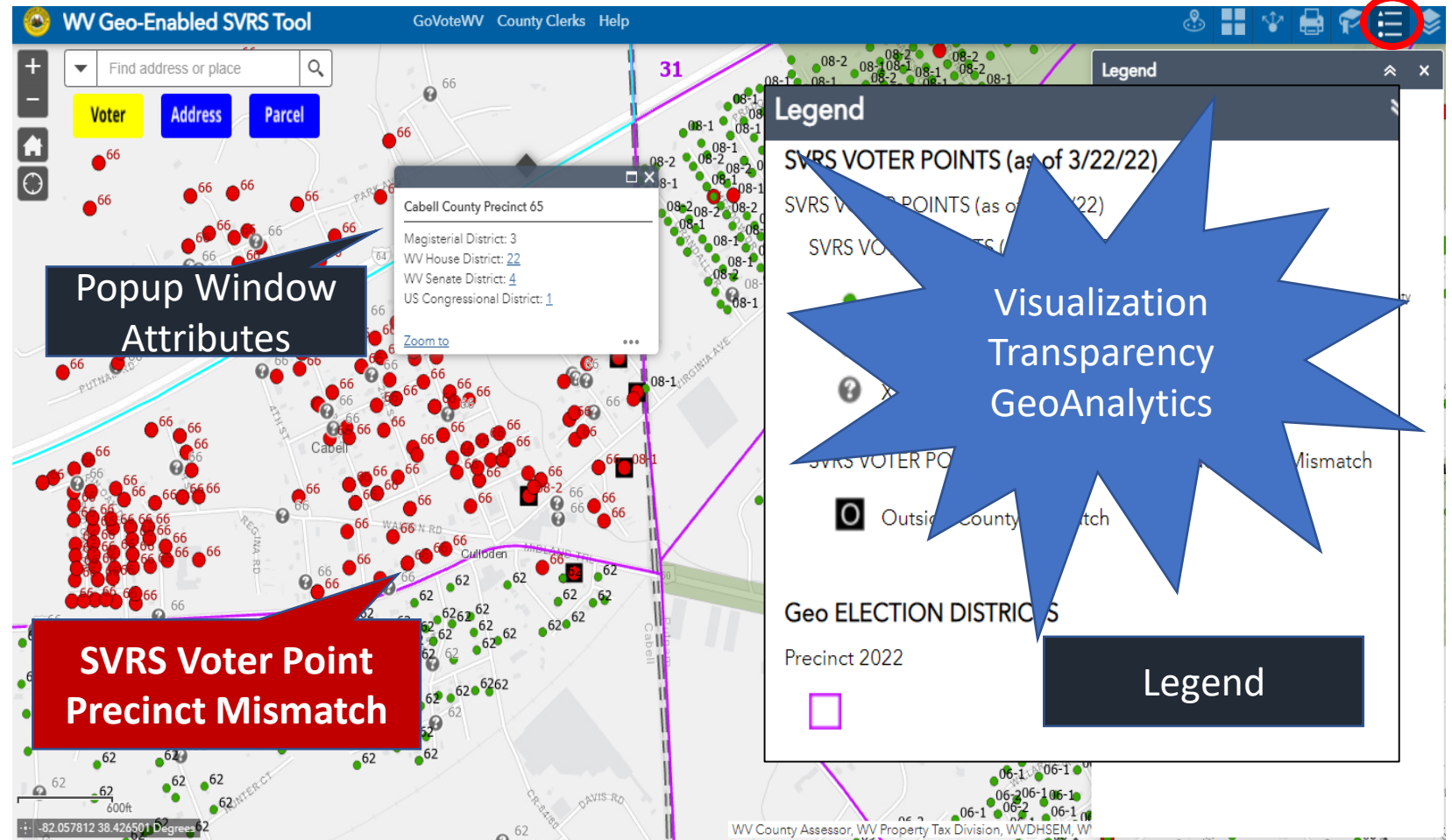
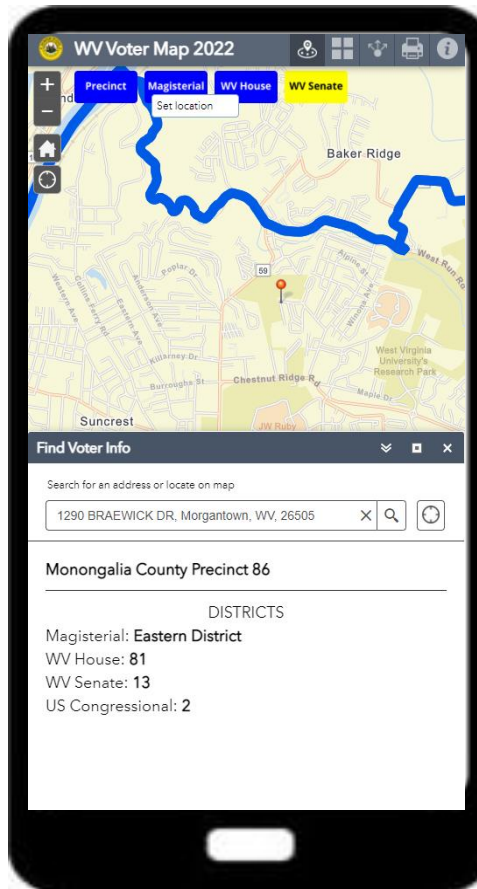


WV Geo-Enabled Elections

9/7/2023

RAISING ELECTION Accuracy and Efficiency with GIS Tools



Kurt Donaldson, Manager, WV GIS Technical Center, West Virginia University, kdonalds@wvu.edu, 304-293-9467

GIS in Elections Pilot Study

■ PILOT STUDY STATES

Kentucky

Kent Anness, Kim Anness, Jared Dearing

Minnesota

David Maeda, Brad Neuhauser, Dan Ross,
Emily Ruetz, Alison Slaats

Nebraska

Michelle Andahl, Wayne Bena, Heather Doxon, Eric Herbert,
Nikki Lampe, Angie Nelson, John Watermolen

Pennsylvania

Mary Fulton, Michael Moser

West Virginia

Tony Simental, David Tackett, Brittany Westfall

■ CASE STUDY STATES

Hawaii

Marc Arakawa

North Carolina

Ballingam Chepuri, Michael Chuang, Veronica Degraffenreid

Utah

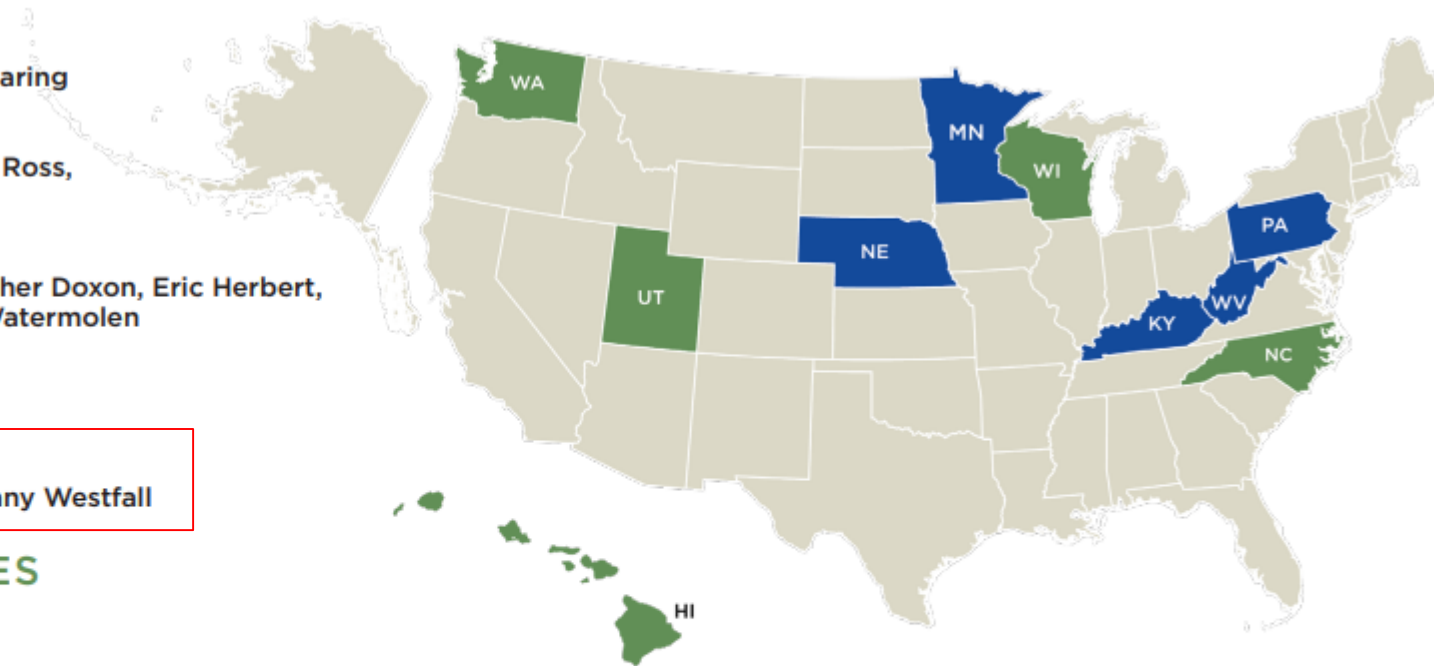
Justin Lee

Washington

Lori Augino, Stuart Holmes

Wisconsin

Greg Grube, Sarah Whitt



In March 2019, [West Virginia](#) joined five other states in a [pilot study](#) sponsored by NSGIC to further the use of GIS in elections and to publish [best practices](#)

5 Best Practices for GIS in Elections

BEST PRACTICES for IMPLEMENTING GIS IN ELECTIONS



For all the rewards from making the transition, implementing GIS into elections management requires a sound plan, effort, and resolve.

