivers in the automation process. Unless there is a statewide effort to develop and maintain topology between participating geographies, a statewide effort to programmatically create precinct splits will require significant manual intervention.

4. Learn more about ES&S' GIS Interface and determine if it can be implemented in one of the counties as a test case.
Although we did not enter a formal process of inquiry with ES&S, we were able to obtain the technical specification for their GIS interface. We were also able to glean insights from others who either have implemented the interface or are working to do so. After our initial research, we opted to forgo the implementation of the GIS interface for several reasons. The most considerable constraint was the lack of on-hand resources and time. Related to this was the knowledge that the interface relies less on a GIS in preference for maintaining a street file as that would continue to be the mechanism for which precinct voters would be assigned. The interface provides an automated way to identify and then manually correct flat street files and is less reliant on GIS than previously understood.

Barriers

2020 has been a year of obstacles. The pandemic made it challenging to conduct the project in the manner we would have liked. We would have enjoyed on-site visits with face-to-face conversations to exchange ideas and learn together. Further adding difficulties was the tremendous amount of pressure felt by election administrators to ensure the elections were free from interference and conducted to allow for an increase of mail-in ballots and overall voter turnout. This was also the first election where new voting machines and electronic ballot books were used in many cases. Simply put, there was a lot going on, and maintaining focus for this project was challenging. Despite that, several barriers can be discussed.

Geocoding: As discussed above, formulating a geocoding approach that can be used statewide or county-wide has been a barrier. This appears to be a barrier regardless of a county's access to resources and expertise. If the address point and road data creators are not using the same approach to input addresses as county clerks, then geocoding is likely to contain errors, sometimes in significant numbers. The answer to this barrier may be found in a more robust geocoding process or the enforcement of standardization of addresses between all government levels. In Arkansas, this may call for clerks to adopt the same syntax and content for address data entry that most closely resembles the addresses assigned by the 911 Address Authority.

Election geography accuracy: In some cases, when reviewing precinct assignments, the misalignment of election geographies and inaccurate depiction of those boundaries became a barrier when doing the spatial data audit. Like the geocoding barriers, ensuring that the election geographies are aligned and are correctly represented before a review of precinct assignments would have given reviewers more time to identify and reconcile issues within the voter registration systems.

Lessons Learned and Key Takeaways

After careful research, we determined the statewide voter registration system has functional barriers in its architecture that prevent the platform from taking direct advantage of geospatial data. While the product can perform an import and export of voter data for address matching and geocoding, those functions are performed with third-party software outside of the core system. Once address matching and geocoding are completed, that data is fed back into the system in a tabular structure. The system cannot visualize the voter location through a map interface to allow election administrators to directly make record-level changes informed by various election districts' spatial data. The system does not have direct spatial data integration, which was a surprising revelation given that voter assignment and elections are necessarily a map-driven process. Instead, local staff must rely on maps outside the system to identify the correct streets or roads ranges for record-level changes.

2. Without legislation geared towards standardizing addresses and an advanced approach to geocoding, fully geo-enabling elections may be difficult or impossible at the state level. Although Arkansas benefits from statewide GIS datasets and legislation that requires civic boundary changes to be coordinated through the Arkansas GIS Office, gaps remain in the geocoding of non-standardized addresses. These gaps can lead to many voters falsely appearing to be assigned to the wrong district due to errors in the geocode. In one case, nearly fourteen percent of voters appeared in error, when after reconciling the geocoding errors, the actual percentage was closer to five percent.

3. All three counties enthusiastically agreed to participate in this project. Their commitment to reviewing voter district assignments was refreshing, given all the other duties for which their offices are responsible. Given the 2020 Election and the difficulties of working during a global pandemic, the likelihood other counties would embrace geo-enabled elections seems high. To this point, although Arkansas's participation in the project included a high-level team of specialists, a geo-enabling elections project would be more successful if each county also convened its own team of specialists.

Unrealized Benefits

At the state level, both GIS and Secretary of State Election Administration staff were brought closer together, developed a more in-depth understanding of each discipline, and overall good rapport. This project also supported an environment where GIS staff could learn more about election management, increasing respect for election administrators. Further, this work also helped to identify issues in the mapping of precincts in one county. A continued commitment to maintaining these relationships will be invaluable for both GIS and election administrators.

