

VEST AR 2018

State: Arkansas

Organization: Voting and Election Science Team (VEST)

Summary of Races included: Governor, Lieutenant Governor, Attorney General, Secretary of State, Treasurer, Auditor, Commissioner of State Lands [General]

Date File Updated: 07/29/2020

Date Report Updated: 08/03/2020

RDH Validation Code (Github): <https://github.com/nonpartisan-redistricting-datahub/pdv-ar>

RDH Criteria	Explanation
<p>Is all raw data available?</p> <p>No</p>	<p><u>Accessible files:</u></p> <ul style="list-style-type: none"> ● VEST Arkansas 2018 File <ul style="list-style-type: none"> ○ Date accessed: 08/03/2021, Source: VEST on the Harvard Dataverse ○ https://dataverse.harvard.edu/file.xhtml?fileId=4931780&version=43.0 ● VEST 2018 Documentation <ul style="list-style-type: none"> ○ Accessed: 08/03/2021, Source: VEST on the Harvard Dataverse ○ https://dataverse.harvard.edu/file.xhtml?fileId=4938247&version=43.0 ● VEST Arkansas 2016 File <ul style="list-style-type: none"> ○ Date accessed: 08/03/2021, Source: VEST on the Harvard Dataverse ○ https://dataverse.harvard.edu/file.xhtml?fileId=4931773&version=65.0 ● Arkansas Precinct Shapefile (Current) <ul style="list-style-type: none"> ○ Date accessed: 04/26/2021, Source: Arkansas GIS Office ○ https://gis.arkansas.gov/product/election-precincts/ ○ Note: After clicking “Add to Cart”, navigate to the cart, then select “Proceed to Download”. From the “Clip by” drop-down, select “Statewide”. In the “Projection” drop-down select “NAD83 UTM-Zone 15N”. Enter your email and select “Place Download”. You will receive an email with a link from which you can download the data. ○ Additional Note: This file is representative of current (as of the date accessed) precinct boundaries in Arkansas. Through personal exchange with Matthew DeLong (Senior GIS Analyst), it was confirmed that “...excluding maybe 4 or 5 corrections this dataset should accurately reflect how the precincts were drawn prior to the 2018 election.”

- Arkansas 2018 General Election Results:
 - Date accessed: 04/30/2021, Source: Open Elections (GitHub)
 - https://github.com/openelections/openelections-data-ar/blob/master/2018/20181106_ar_general_precinct.csv
- Johnson County Voting Centers File:
 - Date accessed: 05/18/2021, Source: Johnson County Clerk's Office (johnsonclerk@arkansasclerks.com)
 - Note: This was retrieved as a Word Document via email.
- Benton County Election Results:
 - Date accessed: 05/18/2021, Source: Dana Caler at the Benton County Clerk's Office (Dana.Caler@bentoncountyar.gov)
 - Note: This data was retrieved as an Excel Document via email.
- Benton County Municipal Boundaries (Current):
 - Date accessed: 05/18/2021, Source: Arkansas GIS Office
 - <https://gis.arkansas.gov/product/municipal-boundaries-polygon/>
 - Note: After clicking "Add to Cart", navigate to the cart, then select "Proceed to Download". From the "Clip by" drop-down, select "County", then from the "County" drop-down select "Benton". In the "Projection" drop-down select "NAD83 UTM- Zone 15N". Enter your email and select "Place Download". You will receive an email with a link from which you can download the data.
- Benton County Municipal Boundary Changes (Current):
 - Date accessed: 06/08/2021, Source: Arkansas GIS Office
 - <https://gis.arkansas.gov/product/municipal-boundary-changes-polygon/>
 - Note: After clicking "Add to Cart", navigate to the cart, then select "Proceed to Download". From the "Clip by" drop-down, select "County", then from the "County" drop-down select "Benton". In the "Projection" drop-down select "NAD83 UTM- Zone 15N". Enter your email and select "Place Download". You will receive an email with a link from which you can download the data.
- Benton County Senate Districts (Current):
 - Date accessed: 05/18/2021, Source: Arkansas GIS Office
 - <https://gis.arkansas.gov/product/ar-senate-districts-2010-census/>
 - Note: After clicking "Add to Cart", navigate to the cart, then select "Proceed to Download". From the "Clip by" drop-down, select "County", then from the "County" drop-down select "Benton". In the "Projection" drop-down select "NAD83 UTM- Zone 15N". Enter your email and select "Place Download". You will receive an email with a link from which you can download the data.
- Izard County Municipal Boundaries (Current):