In September 2019, NSGIC published five [best practices](#) for geo-enabled elections.

Integrating GIS with the Statewide Voter Registration System (SVRS) allows for the *visualization, geoanalytics, and transparency* of voter data.

1. Convene a Team of Specialists

1



CONVENE A TEAM
OF SPECIALISTS

In September 2021, the State GIS Coordinator and Secretary of State's Office contacted the **WV GIS Technical Center** for GIS support in **Redistricting**

The West Virginia GIS Technical Center, located at West Virginia University, provides coordination and technical support in the development and operations of GIS in West Virginia.

- Established by Executive Order 4-93 in 1993
- Six full-time staff
- Funded by service agreements, external grants, and from the state-appropriated Mineral Lands Mapping Program*

* Fund 0253, Activity 207 approved under House Bill 2222 in February 1995



2. Statewide Voting Unit GIS Layer

2



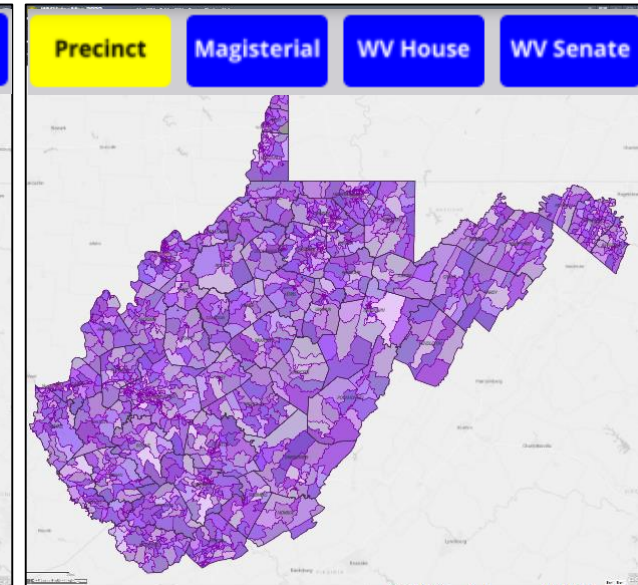
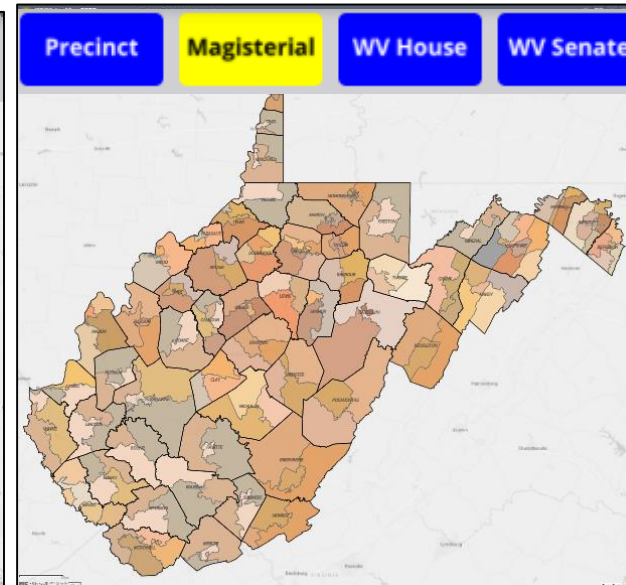
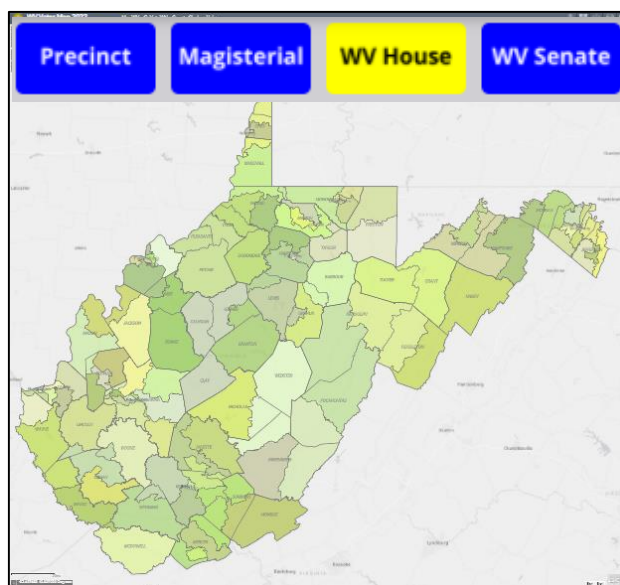
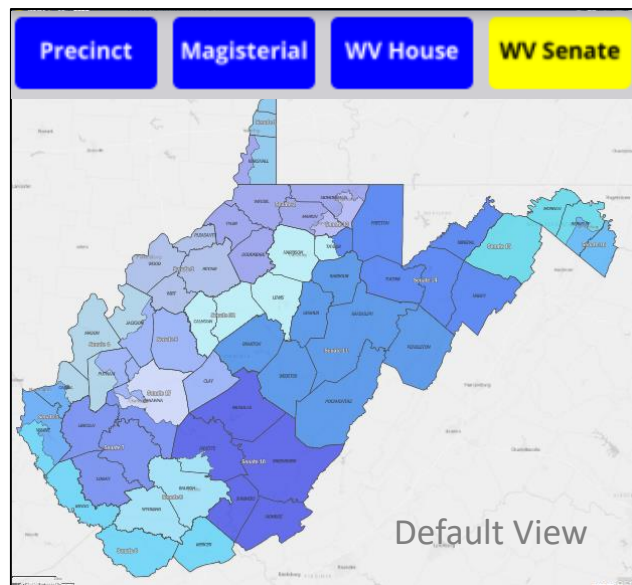
COLLECT & SUSTAIN
A STATEWIDE VOTING
UNIT GIS LAYER

17 WV Senate Districts

100 WV House Districts

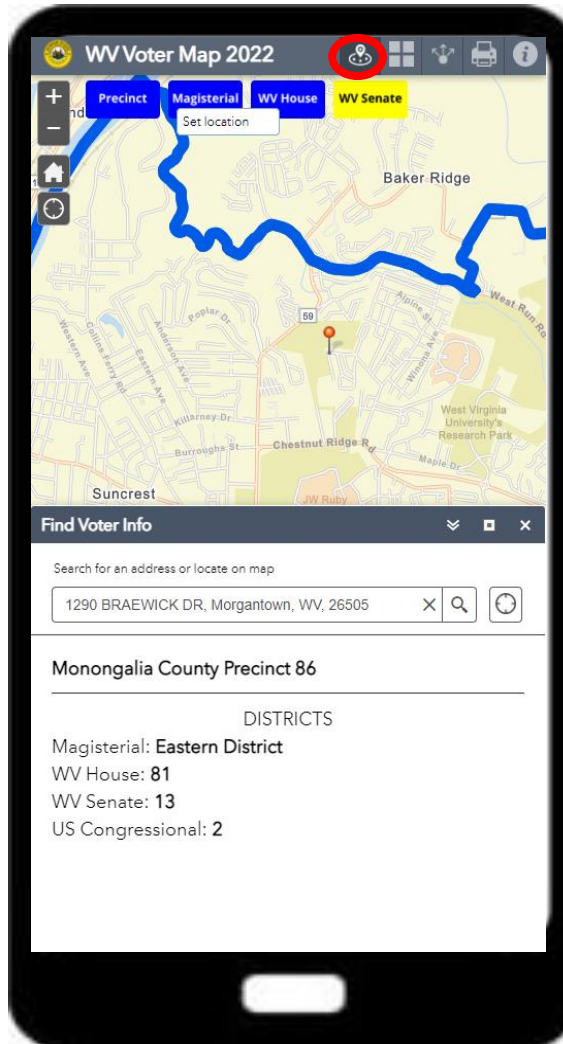
195 Magisterial Districts

1,677 Voting Precincts



Interactive WV Voter Map 2022 (Public)

In March 2022, an interactive map to help voters identify new voting districts and precincts was [announced](#) for the May Primary Election



WV Voter Map Version	URL	Election Voting Districts	Links to Elected Officials	Sample Ballot	Poll Site Directions
Find Voter Info	www.mapwv.gov/vote	Yes	Yes		
Election Early Voting	www.mapwv.gov/vote/ev	Yes		Yes	
Election Day	www.mapwv.gov/vote/poll	Yes		Yes	Yes



On the Primary Election Day of May 10 in West Virginia, the state's best-known broadcaster Hoppy Kercheval commented:

"The Secretary of State's Office has a helpful interactive website with lots of voter information. Just go to <https://www.mapwv.gov/vote/> enter your address and it will tell you your polling location and have links to sample ballots."