Next Steps

As Next Generation 911 (NG9-1-1) and redistricting come closer into view, election administrators may have better tools at their disposal to more easily support geo-enabled elections.

NG9-1-1 necessarily requires address standardization in address point and road data across all jurisdictions. As we get closer to a statewide standardized addressing environment, county clerks may be more likely to mirror those address input standards in their systems, making it easier and quicker to determine and review precinct assignments.

Redistricting will allow us at the state and local levels to ensure that all election boundaries are drawn in a more considered fashion than was previously conducted. In past redistricting efforts, boundaries were often drawn without knowing how nested boundaries were represented in a GIS. Redistricting could also support more robust enforcement of topology, ensuring boundaries free of gaps and overlaps.

Created: November 2020

EXPLORATION **IMPLEMENTATION** OPERATION

Core Team

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Stakeholders

Michigan Department of State
Bureau of Elections
Center for Shared Solutions
People and Voters of Michigan
People and Voters of the United States

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PROJECT BACKGROUND

The Michigan Bureau of Elections (BOE) staff update addresses, including district information, on a daily basis using a tabular system which is a laborious and time-consuming process. While we recently modernized the Qualified Voter File (QVF) voter registration system to a web-based application, it was built as a tabular system; however, it does include the flexibility to accommodate a spatial environment as we anticipated making a change.

In light of the new QVF and the need to streamline and modernize the street index portion of the system, BOE staff agreed that now is the time to incorporate spatial data and processes into the QVF. We determined that it was necessary to begin this process by showing proof of concept to demonstrate that a spatial system populated with data was an acceptable solution to streamline and modernize these processes.

BOE piloted a data exchange and comparison with Ottawa County in 2019 to explore GIS concepts such as geocoding using different types of address standardization tools and assigning districts through a point-in-polygon process. With guidance from the Michigan Center for Shared Solutions (CSS), we evaluated the quality of geocoded address points and district data in QVF compared to Ottawa County GIS Department's data.

Building on the success of the Ottawa County pilot, BOE intends to partner with Michigan Center for Shared Solutions (CSS) utilizing the Michigan Framework (MGF) as the cornerstone of the QVF Spatial Project. MGF is both a product and a program. As a product it serves as a digital base map for state government agencies seeking GIS solutions for their business needs. As a program it is a multi-departmental, multi-jurisdictional effort to pool resources to maintain accurate spatial data and consolidate efforts once duplicated across agencies. The MGF fosters partnerships and communication across various levels of government. The MGF will allow us to effectively work with regional, county, and local levels of government to collect spatial data for election administration purposes.

The core team of this Geo-Enabled Elections Michigan Pilot Project intends to make progress toward statewide implementation and testing of a spatial system that works in conjunction with the QVF by fall of 2021.

Champions

Johnathan Brater, Elections Director, Bureau of Elections, Michigan Department of State
Theresa Williams, Program Development Manager, Bureau of Elections
Mark Holmes, Geospatial Services Manager, Center for Shared Solutions, Michigan Department of Technology, Management and Budget

Pilot Project Goals and Key Outcomes

Our list of initial, specific project goals can be found here. We made some progress on the following goals.

1. Supplement county and local address points with geocoded qualified voter file (QVF) voter addresses. Geocoded points will account for existing voter addresses that could not immediately be equated with a verified county or local address point. Geocoded address points will ultimately be verified and assigned accurate location values. With the help of our partners at CSS, over 3 million unique addresses were cleansed and standardized using SAP and 97% of those were geocoded. After equating QVF addresses to addresses verified by local and county authorities, the remaining addresses can supplement an address repository for those counties where no addresses or data points have been shared with the State.

2. Equate QVF addresses to verified address points in the repository. Most residential QVF addresses should correspond to a single county or local address point. Granulated county and local data, such as mobile home communities or apartment complexes may result in a single QVF address corresponding to multiple county or local points. With the addresses from QVF geocoded, we intend to use SAP to standardize addresses verified by local and county authorities where available to equate those addresses to the addresses from QVF and begin implementing a GIUD system of identifying address locations universally.