	<ul style="list-style-type: none"> ○ Date accessed: 06/04/2021, Source: Arkansas GIS Office ○ https://gis.arkansas.gov/product/municipal-boundaries-polygon/ ○ Note: After clicking “Add to Cart”, navigate to the cart, then select “Proceed to Download”. From the “Clip by” drop-down, select “County”, then from the “County” drop-down select “Izard”. In the “Projection” drop-down select “NAD83 UTM- Zone 15N”. Enter your email and select “Place Download”. You will receive an email with a link from which you can download the data. ● Izard County Municipal Boundary Changes (Current): <ul style="list-style-type: none"> ○ Date accessed: 06/14/2021, Source: Arkansas GIS Office ○ https://gis.arkansas.gov/product/municipal-boundary-changes-polygon/ ○ Note: After clicking “Add to Cart”, navigate to the cart, then select “Proceed to Download”. From the “Clip by” drop-down, select “County”, then from the “County” drop-down select “Izard”. In the “Projection” drop-down select “NAD83 UTM- Zone 15N”. Enter your email and select “Place Download”. You will receive an email with a link from which you can download the data. <p><u>Inaccessible files:</u></p> <ul style="list-style-type: none"> ● Arkansas 2018 Precinct Shapefile: <ul style="list-style-type: none"> ○ Note: The current precinct shapefile for Arkansas was used, as this is what was available. The exact file VEST used was unavailable.
<p>Processing steps available?</p> <p>Yes</p>	<p><u>Description of processing steps:</u></p> <ul style="list-style-type: none"> ● In their documentation (cited above), VEST describes that they used an unreleased version of a statewide precinct shapefile and made several edits “to reverse changes not yet enacted for the 2018 election.” ● The also note several specific county modifications to the election results: <ul style="list-style-type: none"> ○ Johnson County: “Johnson County switched to new vote centers for the November 2018 election. Due to a coding mismatch, votes were then incorrectly assigned to precincts in the Secretary of State results, indicating some precincts had almost no votes and others had far too many. For the purpose of assigning votes as accurately as possible, the precincts are merged according to their assigned vote center with results by vote center received from the county. Votes that were reported countywide were then distributed based on the number of ballots cast by precinct according to the voter statistics report also received from the county.”

- Benton County: “For Benton county the Secretary of State results combine the Precinct 41 votes with the Precinct 4 votes. These were corrected according to precinct reports received from the county.”
- Absentee/Early/Provisional Votes: “Countywide votes were distributed for Fulton, Jefferson, Johnson, Union. These were distributed by candidate to precincts based on their share of the precinct-level reported vote.”
- VEST also notes counties in which a precinct merger was made in the shapefile: Carroll, Chicot, Clark, Crittenden, Dallas, Faulkner, Hot Spring, Howard, Independence, Johnson, Mississippi, Monroe, Nevada, Phillips, Poinsett, St. Francis, and Stone Counties.
- VEST further details specific modifications to each county:
 - Benton: Align Siloam Springs and Gravette precincts with 2018 municipal boundaries
 - Boone: Precinct splits based on municipal boundaries and legislative boundaries consistent with county map
 - Greene: Merged Wards 3/3A and 4/4C as the splits were not reported separately for the 2018 general election
 - Izard: Sage in Melbourne 4 and Oxford in Brockwell split by township shapefile
 - Jefferson: Precincts 6, 35, 38, 39, 42, 43, 44, 46, 52, 63, 129, 402, 411 from 2016 shapefile
 - Madison: County precincts outside Huntsville from 2016 shapefile
 - Phillips: Helena-West Helena wards added from city redistricting map; Precinct 4 was no longer in use for the 2018 general election, the single vote reported for Precinct 4 was actually from Precinct 6
 - St. Francis: Forrest City wards revised to match city PDF and legal description in municipal code
 - Stone: Ben 1 & Ben 2 split according to Secretary of State map

Information not in their processing steps:

- VEST did not include what exact mergers were made in the counties that they listed.
- VEST did not indicate their method for assigning election results to precincts.