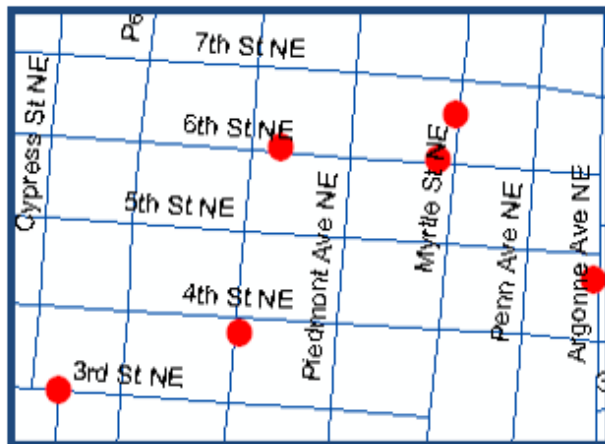
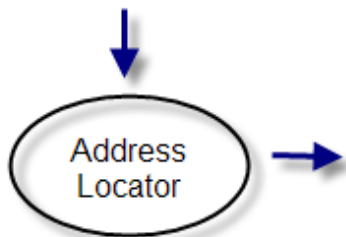
3. Geocoding Strategy

3



IMPLEMENT
A STATEWIDE
GEOCODING
STRATEGY

customers				
	NAME	ADDRESS	CITY	S
▶	Ace Market	1171 PIEDMONT AVE NE	ATLANTA	G.
	Andrew's Gasoline	1670 W PEACHTREE ST NE	ATLANTA	
	AP Supermarket	4505 BEVERLY RD NE		G.
	Atlanta Market	241 16TH ST NW	ATLANTA	G.



● Geocoded point for the matched address

Geocoding, or address matching, is the computational process by which a physical address is converted into geographic coordinates.

Address Accuracy and Standardization Issues

Valid city-style addresses based on E-911 authoritative data need to be entered in the **Statewide Voter Registration System (SVRS)** to be successfully geocoded

INVALID ADDRESSES

Rural Route addresses like **RT 14 BEN CREEK STAT RD BEN CK STAT RD, GILBERT, WV 25621**

PO Box addresses like **BOX 206-A, BAISDEN, WV 25608**

General Delivery addresses like **GENERAL DELIVERY, DINGESS, WV 25671**

Highway Contract addresses like **HC 70 BOX 520, LENORE, WV 25676**

No House Numbers like **CHATTAROY HOLLOW LILLY ADDITION LOT 58, CHATTAROY, WV 25667**

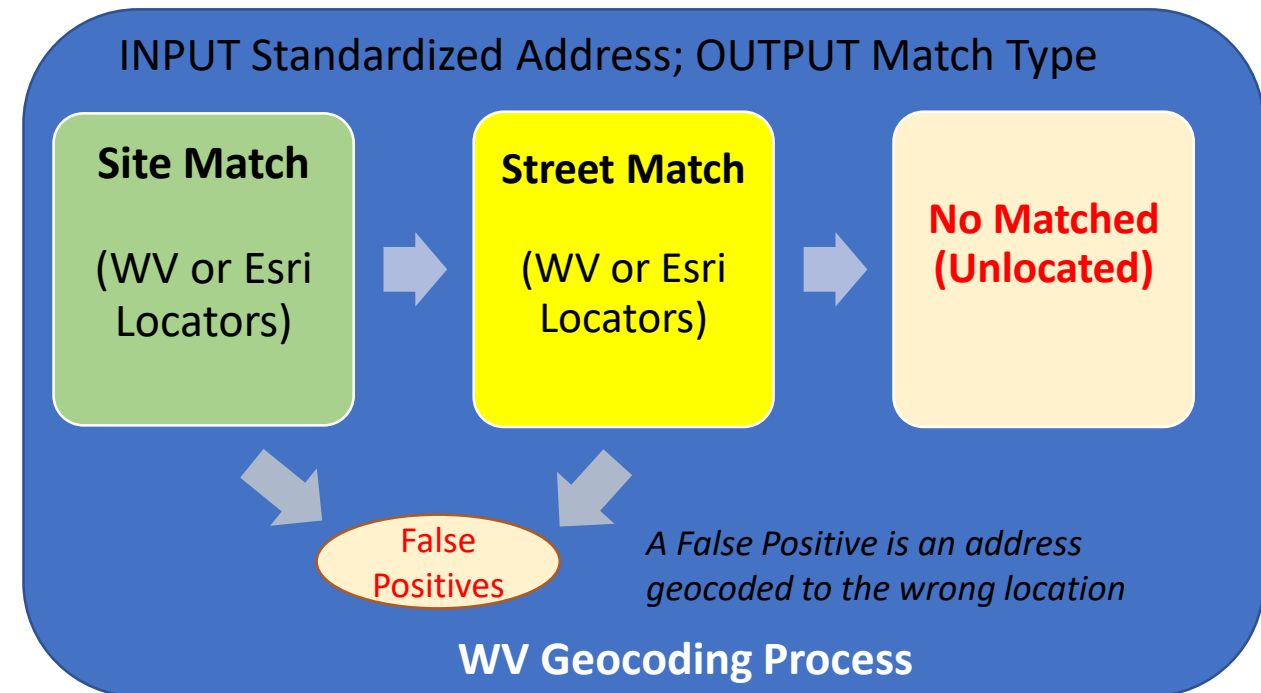
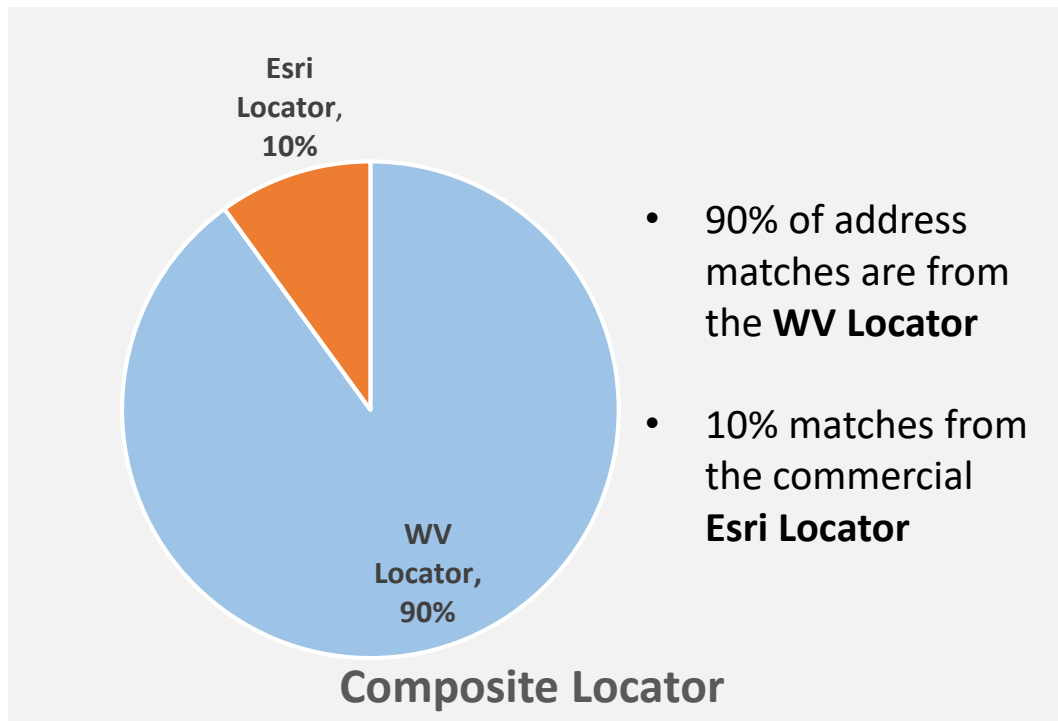
Descriptive addresses like **BELOW FOOTBALL FIELD, GILBERT, WV 25621** or **ABOVE POST OFFICE, RAGLAND, WV**

Incomplete addresses like **KERMIT KERMIT, KERMIT, WV 25674** or **PIGEON CR PIGEON CREEK**

Non-Standardized addresses like **MATE CREEK** and **MATE CRK**, or **MUNCY HOLLOW** and **MUNCY HOLLW**

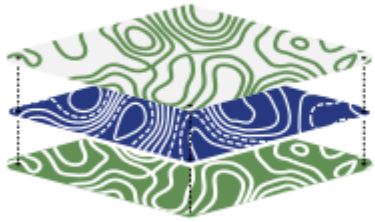
WV Composite Locator

There are approximately 1.0 million addressable structures in West Virginia. A **Composite Locator** is created from public and commercial address layers to geocode 1.1 million voter registration addresses. It is need for both single and bulk geocoding of voter address points.