We did not make progress on this goal during our six-month pilot project.

3. Establish a placeholder point for QVF voter addresses that cannot be geocoded. Placeholder points represent unverified voter addresses. 3% of the QVF addresses for existing voter registrations could not be geocoded. Manual research will be required to verify, geocode, and ultimately equate these addresses to valid county or local address points in the repository. Until the manual research can be completed, placeholder points retain existing QVF election geography.

Barriers

Once our team and partners in the State (Department of Technology Management & Budget and the Center for Shared Solutions) were in agreement about the best way to share and format over 3 million addresses from QVF, we experienced delays for approval to access servers and that process was further slowed by the competition for our time and resources leading up to the August Presidential Primary.

The time and energy we were able to devote to this pilot project only decreased from there as the priorities for every member of the project's core team shifted to helping administer elections and support election officials for the August Primary and November 3rd Presidential Elections.

The state-wide scope of this pilot project was also a large undertaking and contributed to the difficulty we faced moving the project along as a whole, especially considering the competing priorities of our regular elections work.

We also recognize that the data we began this project with is already 6 months old. The dynamic nature of our QVF database is both an excellent example of why we need a GIS based alternative to our tabular address system and why delays in the project degrade the data and compound our project challenges.

Lessons Learned and Key Takeaways

Our partnership and communication with GIS specialists in our state, as well as with our pilot project mentor, Sarah Whitt, has been invaluable. As a team tasked with assisting election administration in Michigan, it is clear that this has been an interagency project, and we are grateful for the experience and coordination that partnering early on with GIS specialists has afforded us in this endeavor.

Now that we have reached a milestone in our project of geocoding the QVF addresses, there comes the task of assigning coordinates for addresses that could not be handled by the automated process and correcting coordinates that are not precise enough where voting

boundaries are concerned. Not only do we need to do this for the fallout from the one-time batch process of geocoding, but we also need to develop standards, methods, and a mechanism for committing those manual adjustments in the future. This next step feels fairly urgent considering how the quality of our data degrades over time as homes are built and as annexations and readdressing occurs. Again it is clear how beneficial and necessary trusted partnerships are with GIS specialists and other state agencies. As election specialists, we began the pilot project with NSGIC because we saw the need and the "why" for geo-enabled elections, and we clearly need to partner with GIS specialists for the "how" such as developing the tools and workflows for data correction and long-term maintenance.

As for long term maintenance, a key point was made in our discussions as we reflected on the progress with this project and what our next steps should be. While we must make tough decisions now to prioritize the review and adjustment of coordinates for geocoded points where necessary, the location of a point that may not seem consequential at present, could very well become much more relevant sooner or later as boundaries change.

Another key resource we need once we begin to review geocoded points and adjust coordinates where necessary are contextual GIS layers to assist us with the correct placement of the address points. Again, something we've long planned on, which now feels more urgent, is the ability to visualize our geocoded points overlayed with parcel boundaries, aerial imagery, and even building footprints.

Unrealized Benefits

Our venture into geo-enabling elections began by geocoding the voter registration addresses within our registration database, the Qualified Voter File (QVF). Though this task was just one step in a much larger process, we have had discussions with our GIS partners at the State about the impact this data could have in other areas outside of our purposes for elections.

One such benefit would be to aid addressing services like 911 in counties or regions where address points are lacking. Additionally, while we anticipated some accomplishments in this project benefiting the redistricting process, another possible project spawned from our efforts has been a district mapping tool which could aid election officials in redrawing boundaries, like precincts and county commissioner districts, for which they are responsible.

Next Steps

We are excited to re-invigorate the project now that we anticipate having more time to devote to it. We feel really good about the work that has been done, the collaboration with key partners, and the progress that has been made.

Next, we plan to revisit our original three goals for this 6-month pilot, apply the lessons learned and come to a consensus on how best to continue this work and identify which tasks should come next. One such point to discuss moving forward will include how to manage the address changes to QVF that have occurred since we exported addresses for geocoding six months ago and bring that data into our existing process, mapping out what address maintenance may look like moving forward.

We'd like to continue the work we've started on this pilot project with the support of NSGIC and advisors to pursue geo-enabled elections in Michigan.