Able to replicate joining election data and shapefiles?

No, given the documentation VEST provided and the files we had available, we were not able to join all of the precincts with the election results. However, we were able to join 2,523/2,617 precincts and we made the following modifications:

- In the election data, we made the modifications that VEST specified:

No

- Read in Benton County data for Precincts 4 and 41 (and removed the original Precinct 4)
- Read in the Vote Centers for Johnson County and joined them to the precincts and then grouped by vote center to get election data at the more aggregated level. NOTE: The vote center file we retrieved from Johnson County was not the same vote centers which VEST used, but we were able to repeat VEST's steps based on the way they named their aggregated Vote Centers (which included original precinct names)
- Election data was cleaned by identifying candidates that are needed to recreate the VEST file, subsetting by those candidates, pivoting on a unique identifier, and then renaming the data to match VEST's conventions.
- Early votes were assigned for all counties VEST mentioned in their documentation, except Johnson County, as the data that we retrieved had already allocated votes by county (there was no absentee/provisional/early precinct in the dataset). We verified this against the Secretary of State data, which also did not have an early voting precinct ([LINK HERE](#)).
- There were still a few more precincts in the source election data than the VEST data (2,617 in VEST and 2,621 in the source data):
 - Greene County had two more precincts in the source data
 - Removed extraneous precincts from source data which contained no votes
 - Marion County had one more precinct in the VEST data
 - Add a null precinct to the source data to match VEST
 - Ouachita County had one more precinct in the source data
 - Removed extraneous precincts from source data which contained no votes
 - Phillips County had one more precinct in the source data
 - Precinct 0004 contained one vote for several candidates. In order to reassign these votes, we renamed and cleaned the precincts to match VEST precincts, and then joined the data and performed a precinct-by-precinct validation of the results to determine the discrepancy and where to allocate. For each race in which Precinct 0004 had one vote, VEST contained one additional vote for HWH Ward 3 D,E,F, so all of Precinct 0004's votes were reallocated to that precinct.
 - White County had one more precinct in the source data
 - Removed extraneous precinct from source data which contained no votes
- After making the modifications above, there were the correct number of election results in the source data to run the elections validation with the

VEST file, but modifications to the precinct names were needed to validate by precinct:

- A unique ID in both the VEST and election data was created through a concatenation of the county name and precinct name. This did not successfully join all precincts, so we attempted a string matching using the fuzzywuzzy library.
- This method improved the matching, but was not perfect, so we made some bulk modifications to Benton, Craighead, and Saline counties (see the script for details).
- To further improve the match rate, we manually matched precincts using a dictionary (see script for full dictionary).
- There were two remaining counties in which it was unclear which precincts matched with which in the election data and VEST, as the election data named the precincts after the location rather than a description of the precinct (e.g. 1st Baptist Church vs. Ward 1). To fix this, we created a field that was a concatenation of the votes for the Democratic and Republican candidates for Governor in both the VEST and election data, which produced a successful join for all 2,617 precincts.
- After validating the election results, there were a number of modifications that needed to be made to the shapefile in order to successfully validate the precincts:
 - Boone County: VEST notes modifications they made to Boone County (see documentation above), and we attempted to make these modifications by intersecting a shapefile of the municipal boundaries with State Senate boundaries to produce a new file. Since there were modifications to the municipal file since 2018, we also used a municipal boundaries change file to undo some of these changes to more closely represent the files that VEST would have made. Ultimately, however, we were unable to produce a county shapefile that could be used, so removed this data from our final shapefile validation.
 - Carroll County: There were 21 precincts in the election data, and 31 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
 - Chicot County: There were 12 precincts in the election data, and 13 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to

successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.

- Clark County: There were 20 precincts in the election data, and 27 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Crittenden County: There were 24 precincts in the election data, and 43 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Dallas County: There were 9 precincts in the election data, and 16 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Faulkner County: There were 50 precincts in the election data, and 51 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Fulton County: There were 11 precincts in the election data, and 10 in the shapefile, so we examined the data in QGIS in order to determine where splits were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. We were not able to split the data on the line that VEST had, as we did not have the same underlying file or other input files, so we merged the two precincts in question in the VEST file and aggregated the election results so they could be successfully joined. See the script for precinct names and changes.
- Greene County: There were 36 precincts in the election data, and 38 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these

merges were not included in VEST documentation. See the script for precinct names and changes.