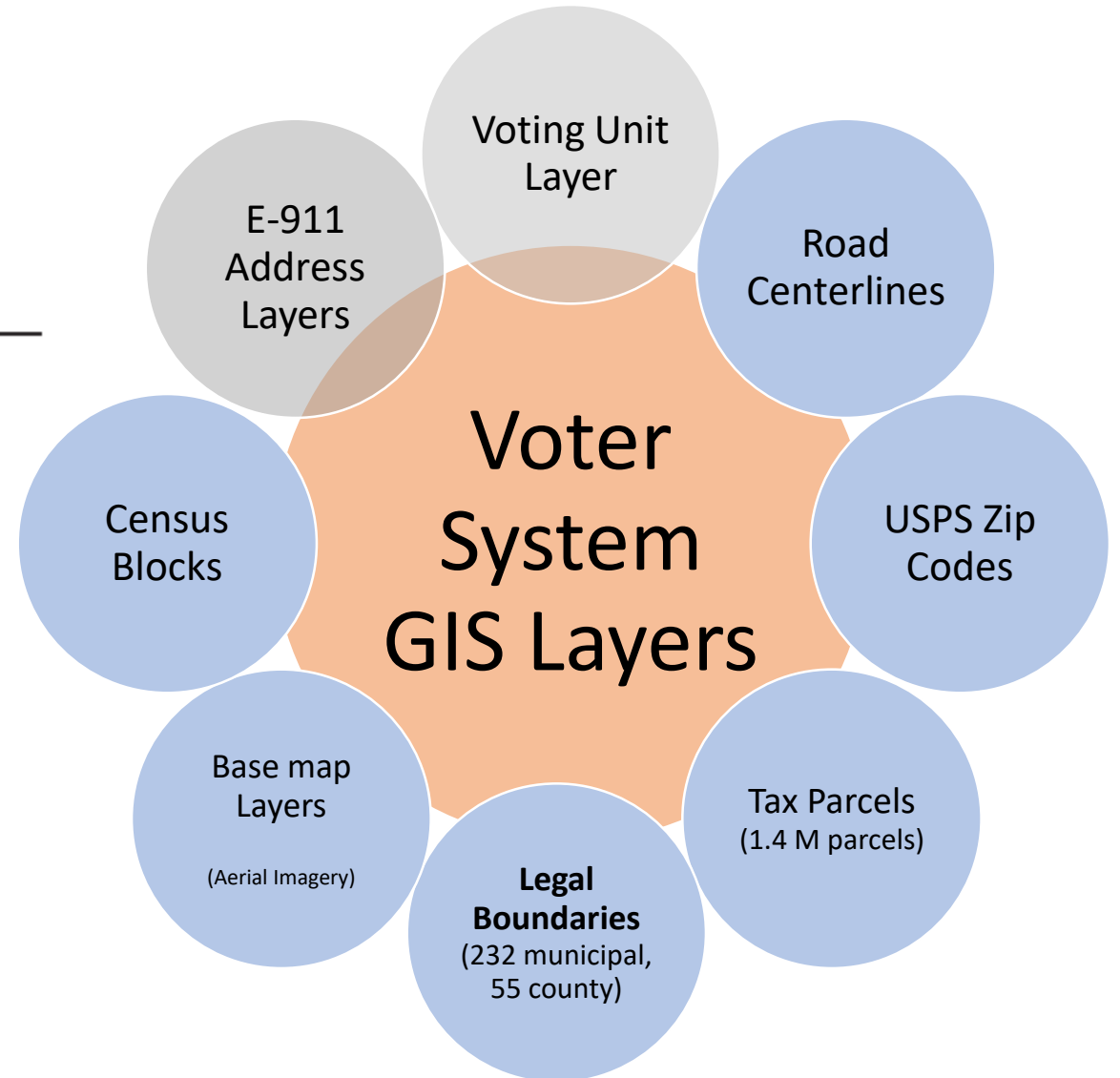
4. Contextual GIS Layers

4



ASSEMBLE BEST AVAILABLE CONTEXTUAL GIS LAYERS

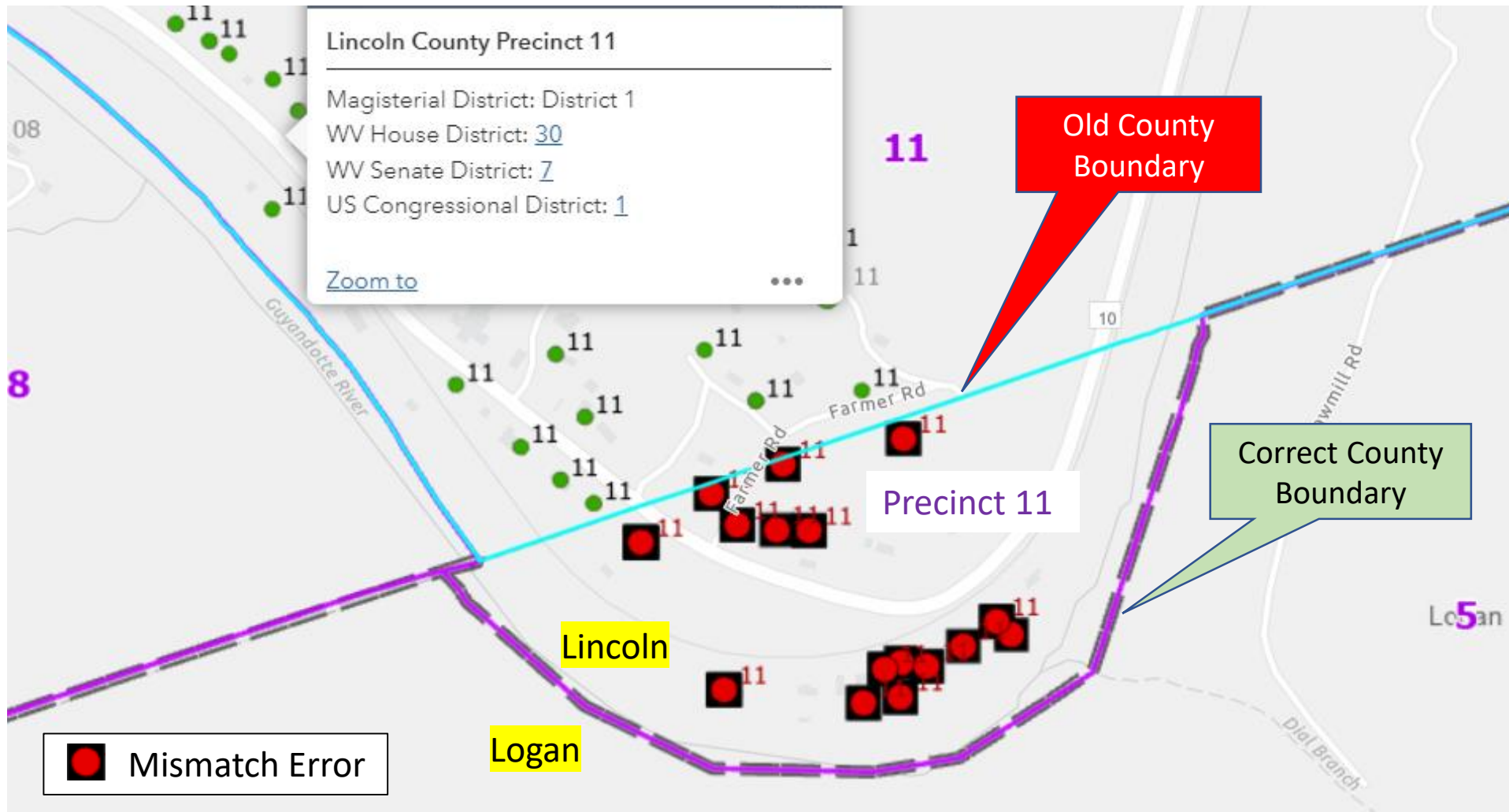
- Reference or **contextual GIS layers** that support Geo-Enabled elections include municipal and county boundaries, tax parcels, and aerial imagery.
- These GIS layers provide *context* for mapping election district boundaries and address locations.
- Support the State's Spatial Data Infrastructure