Created: November 2020

EXPLORATION **IMPLEMENTATION** OPERATION

Core Team

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Emily Ruetz, GIS Specialist, MnGeo

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Stakeholders

County and Local Election Officials
Office of Secretary of State
Voting Public
Media
Political Campaigns
Civic Democracy Non-Profits
Academia

Champions

Dan Ross, GIO for MN and CBTO, MnGeo
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PROJECT BACKGROUND

In 2019, the Office of the Minnesota Secretary of State and the Minnesota Geospatial office partnered for the initial Geo-Enabled Elections pilot program. The focus of that project was on geocoding voter addresses, locating them within GIS precinct data, and comparing that with the precinct for the address in the statewide voter registration database. This proposal is for Phase II where we will go through the process of creating a layer of polling places as a foundational spatial dataset for Minnesota's elections, as well as continuing some of the work from Phase I.

This pilot builds on the previous phase, as well as existing data and processes to improve Minnesota election administration using geospatial technology.

Existing data includes:

- OSS maintains precinct data in geospatial format and distributes it on the Geospatial Commons (https://gisdata.mn.gov/dataset/bdry-votingdistricts).
  - Congressional
  - MN Senate
  - MN House
  - County Commissioner
  - Soil & Water Conservation
  - Hospital
  - City Wards
- OSS also administers the Statewide Voter Registration System (SVRS) database which contains spatially enabled information in the form of addresses (voter addresses, polling places) and address ranges (used for matching voters to correct precinct/districts). This data is updated by county elections officials.
- MnGeo has geospatial data including addresses in Minnesota, parcel and address point data for most of the state, and road centerlines with address ranges.
- Additional governmental geospatial data that could also be relevant include:
  - School district boundary data from Minnesota Department of Education (MDE)
  - Municipal boundary data from MNDOT
  - 2012 congressional and legislative boundaries from Legislative Coordinating Commission (LCC)

Pilot Project Goals and Key Outcomes

Polling locations are a foundational data set for elections. Although Minnesota has a database of polling locations, there was not a spatial dataset for this information. For this pilot project, the main goal was to take the current polling location database and geocode them. To support that effort and ensure quality data, MnGeo created a quality assurance (QA) process which was used on the initial dataset and will be used for future geocoding. To plan for future publication on the Minnesota GeoCommons, MnGeo created metadata formatted for the Commons.

Here is our list of specific project goals.
• Geocode and create a geospatial data layer representing over 4000 polling place locations.

• Create a QA process for polling place data.

• Create metadata for this layer.

• Ascertain the potential to share this data from the GeoCommons.

• Enlist pilot counties to QA the polling place results as they have the most knowledge of those sites.

• Define the process for updating layers considering polling locations can sometimes change due to an emergency.

Barriers

MnGeo has the great fortune to have talented staff members. In the middle of our project, our GIS Specialist, who started the project, left for a new opportunity. We had a seamless transition to another GIS specialist. So even though this was a potential barrier, we were able to move forward with our work.

Lessons Learned and Key Takeaways

We have identified our lessons learned and key takeaways for this project as follows:
• The majority of polling places seemed to geocode well using the NG911 data. The hit rate was very high, approximately 95%, so that gave us confidence in the geocoded data.

• Validated spatial data would be useful! During this year's election, some voters did complain about the location provided by map services to certain polling places.

• The way polling place updates are handled in the voter registration system should be improved to more easily identify when polling places are changed.

Unrealized Benefits

MnGeo is the curator of the Next Generation 911 (NG9-1-1) data. This pilot project allowed MnGeo the opportunity to update the statewide geocoder with NG9-1-1 information and test the difference in the accuracy of the new data compared to the old geocoder that was using other centerline and address information.

With the very busy election season this year, the OSS was unable to work with counties to do quality checks on the geocoded locations of the polling place data. However, OSS did identify a few address errors in the addresses that didn't geocode, and the counties corrected the addresses.

Next Steps

We will continue our work toward completing tasks that we did not yet complete. We will discuss if we want to have this data on the GeoCommons as is or do additional updates need to be made.

Now that the 2020 election season is over, it may be possible to engage with more counties to see how this data, the polling place locations, might be useful to them.

