**VDSS\_ZIP\_FIPS\_BORDER\_STATUS\_FINAL\_DESIGNATION.R - README**

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**File Name: VDSS\_ZIP\_FIPS\_BORDER\_STATUS\_FINAL\_DESIGNATION.R**

**Purpose**

This script classifies ZIP codes in Virginia into categories based on their intersection with county boundaries and FIPS codes. Each ZIP code is assigned a classification of "Interior," "Bordering," "Overlapping," or "No Shapefile." The results are saved in an Excel file for further analysis.

**Overview**

The script processes ZIP code and county shapefiles to:

1. Intersect ZIP code boundaries with county boundaries.
2. Count the number of counties each ZIP code intersects.
3. Assign classifications to ZIP codes based on intersection results and FIPS codes.
4. Save the classified ZIP codes to an Excel file for further use.

**Datasets and Tools**

**Input Data:**

1. **VDSS\_Zip\_FIPS\_Border\_Population\_Filtered.xlsx:** Contains pre-filtered ZIP code and FIPS code data.
2. **TIGRIS Shapefiles:** Provides ZIP code (ZCTA) and county boundaries for Virginia.

**Output File:**

1. **VDSS\_Zip\_FIPS\_Border\_Status\_Final\_Designation.xlsx:** Final classification of ZIP codes by border status.

**Dependencies:**

* **R Libraries:**
  + dplyr: For data manipulation.
  + readxl: For reading Excel files.
  + tigris: For accessing TIGER/Line shapefiles.
  + sf: For handling spatial data.
  + future.apply: For parallel processing.
  + writexl: For writing Excel files.
  + progressr: For monitoring progress during processing.

**Script Functionality**

**1. Loading Data:**

* Reads pre-filtered ZIP code data and TIGRIS shapefiles for ZIP codes and counties in Virginia.
* Ensures all spatial data are transformed to CRS 4326 (WGS84) for consistency.

**2. Intersecting ZIP Codes with Counties:**

* Defines a function to intersect ZIP codes with county boundaries using sf spatial operations.
* Processes all intersections in parallel using future.apply with progress tracking.

**3. Counting County Intersections:**

* Identifies the number of unique counties each ZIP code intersects with.

**4. Classifying ZIP Codes:**

* Assigns classifications based on intersection results and FIPS codes:
  + **Interior:** Intersects with one county and has no secondary FIPS code.
  + **Bordering:** Intersects with multiple counties and has no secondary FIPS code.
  + **Overlapping:** Has a secondary FIPS code indicating overlap.
  + **No Shapefile:** Missing shapefile data or other issues.
* Renames the classification column to BORDER\_STATUS for clarity.

**5. Saving the Results:**

* Exports the final classification dataset to an Excel file for further analysis.

**File Output**

**VDSS\_Zip\_FIPS\_Border\_Status\_Final\_Designation.xlsx:**

* Includes ZIP codes and their classifications (Interior, Bordering, Overlapping, or No Shapefile).

**Usage**

1. Ensure all required R libraries are installed.
2. Place the input data files in the specified directories.
3. Execute the script in an R project environment.
4. Access the output file in the Data Outputs/VDSS\_Zip\_Border\_Status/ directory.

**Notes**

* Accurate and complete shapefiles and pre-filtered data are crucial for reliable results.
* Any discrepancies in the input datasets could affect the accuracy of the ZIP code classifications.