Legal Boundaries (County)

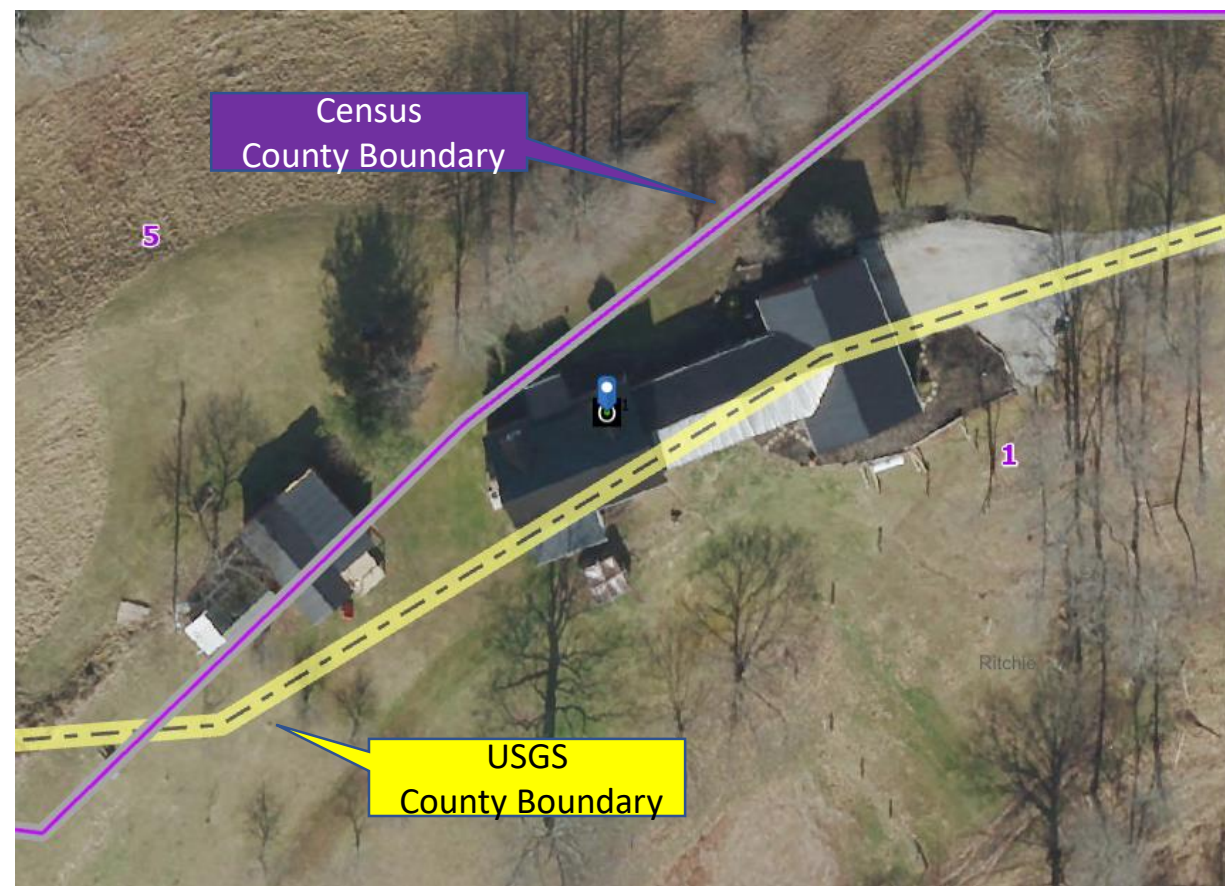
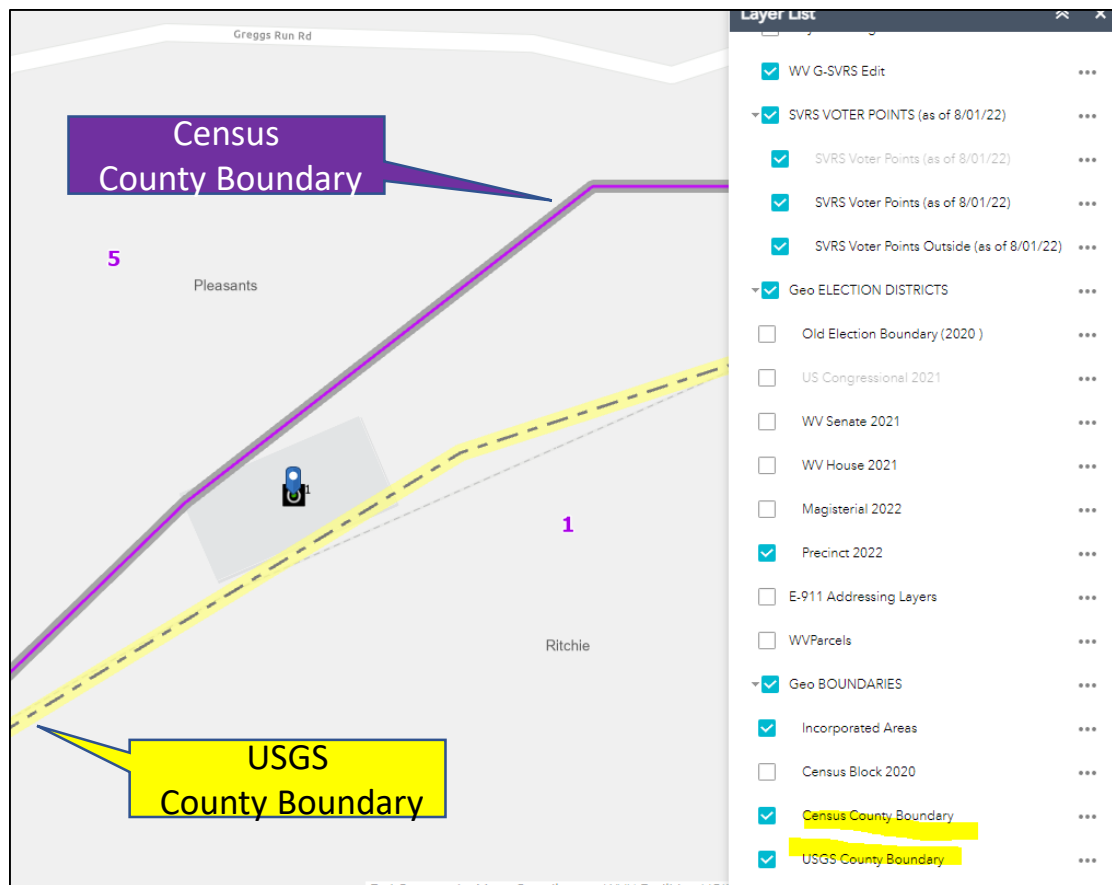
Precinct Mismatch Errors will result if County or Incorporated Place boundaries are incorrect

The Lincoln-Logan county boundary changed by the [2020 BAS](#) was not correct for the 3/22/2022 spatial audit, resulting in mismatch and outside county precinct errors for voter points in Lincoln County [Precinct 11](#). The GIS boundary has been updated in the G-SVRS Tool, so the precinct mismatch errors should be corrected when the next spatial audit is performed.