- Hot Spring County: There were 31 precincts in the election data, and 35 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Howard County: There were 36 precincts in the election data, and 49 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Independence County: There were 34 precincts in the election data, and 36 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Izard County: There were 47 precincts in the election data, and 45 in the shapefile, so we examined the data in QGIS in order to determine where splits were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. We were not able to split the data on the line that VEST had, as we did not have the same underlying file or other input files, so we merged the two precincts in question in the VEST file and aggregated the election results so they could be successfully joined. See the script for precinct names and changes.
- Jefferson County: There were 201 precincts in the election data, and 188 in the shapefile. VEST notes that a number of precincts (listed above in documentation) came from their 2016 Arkansas file. These were added to the 2018 file successfully.
- Madison County: There were 20 precincts in the election data and 10 in the shapefile. VEST notes that a number of precincts (listed above in documentation) came from their 2016 Arkansas file. These were added to the 2018 file successfully.
- Mississippi County: There were 20 precincts in the election data, and 54 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to

successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.

- Monroe County: There were 16 precincts in the election data, and 24 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Nevada County: There were 12 precincts in the election data, and 18 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- Ouachita County: There were 60 precincts in the election data and 18 in the shapefile. It was unclear based on names how to aggregate or merge the precincts in the shapefile, and nothing was included in VEST's documentation (likely due to this being a slightly different shapefile than the one they used) so we were unable to process the shapefile for this county and it was omitted from our shapefile validation process.
- Phillips County: There were 16 precincts in the election data and 44 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. There is also a precinct that VEST notes that was split (HWH Ward 3, see documentation above), but we did not have the correct file to split the precincts, so we un-did the split in the VEST data by merging the precincts back together. See the script for precinct names and changes.
- Poinsett County: There were 13 precincts in the election data and 41 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data to the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.
- St. Francis County: There were 15 precincts in the election data and 48 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to

	<p>successfully join the election data tot the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes.</p> <ul style="list-style-type: none"> ○ Stone County: The election data and the shapefile both had 19 precincts, however, there needed to be one merge made to the shapefile and one made to VEST and the election data in order to correctly merge. This was discovered through the joining process later on. For details on the merges see the script. (There are ultimately 18 precincts) ○ Washington County: There were 151 precincts in the election data and 154 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data tot the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes. ○ Johnson County: There were 11 precincts in the election data and 22 in the shapefile, so we examined the data in QGIS in order to determine where merges were needed to be made in order to successfully join the election data tot the shapefile, since these merges were not included in VEST documentation. See the script for precinct names and changes. ● After completing all of the necessary merges and removing Boone and Ouachita counties (due to their inability to align precinct numbers between election data and shapefiles), there were some name changes to precincts that needed to be made to join the election data and the shapefile: <ul style="list-style-type: none"> ○ After completing the merges and removing the two counties that we could not get the same number of precincts in for both the election data and shapefile there were 2,523 precincts. ○ The initial join only produced a merge of 708 precincts. ○ To improve the join rate, we performed a fuzzywuzzy string matching again, which produced 1,241 to join out of 2,523 ○ The remaining precincts were manually addressed to join all 2,523. To see all name changes, look at the dictionary in the script.
<p>Able to replicate joining demographic data to block-level shapefiles?</p>	<p>There is no demographic data on the file.</p>