In our third pilot with the NSGIC Geo-Enabled Elections, we will advance in our pod designation to operational – meaning – GIS has been integrated in our elections. We will continue to do this work, focus on things left unfinished, and identify processes linked to data modifications, working with counties to do this.

Created: November 2020

Core Team

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Stakeholders

Montana Secretary of State
Montana State Library
Montana Clerk & Recorders
Montana 9-1-1 Advisory Council
Montana SITSD: Public Safety Communications Bureau
Montana Department of Commerce
Montana Department of Revenue
Montana Legislative Services Division
Montana Election Administrators
Montana Land Information Advisory Council
Montana Association of Geographic Information Professionals

Champions

Jennie Stapp, State Librarian & Chair of the Montana Land Information Advisory Council, Montana State Library
Dana Corson, State Elections Director, Montana Secretary of State

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PROJECT BACKGROUND

The Montana Secretary of State's Office and the Montana State Library have been working together for the past year to coordinate and explore a partnership for implementing GIS into existing elections processes.

The Secretary of State's office has been working to implement a new election management system (EMS), which includes a GIS and mapping component. The SOS's goal is to utilize the GIS components to better calculate and pinpoint a voter's address along with the appropriate assigning of districts and splits for elections. This will assist with upholding the integrity of Montana elections.

The State of Montana is in a good position to implement GIS into the elections process because of the Montana Spatial Data Infrastructure (MSDI). The Montana Land Information Act established the MSDI; it is composed of 15 critical base geographic data layers deemed essential for Montana to govern, do business, and operate.

The Montana State Library has identified similarities in both the geo-enabled elections and Next Generation 9-1-1 (NG9-1-1) implementation initiatives. Through this pilot project, the team will work to identify these commonalities and opportunities for collaboration.

Pilot Project Goals and Key Outcomes

Our list of initial, specific project goals can be found here. We made major progress on the following goals.

1. Develop the Montana Geo-Enabled Elections Outreach Task Force.
We have the key players from the Secretary of State's Office, Montana State Library, and two counties. The two counties were also awarded FY2021 Montana Land Information Association grants for geo-enabling elections. The task force has agreed to meet monthly until the BPro implementation goes live in January 2022. We will work to inform newly elected officials in 2021.

2. Create an inventory of existing state and local statutes and administrative rules relating to election boundaries.
An inventory was created for data layers and the associated state statute and administrative rules.

3. Further explore the GIS and mapping capabilities of the state's election management system.
We have created multiple FME translators to convert MSDI data into the BPro format. Further exploration is needed on this integration.

4. Develop a list of all election districts based on geography in the state of Montana, including their corresponding statewide GIS data availability status.
We created a list and inventory of data layers needed for geo-enabling elections. We have integrated geo-enabled elections into our Montana Land Information Plan. We will continue to work with local governments to see what local datasets are mapped and use the datasets to identify disparities between the counties.

We made some progress on the following goal.

5. Research and document the existing practices of rolling-up local geo-enabled elections related geographic datasets to the state.
We have the existing NG9-1-1 and Geo-Enabled Elections project best practices to start from; however, more work is needed in this area. We are working with two counties as a part of the Montana Land Information Act Grant Program. Contracts are in place for the 2021 fiscal year. We will have even more to report at the completion of their projects.

Barriers

There have been several barriers to this pilot project. COVID-19 has slowed efforts and caused a redirect of state GIS resources to pandemic response. Through this project, we have identified the amount of work that is needed to create and maintain a statewide election boundary data. We have identified a need for additional resources to better support these data collection efforts.

Lessons Learned and Key Takeaways

Implementing GIS in the Montana elections process is a coordinated effort across state, tribal, and local government. Success depends upon buy-in and partnership from both leadership and elections and GIS practitioners. Through the existing partnerships used to develop the Montana Spatial Data Infrastructure (MSDI), the Montana State Library had a framework to build upon for the geo-enabled elections initiative.

In Montana, both state and local governments are preparing for the implementation of NG9-1-1. There is a natural synergy between geo-enabled elections and NG9-1-1; they both require address information. Through this pilot project, we wanted to explore and compare the similarities between NG9-1-1 and geo-enabled elections. Duplicative data efforts would set us back. We want both processes to inform each other and have one standardized dataset. Through the Montana Land Information Act Grant Program, we have created several internal pilot projects to explore these two geospatial initiatives.