County Boundary Accuracy Improvement

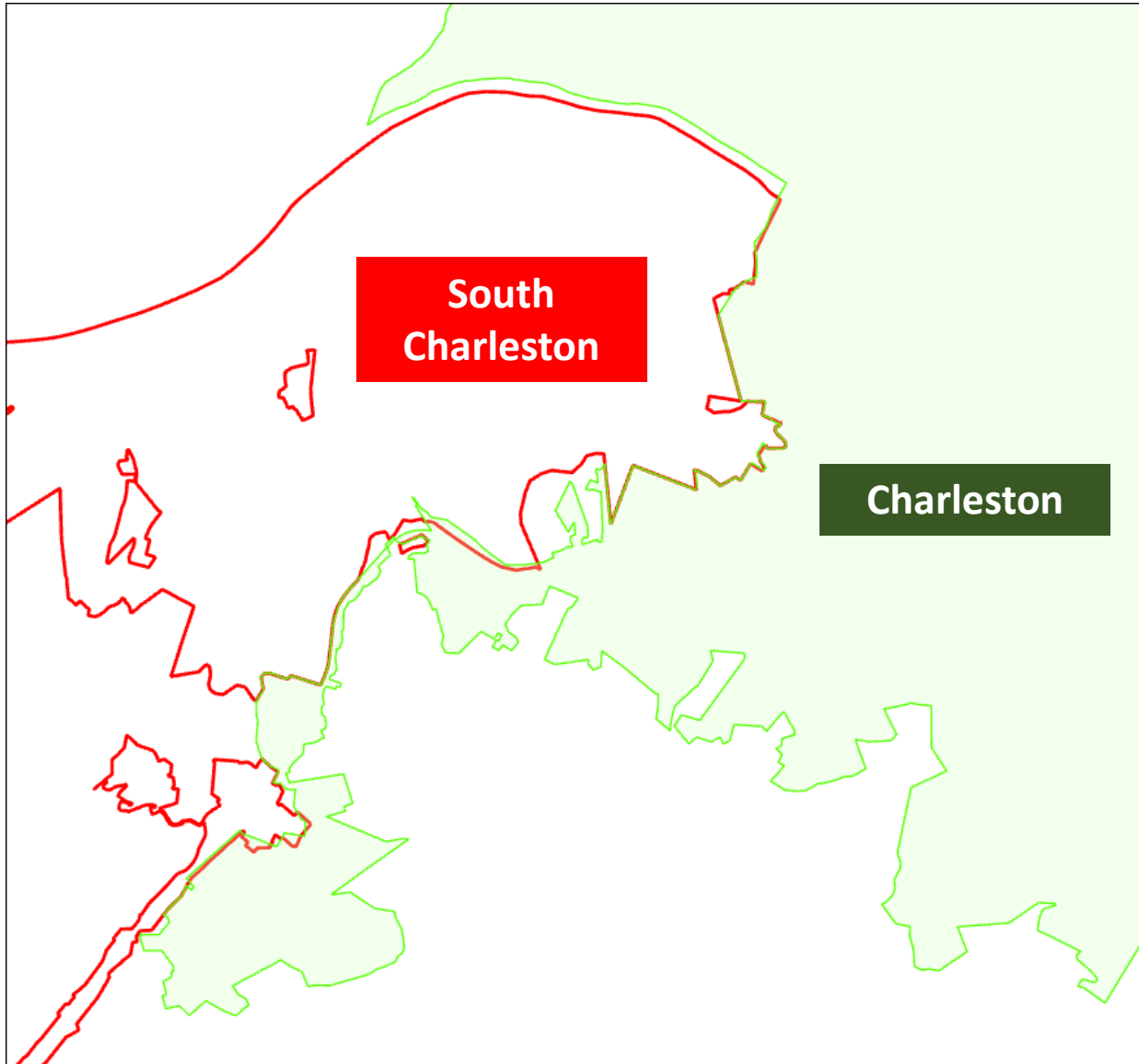
The official county boundaries for West Virginia are the USGS topographic map boundaries plus recent court order updates. West Virginia is coordinating with Census BAS to improve the spatial resolution of county boundaries in West Virginia before the 2030 Census.



Non-coincidental USGS topo and Census boundaries

<https://mapwv.gov/svrs/?marker=-81.075303,39.327192&level=20>

Legal Boundaries (Municipal)

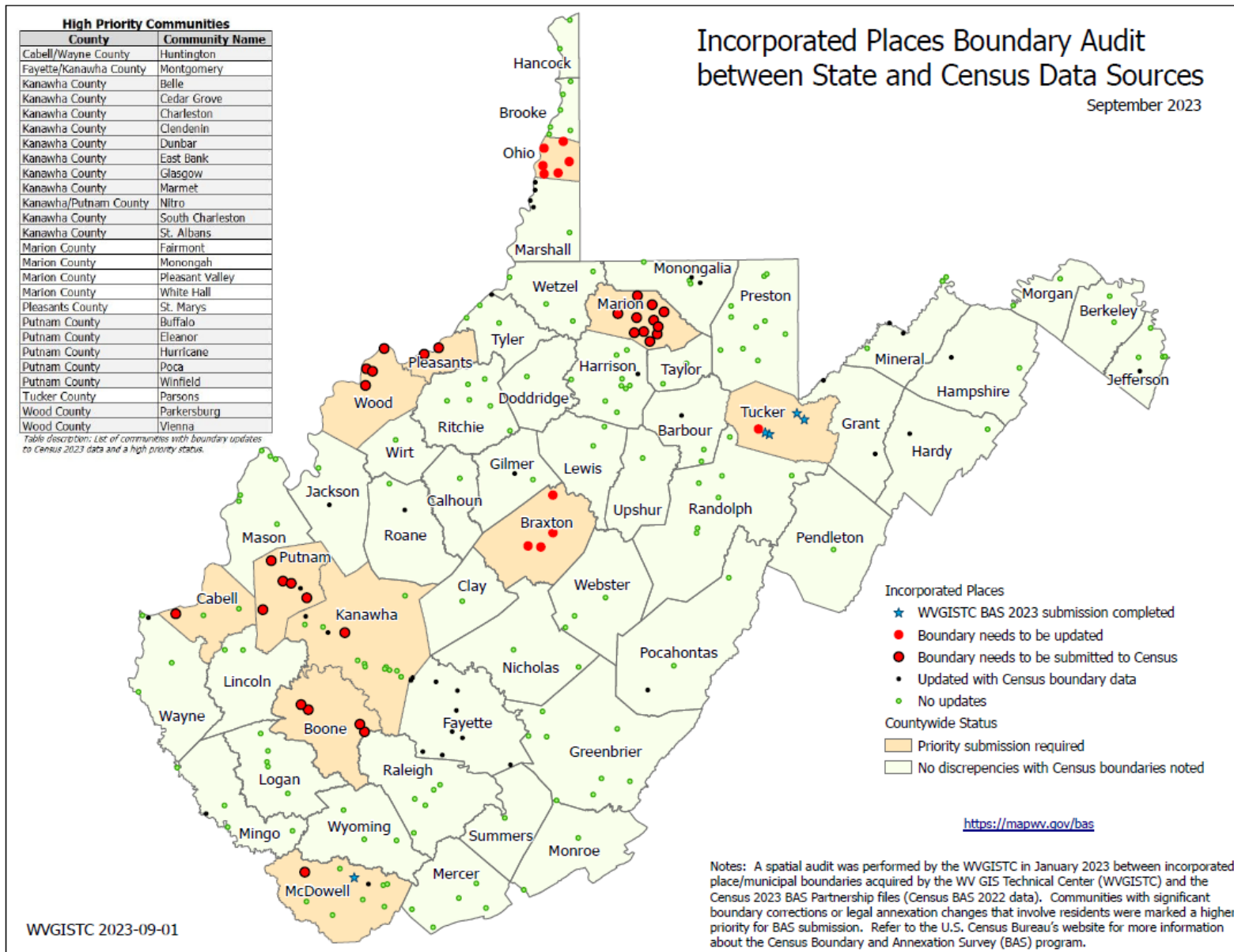


Municipal or Incorporated Place Boundaries

- Incorporated Place boundaries are important for defining **municipal precincts**
- Municipal boundary corrections need to be submitted to the federal geospatial database via **Census BAS** for Charleston and South Charleston which have a shared boundary.
- A tracking log should monitoring progress of pending community BAS submissions

[WV BAS Interactive Viewer](#) of Municipal Boundaries from Census and Local Data Source

Municipal Boundary Audit / BAS Tracking



Municipal Boundary audit between Census and local data sources. Boundary changes submitted via Census [BAS](#) program.

Topic	Census Resources	State Resources
Review Boundary Data	TIGERweb¹ viewer and guide	WV Incorporated Places Viewer
	BAS Partnership Shapefiles²	State Municipality GIS File
	PDF BAS maps³	WV BAS Status Graphic
		WV BAS Audit Table