<p>N/A</p>	
<p>Able to replicate joining boundary data?</p> <p>N/A</p>	<p>There is no boundary data on the file.</p>
<p>Successfully ran validation?</p> <p>No</p>	<p><u>Election results:</u> No</p> <ul style="list-style-type: none"> ● We validated election results at three different levels: <ul style="list-style-type: none"> ○ Statewide candidate vote totals: <ul style="list-style-type: none"> ■ At the statewide total, all candidate totals matched except the State Auditor’s race. The two candidates for State Auditor, Andrea Lea and David E Dinwiddie, have mismatching totals. See Table 1 below for more information. ○ Countywide candidate vote totals <ul style="list-style-type: none"> ■ At the county level, 73 of 75 counties matched perfectly for all candidates in all races. For two counties, Ouachita and Woodruff, all races matched except the two candidates for State Auditor, again. See Table 2 below for more information. ○ Precinct-level candidate votes <ul style="list-style-type: none"> ■ There were 2,375/2,617 precincts which matched all election results perfectly. ■ There were 2,526/2,617 precincts which matched all election results within one vote, this difference is likely due to rounding differences. ■ There were 86/2,617 precincts which had a difference greater than one vote. Most of these precincts are situated in the two counties highlighted in the county totals validation: Ouachita and Woodruff. All precincts in these two counties have inverse values (like the counties as a whole do as well) for the two candidates in the State Auditor’s race. There are also notable discrepancies in election results for Johnson County, this is likely due to the fact that the data we retrieved from Open Elections (and cross-checked with county data directly available from the Secretary of State), did not have any early voting/absentee/provisional precinct,

which VEST notes in their documentation. It is likely that how they allocated absentee/early/provisional votes is different from how our retrieved data had already been allocated.

Table 1.

Candidate Field	RDH Total	Partner Data Total	SOS	Difference (RDH & Partner)
G18AUDRLEA	624,525	621,772	621,772	2,753
G18AUDLDIN	235,126	237,602	237,602	2,476

Statewide SoS data:

https://results.enr.clarityelections.com/AR/92174/Web02-state.216038/#/c/C_2

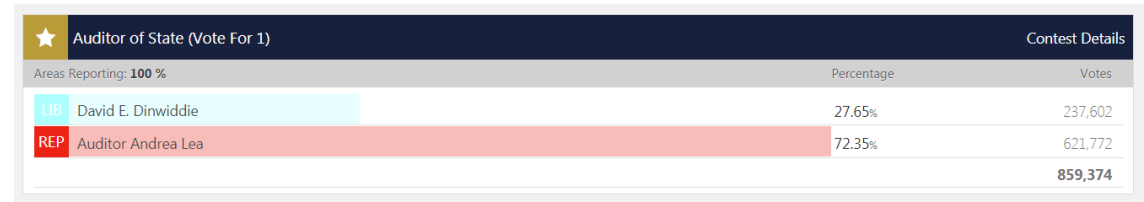


Table 2.

Candidate Field	RDH Total	Partner Data Total	SOS	Difference (RDH & Partner)
Woodruff G18AUDRLEA	1,369	631	1,369	738
Woodruff G18AUDLDIN	631	1,369	631	738
Ouachita G18AUDRLEA	2,543	4,558	2,543	2,015
Ouachita G18AUDLDIN	4,558	2,543	4,558	2,015

Ouachita SoS data:

<https://results.enr.clarityelections.com/AR/Ouachita/92227/Web02.221448/#/>

★ Auditor of State (Vote For 1)		Contest Details	
Precincts Reporting: 100%		Percentage	Votes
REP	Andrea Lea	64.19%	4,558
LIB	David Dinwiddie	35.81%	2,543
			7,101

Woodruff SoS data:

<https://results.enr.clarityelections.com/AR/Woodruff/92249/Web02.221448/#/>

★ Auditor of State (Vote For 1)		Contest Details	
Precincts Reporting: 100%		Percentage	Votes
REP	Andrea Lea	68.45%	1,369
LIB	David E. Dinwiddle	31.55%	631
			2,000

It appears as though there is a discrepancy between the county totals and the statewide totals on the Arkansas SoS website, which shows the statewide totals supporting VESTs statewide totals, however, the county-wide totals supporting the source data that we used (and is confirmed by the SoS results).

Geographies: No

- Out of 2,523 total precincts that we could run the validation on:
 - 2,353 precincts w/ a difference of 0 km²
 - 141 precincts w/ a difference between 0 and 0.1 km²
 - 18 precincts w/ a difference between 0.1 and 0.5 km²
 - 3 precincts w/ a difference between 0.5 and 1 km²
 - 2 precincts w/ a difference between 1 and 2 km²
 - 1 precincts w/ a difference between 2 and 5 km²
 - 5 precincts w/ a difference greater than 5 km²
- The notebook prints out all precincts with a difference greater than .5 km².