Unrealized Benefits

Through this project we were able to identify and create an accurate inventory of what was needed. Through this inventory, we now have a better understanding of what data development needs to take place in order to be successful at integrating GIS into the elections process. We know that we need to prioritize the collection of precinct boundary data.

Overall, the Montana State Library has seen a positive response to our geo-enabled elections

coordination and a desire to continue exploring the NSGIC Geo-Enabled Elections Best Practices. We are excited to be a part of this opportunity!

Next Steps

Montana will continue our coordination and collaboration between state, tribal, and local. We will work with our partners to explore aligning NG9-1-1 and the NSGIC Geo-Enabled Elections Best Practices. We will work to complete statewide precinct boundary datasets and hope to adopt these layers as official MSDI layers.

Created: November 2020

Core Team

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David Mather, GIS Data Administrator, Oregon Geospatial Enterprise Office

Nicholas Kramer, Voting System Analyst, Oregon Secretary of State

Stakeholders

Oregon Secretary of State (SOS)
Oregon Geospatial Enterprise Office (GEO)
Oregon Department of Revenue (DOR)

Champions

Cy Smith, Geospatial Program Coordinator, Oregon Geospatial Enterprise Office
Steve Trout, Election Director, Oregon Secretary of State

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PROJECT BACKGROUND

State of Oregon with project concentrating in the following counties: Hood River County, Washington County, and Lane County

The project started with a simple question. How can we use GIS to determine if a voter is receiving the correct ballot? More importantly, what data can be used to validate the election districts that determine the ballot style for each voter?

Oregon is a vote by mail state. Precincts, although not arbitrary, are further divided into precinct splits. These precinct splits are the unique aggregation of election districts within which each voter address is located. This resulting unique configuration, identified by a 'split ID', is not determined from some kind of spatial district polygon intersection, but rather from the combination of districts in the master street address database, where districts are defined by their associated street ranges.

With a lack of GIS data representing election districts, we looked towards the Oregon Department of Revenue (DOR) and their taxing districts to validate ballot configurations. The assumption was that taxing districts, which are also election districts in most cases, may be more accurate due to additional scrutiny placed on fiscal data (people are more likely to notice errors regarding where they are sending money versus who is on their ballot). DOR recently mapped out 15 taxing districts statewide based on parcel-level tax codes. This data served as the comparative element for answering the question: Are you voting in the same combination of districts where you are paying taxes?

The initial challenges of this project were mainly related to creating a shared understanding of the project goals and election specific terminology, as well as establishing lines of communication between agencies. Other challenges appeared as the project progressed, mainly relating to data quality.

Designing a workflow was relatively straightforward: geocode a registered voter address, determine the intersecting taxing district and see if it's the same as the election district that shows up on their ballot. We quickly realized that this process introduces several avenues for error. For example, the geocoded address location may be incorrect, the election and taxing district names may be slightly different, but refer to the same thing, or in some cases, the districts may have changed or been merged, which may not be reflected yet in both data sources.

Overall, we were able to accomplish our goal of designing a workflow, consisting of both automated and manual steps, that would allow us to find all the records where the election and taxing districts are indeed in disagreement, omitting conflicts with any obvious data quality errors.

Surprisingly (but reassuringly), by checking every address in our three pilot counties, we only identified a dozen or so locations where we believe either the election or taxing district is incorrect. We will use these findings to follow up with the county clerks in our pilot counties to determine the root cause of the errors.

The same process can be applied Statewide and we believe it can quickly identify and resolve problems that relate not only to election district assignments, but also taxing districts and address data that fuels the Oregon geocoder.

Pilot Project Goals and Key Outcomes

1. Establish primary points of contact within the Oregon Secretary of State and Oregon Department of Revenue.
• We identified Thomas York at the Oregon Department of Revenue as our primary point of contact for taxing districts.

• We identified Nicholas Kramer at the Oregon Secretary of State as our primary point of contact for voter data.

2. Extract registered voter locations from Oregon Centralized Voter Registration (OCVR) database, with a unique identifier for the associated split ID.
We received an export from the Secretary of State that contained registered voter addresses and a column with a split-ID that could be joined with a split table.