5. Data Validation Processes

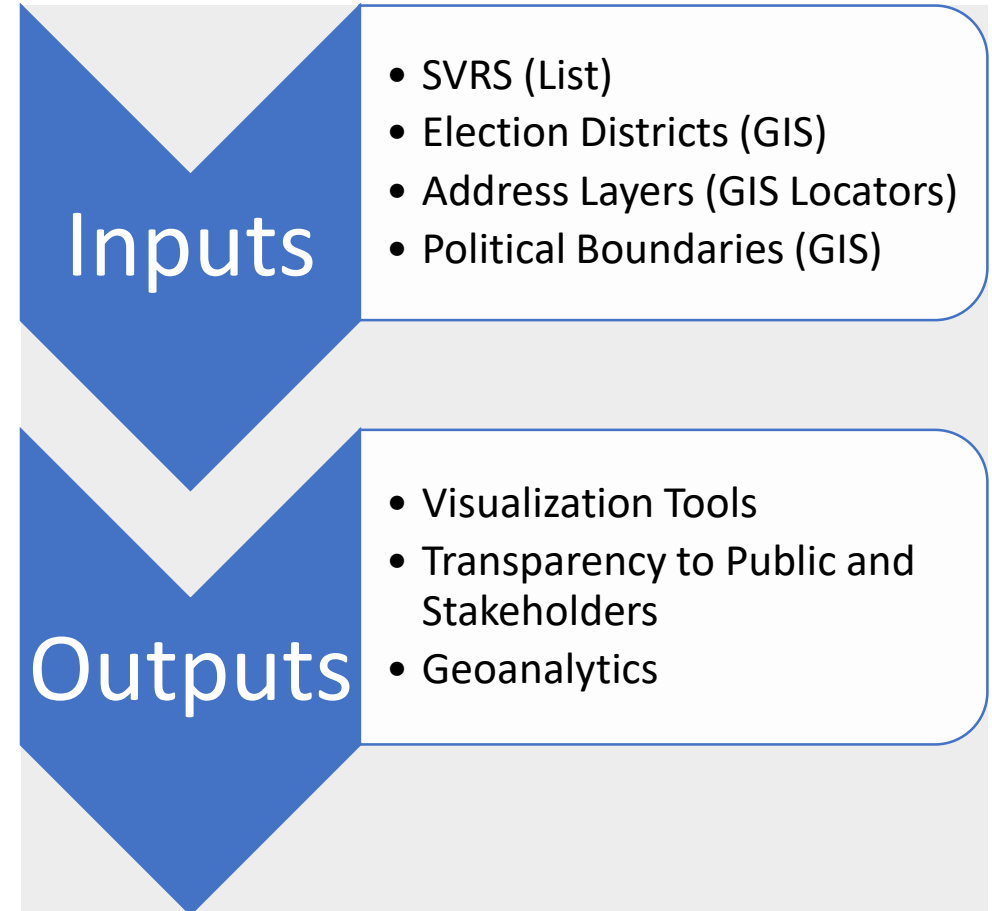
5



DEFINE & IMPLEMENT DATA VALIDATION PROCESSES

Validating the elections data using geanalytics provides greater confidence in the elections system to administrators and the public. Monthly systematic audits include:

- Verifying mapped voters fall within the correct district
- Address geocoding match rates



WV GIS Products

PRODUCT	DESCRIPTION	WEB LINKS
County Report Lists (Excel Spreadsheet)	Precinct Mismatch List	Download County Mismatch File
	Voter List (all SVRS records)	Download County Voter List File
	E-911 Site and Street Ranges	Download Select Counties
Map Viewers (Online Web)	WV Voter Map 2022 (Public)	www.mapwv.gov/vote
	WV Geo-Enables SVRS Tool (Non-Public) <i>formerly the redistricting web map</i>	www.mapwv.gov/svrs
Progress Tracking (Excel Spreadsheet)	County SVRS-GEO and Address Geocoding Statuses	Table Graphic Geocode Status
	Precinct SVRS-GEO Status	Table Graphic
Online Resources	County Clerk Redistricting Resources	www.mapwv.gov/redistricting
	Background info about Reports and Map Viewers	GEO-SVRS Reports and Map Viewers

Statewide Voter Registration System (SVRS) Reports link tabular data to Map Viewer

G-SVRS TOOL

PUTNAM Precinct Mismatch List (V3)										
03/24/2022										
GEO	Voting Prec	VRS Voter ID	VRS Combo	VRS Precinct	GEO Precinct	VR	PV	FT	X	Y
1	1	331973	81 22	1	1	Link	Link	Link	-81.9838	38.60887
7	1	737224	73 22	1	1	Link	Link	Link	-81.9838	38.60887
8	1	349926	81 22	1	1	Link	Link	Link	-81.9838	38.60887
9	1	100771046	4 7	1	1	Link	Link	Link	-81.981	38.60915
0	1	100275392	9 15	1	1	Link	Link	Link	-81.9818	38.61775
1	1	356393	49 40	1	1	Link	Link	Link	-81.9749	38.62171
2	1	100890117	49 40	1	1	Link	Link	Link	-81.9749	38.62171
3	1	100662277	49 40	1	1	Link	Link	Link	-81.9749	38.62171
4	1									
5	1									
6	2									
7	2	1007154171	5314	12	1	Link	Link	Link	-81.9891	38.57434