3. Extract split precinct data from the OCVR database, containing every district associated with a unique split ID.
We received an export from the Secretary of State of all split ID's by county with associated district types and names.

4. Geocode every registered voter address using Oregon's statewide geocoder and document the results.
Registered voter addresses were assigned matching coordinates by geocoding each address through Oregon's statewide geocoder.

5. Intersect address points with taxing districts and identify addresses where voting districts and taxing districts are in disagreement.
Geocoded voter addresses were spatially joined with taxing districts. Addresses that had non-matching taxing and voter districts were flagged for further inspection.

We made some progress on the following goals.

6. Manually inspect conflicting districts and attempt to determine the root cause.
A preliminary manual inspection was done to identify the underlying issue. In some cases, the issue was related to inaccurate geocoding. Addresses that were geocoded correctly, but still had conflicting taxing and voter districts were flagged for additional follow-up.

7. Document a repeatable process for future automation of workflow.
The initial phase of this project can be automated since we documented the necessary input data, geocoding methodologies, and spatial queries. The process of identifying conflicts and follow-up is a manual process that cannot be automated.

8. Identify conflicts in district naming between Secretary of State and Oregon Department of Revenue.
District names can have subtle differences between the Secretary of State and Oregon Department of Revenue data. In some cases, districts have been consolidated or changed, causing discrepancies between the two data sources.

We identified these goals initially for the project; however, we did not make progress on them during our six-month pilot project.
• Investigate discrepancies or problem addresses with Oregon Department of Revenue and county clerks for each pilot county.

• Use registered voter address data to QA/QC quality and completeness of underlying address data powering Oregon's composite geocoder.

• Replicate workflow to QA/QC data for every county in Oregon.

Barriers

The biggest barrier in this project is in being able to identify where errors originate from.

Our process can identify instances where a voter address is in a different taxing district than what shows up on their ballot. However, this does not imply where the discrepancy begins.

This only tells us that one of the following scenarios may
be present:

• The original registered voter address is improperly formatted;

• The geocoded location of the address is incorrect;

• The address is assigned the incorrect voting district;

• The address is assigned the incorrect taxing district; or,

• There may be a problem with the underlying data or process.

Because there are many possible errors to investigate, it's important to manually inspect the conflicts and work closely with the Department of Revenue, the Secretary of State, and county clerks to research these issues.

Lessons Learned and Key Takeaways

There are often overlooked learning curves with projects that involve multiple entities, datasets, and unique terminology. It's important to spend the time up front to establish points of contact, document knowledge of key concepts, and develop a common dictionary of project terminology.

The success of this process long term relies on effective relationships and lines of communication between participating state agencies and local governments.

When dealing with multiple datasets, processes, and individuals, it's important to realize that data conflicts can originate from a variety of sources.

One key takeaway from this project is that we identified very few instances where we believe errors between voter data and taxing districts exist. This illustrates the effective work being done at the local county clerk offices, the Secretary of State, and the Department of Revenue.

Unrealized Benefits

An unexpected benefit of this project is that the same process we used to identify anomalies between individuals in voting and tax districts can be used to improve the quality of all the input datasets.

For example, registered voter data can be used to test the effectiveness and improve the quality of the Oregon composite geocoder. Also, GIS can be used to more easily identify potential errors in the Oregon Centralized Voter Registration (OCVR) data, as well as errors in the Oregon taxing district data from the Department of Revenue.

Next Steps

The first part of this project focused on developing the necessary lines of communication, identifying datasets to begin our analysis, and establishing an effective process to find conflicts between registered voter data and their associated taxing districts. We have identified a dozen conflicts that need further investigation to determine the root cause. The next step would be to identify the underlying issues and work to resolve the conflicts. The same process should be used to QA/QC registered voter data in all Oregon counties, not just the three pilot ones.

It would be worth considering a part two of this project. Since our first phase took place during elections, the communication process and data transfer took longer than anticipated.

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Core Team

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NSGIC's Geo-Enabled Elections Project
NSGIC partnered with states and subject matter experts to develop Best Practices for integrating GIS in electoral systems. This pilot study helps inform the Best Practices. Learn more on **elections.nsgic.org.**

PROJECT BACKGROUND

Shasta County, California has used this project as an opportunity to enhance the integrity and efficiency of election administration using geographic information systems (GIS) to significantly expand the practices, data accuracy, and relationships currently in place.

To the extent possible, this has included annual processes of:

- Address verification and updates between Shasta County departments and the three incorporated cities;
- Attribute and spatial verification of voter addresses;
- Precinct layer verification and updates as needed; and
- Confirmation that the voter's geocoded and manually assigned precincts match.

Stakeholders

Paul Hellman, Shasta County California, Director of Resource Management
Leslie Morgan, Shasta County California, Assessor Recorder
John Ducket, City of Shasta Lake, City Manager
Barry Tippin, City of Redding, City Manager
Jeff Kiser, City of Anderson, City Manager
Shasta County Voters
California Voters

Champions

Cathy Darling Allen, Shasta County California Registrar of Voters (ROV)
Matthew Pontes, Shasta County California CEO
Tom Schreiber, Shasta County California CIO
Neal Kelley, Orange County California Registrar of Voters
Jana Lean, State of California Office of the Secretary of State, Director of Elections

Pilot Project Goals and Key Outcomes

Our list of specific project goals can be found below.

1. Review precinct layers for accuracy and correctness using local tax rate areas data, verifying that all recent annexations and modification have been added to the layers.

2. Geocode voters and compare to the most updated precinct layer. For voter registration records with address ranges additional troubleshooting will be required.

3. Examine and analyze errors and omissions - determining if GIS layer analysis results or voter database information is correct and making the appropriate corrections as needed.

4. Audit the Incumbent File data (list of elected officials in the county currently in office) against the new verified data set.

Barriers

One of the most significant challenges came to light relatively late in the pilot. After six months we realized that the Elections and IT-GIS departments within the county were maintaining and updating separate shape files or data layers. Once we realized we were not working with the same base data, things progressed more smoothly and clearly.

Lessons Learned and Key Takeaways

This is the first time that a spatial review process has been undertaken for the Shasta County voter file. This review showed that there is measurable value when spatially assigned attributes, such as the voter's assigned precinct, is verified using spatial analysis.

Making this happen required collaboration between the Elections Department, the IT-GIS staff, and staff from other county departments. An in-house built address locator was used that included verified address points, local road centerline address ranges, and county assessment record addresses for consistent assignment of the geographical location for each voter address. The need for accurate precinct and portions areas, updated for each change in local Tax Rate Assessment (TRA) boundaries, is significantly dependent on the accuracy and accessibility of supporting GIS data layers. For this project, an updated TRA table was spatially joined to the county parcel layer which was then used to update critical GIS layers like school, water, and other municipal boundaries. These updated layers, along with refreshed data from other sources, were then used to validate and adjust election precinct and portion layers as needed.

Using the capabilities of the GIS to geocode or find the physical location of each voter residence and create a VoterFilePoints layer that shows the voters address location along with reviewing existing boundary files helped improve the counties' electoral processes by not only enhancing accuracy but by providing additional visual resources that enable opportunities to provide enhanced public information, education, and outreach.

Unrealized Benefits

There has been an ongoing address assessment and verification project within the county department that assigns addresses and other county departments that use physical address information to provide services, assess values, and collect revenue. This election-focused project brought additional visibility to, and highlighted the value in, completing the address assessment project.

This project also highlighted the need for ongoing collaboration between departments to assure that common spatial data being used is accurate, current, and sourced from one understood and documented location. At the beginning of the project it was discovered that there were multiple common data layers that were sourced from two different locations and versions.

The project has emphasized the importance and urgency of replacing the current file-based voter information system with a spatial system – one that contains spatial voter locations and boundaries. A spatial system for election data verification and analysis.

From the elections department perspective, this project provided a framework and accountability

that was missing from a previously friendly, encouraging, and helpful relationship with GIS staff.

Next Steps

Shasta County will continue to participate in the project as the 2021 pilot projects begin. We will implement the following in 2021:

• Develop spatial based policies, workflows, and auditing processes that will facilitate the automated determination and validation of voter precinct assignments.

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