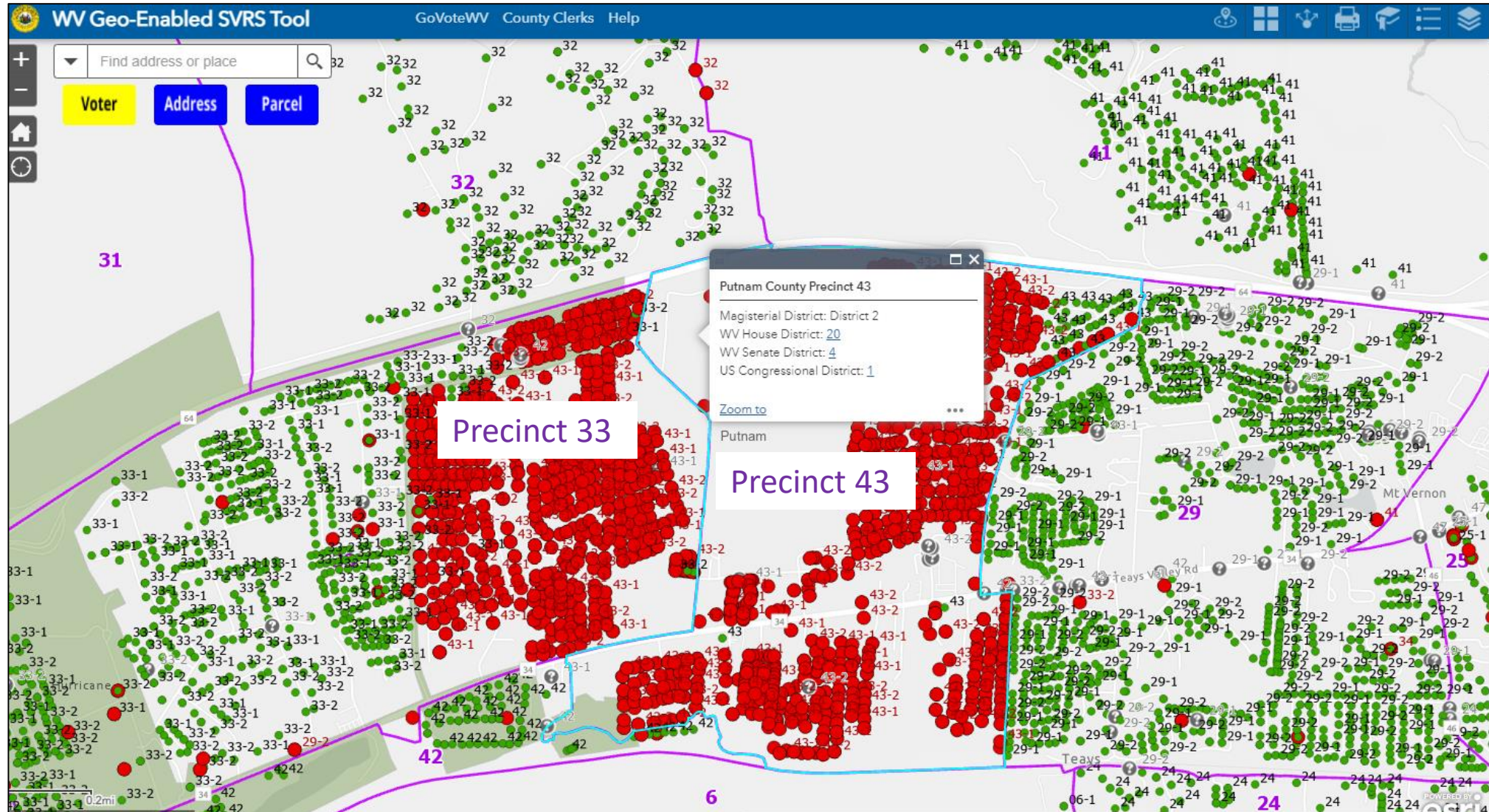
County Precinct Mismatch Report



WV Geo-Enabled SVRS Tool

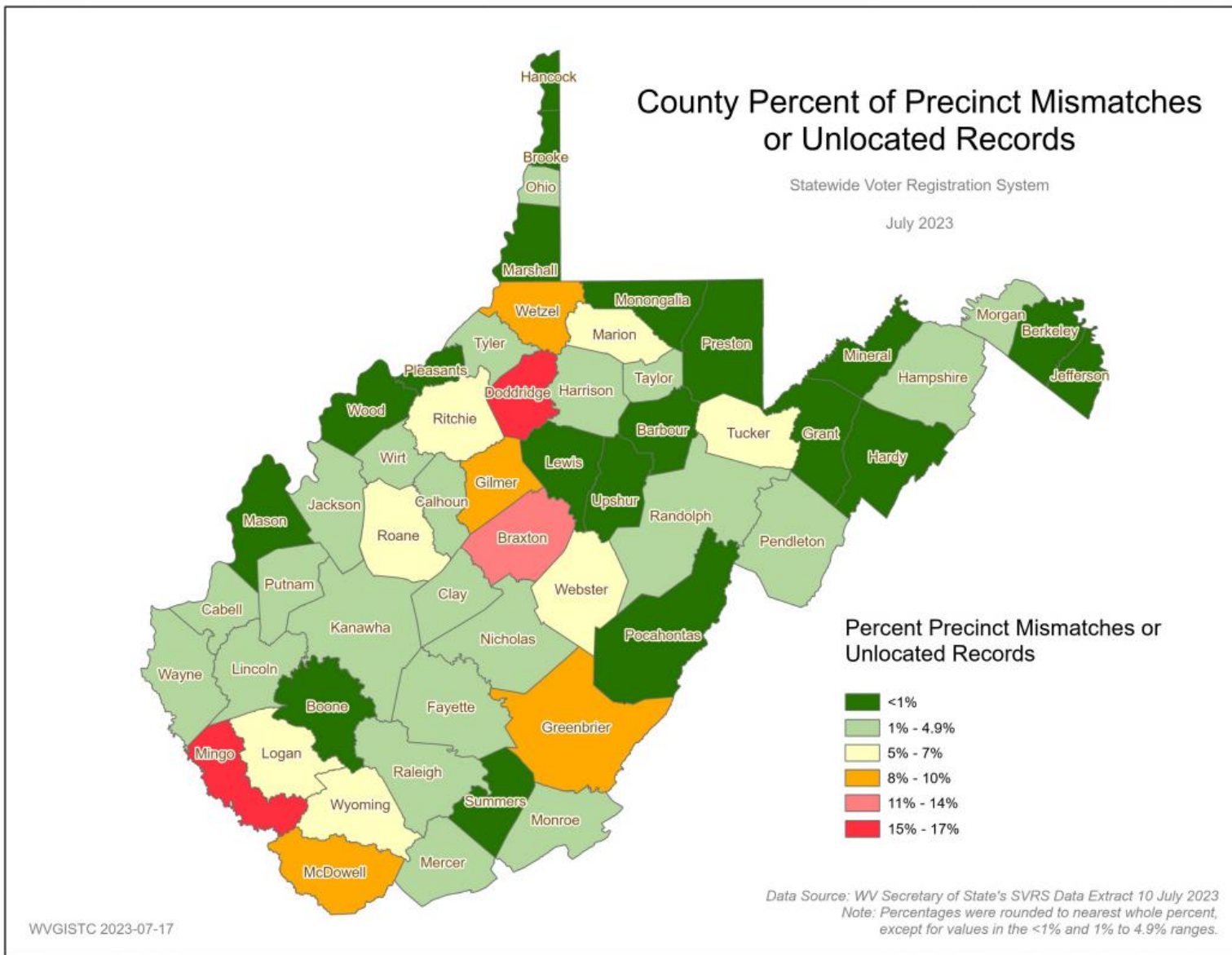
G-SVRS Map Tool

Precinct Level SVRS-Geo Audit



View specific precincts on [G-SVRS Tool](#)

Countywide % SVRS-Geo Mismatch



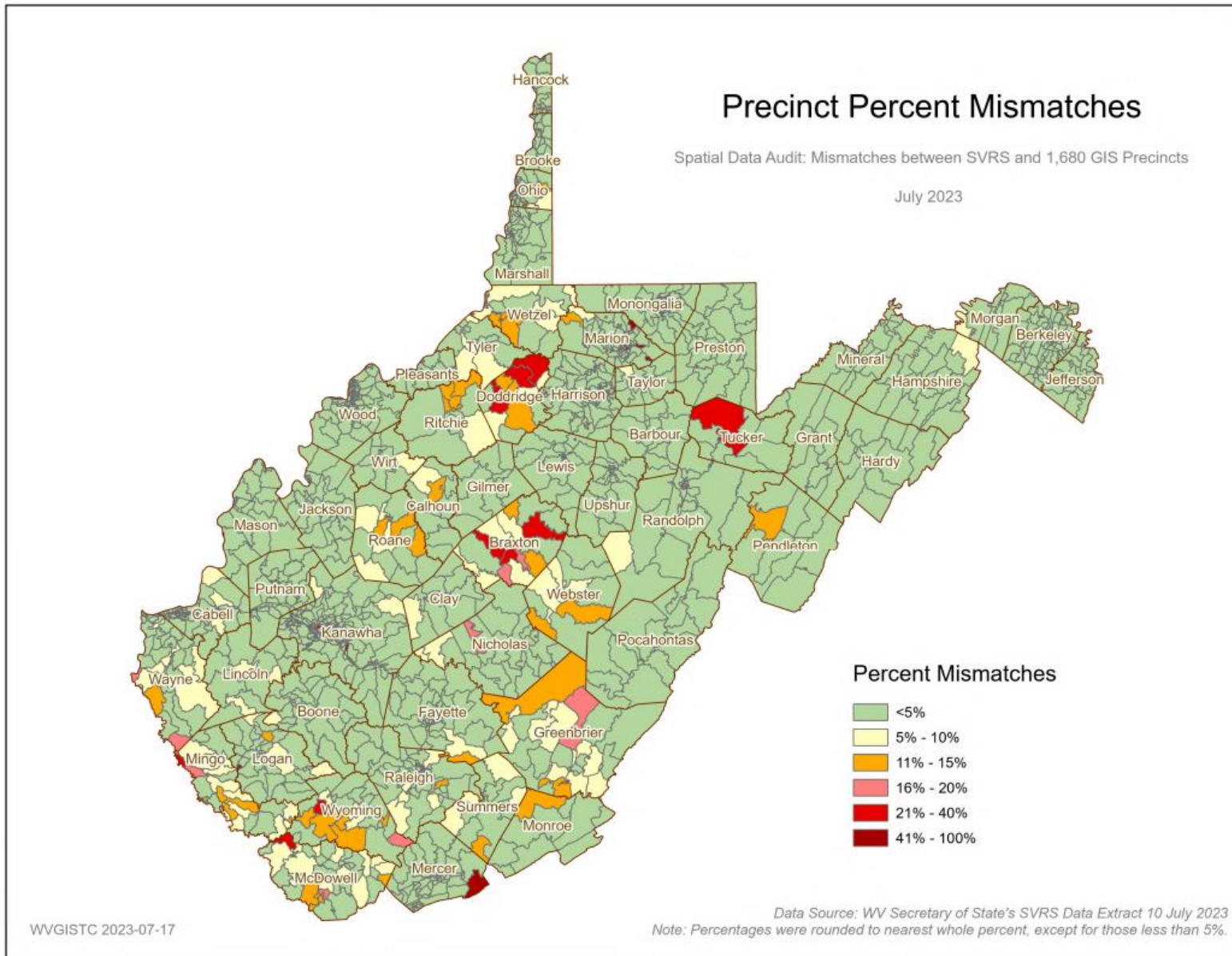
State Level

- SVRS-GEO mismatch 2.3%
- Ideally < 1%

County Level

- SVRS-GEO mismatch < 5%
- Ideally < 1%

Precinct % SVRS-Geo Mismatch



Precinct Level

- SVRS-GEO mismatch < 5%
- Ideally < 1%

GeoAnalytics: County Performance Measures

Voting Districts	Deficiency: SVRS-GEO Mismatches
County Level	<ul style="list-style-type: none"><input type="checkbox"/> > 5% SVRS-GEO countywide precinct mismatch; > 10% more severe<input type="checkbox"/> > 1000 SVRS-GEO precinct mismatches<input type="checkbox"/> > 20 outside county precinct mismatches<input type="checkbox"/> < 90% SVRS-GEO matches (all districts: Congressional, WV State, WV House, Magisterial, Precinct)
Precinct Level	<ul style="list-style-type: none"><input type="checkbox"/> # precincts > 100 voters<input type="checkbox"/> Precinct boundaries not precisely mapped to match SVRS voter assignments

Addresses	Deficiency
% Site Address Matches	<input type="checkbox"/> < 95% countywide site geocode match rate (valid addresses)
% Unlocated Addresses	<input type="checkbox"/> > 2% countywide unlocated geocode match rate (invalid addresses)
Updates to SAMS	<input type="checkbox"/> > 1 year addresses not updated to Statewide Addressing and Mapping System (SAMS)
Address Exceptions	<input type="checkbox"/> > 1% address exceptions (issues with address quality)

Legal Boundaries	Deficiency
Incorporated Place or County Boundary	<input type="checkbox"/> 1 or more BAS submissions pending