

# us\_diocese\_mapper\_V10\_tex

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## 1 US Diocese Mapper

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Code released under the MIT License

(The county\_shapes.csv, county\_shapes.geojson, state\_fips\_codes.csv, and counties\_by\_diocese.csv files are released into the public domain.)

The tileless maps (with a gray background) are released under the Creative Commons Attribution 4.0 license (CC-BY 4.0); I believe the ones with the Stamen Toner background may need to be released under a more restrictive license since they display OpenStreetMap data in the background, but I'm not sure. I would like to release those under a CC-BY 4.0 license as well if possible.

### 1.1 Note:

I plan to add in more documentation/comments in the near future.

## 2 Introduction and Overview

In this notebook, I will generate a map of US Latin rite Catholic dioceses, provinces, and cathedrals. I'll generate both interactive .HTML versions and static .PNG and .JPG versions of the map, along with several variants of the map. In order to create the map, I'll use a number of free and open-source tools and resources, including Python, Geojson.io, OpenStreetMaps, and Wikipedia.

### 2.1 Preliminary steps

First, I downloaded county shapefiles from the US Census bureau here:  
<https://www.census.gov/cgi-bin/geo/shapefiles/index.php?year=2021&layergroup=Counties+and+equivalents>

See this note regarding use of the shapefiles: [https://www2.census.gov/geo/pdfs/maps-data/data/tiger/tgrshp2021/TGRSHP2021\\_TechDoc\\_Ch1.pdf](https://www2.census.gov/geo/pdfs/maps-data/data/tiger/tgrshp2021/TGRSHP2021_TechDoc_Ch1.pdf)

Once you download the shapefiles to your computer, extract them using an unzipping utility. The shapefile document within this unzipped folder ends in .shp; for the 2021 county data, the file name is tl\_2021\_us\_county.shp.

It appears that the other files within this folder may also be used by Geopandas in the creation of GeoDataFrames, so I recommend accessing the file within the unzipped folder rather than copying it into your project folder.

Note: I used the diocese names on this list as the official names of almost all dioceses: <https://www.usccb.org/about/bishops-and-dioceses/all-dioceses> There are two exceptions: I use “Springfield in Massachusetts” instead of “Springfield, Massachusetts” and “St. Thomas” instead of “St. Thomas, VI.”

```
[ ]: import time
start_time = time.time()
import geopandas
import pandas as pd
import folium
import branca
import numpy as np
from selenium import webdriver
from selenium.webdriver.common.keys import Keys
# Source: https://selenium-python.readthedocs.io/getting-started.html
import PIL.Image
import IPython
```

```
[ ]: generate_county_list_and_boundaries = False # This cell determines whether
# or not to create a new table of county boundaries, along with province
# and diocesan boundaries based on those county boundaries. This should be
# set to True when generating the first batch of these boundaries; otherwise,
# it can generally be set to False, thus saving processing time.
extract_FIPS_codes_from_website = False # Useful if working offline (or if
# the website's layout changes in the future)
```

The following block converts county shapefile data into a GeoDataFrame (similar to a pandas DataFrame). In the process, it also merges in US state names by accessing a list of state FIPS codes from a government website.

```
[ ]: if generate_county_list_and_boundaries == True:

    shapefile_path = \
        r'C:\Users\kburc\Downloads\tl_2021_us_county_download\tl_2021_us_county.
    ↪shp'
    if extract_FIPS_codes_from_website == True:
        state_fips_codes = pd.read_html(
            'https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/
    ↪technical/nra/nri/results/?cid=nrcs143_013696')[0]
        # This resource contains both FIPS codes and state names. These state
        # names will then be merged into the county_shapes DataFrame below.
        state_fips_codes = state_fips_codes.iloc[0:55].copy()
        state_fips_codes['FIPS'] = state_fips_codes['FIPS'].astype('int')
        state_fips_codes.rename(columns={'Name':'State_Name',
            'Postal Code':'State_Code'},inplace=True)
        state_fips_codes.loc[55] = ['District of Columbia', 'DC', 11] # DC
    ↪wasn't
```

```

# present in the original webpage, so I added it in. I located its FIPS
↪code
# within the county shapefile dataset.
state_fips_codes.to_csv('state_fips_codes.csv', index = False)
else:
    state_fips_codes = pd.read_csv('state_fips_codes.csv')

county_shapes = geopandas.read_file(shapefile_path)

county_shapes.drop(['CLASSFP', 'MTFCC', 'CSAfp', 'CBSAfp', 'METDIVFP',
'FUNCSTAT', 'ALAND', 'AWATER', 'INTPTLAT', 'INTPTLON'],
axis = 1, inplace = True)
county_shapes['STATEFP'] = county_shapes['STATEFP'].astype('int')

merged_county_shapes = county_shapes.merge(state_fips_codes,
left_on = 'STATEFP', right_on = 'FIPS', how = 'left')
merged_county_shapes['county_state'] = merged_county_shapes[
    'NAMLSAD'] + ', ' + merged_county_shapes['State_Name']
# The county_state column will be a valuable resource, as each entry
# within this column is unique. (County names by themselves are not
# unique as multiple counties can share the same name.)

# The above line exports the GeoDataFrame created by prepare_zip_table
# so that it can be imported back into the program, which takes less time
# than does recreating the GeoDataFrame.

# merged_county_shapes.to_file('original_county_outlines.geojson')
# This file is over 200 MB in size.

df_dioceses = merged_county_shapes.copy()

else: # If generate_county_list_and_boundaries is set to false, the block
# simply reads in a saved copy of df_dioceses, along with two other
# DataFrames. (These DataFrames will get created later on if
# generate_county_list_and_boundaries is set to True.)
df_dioceses = geopandas.read_file('counties_by_diocese.geojson')
diocese_boundaries = geopandas.read_file('diocese_boundaries.geojson')
province_boundaries = geopandas.read_file('province_boundaries.geojson')

```

df\_dioceses can be in two different formats at this point depending on whether a new copy of df\_dioceses was created in the above cell. However, this will not interfere with the following code blocks.

[ ]: df\_dioceses.head(5)

	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMLSAD	LSAD	\
0	36	039	00974118	36039	Greene	Greene County	06	

```

1      36    025  00974111  36025  Delaware  Delaware County  06
2      36    091  00974143  36091  Saratoga  Saratoga County  06
3      36    001  00974099  36001  Albany    Albany County   06
4      36    043  00974120  36043  Herkimer Herkimer County  06

      State_Name State_Code  FIPS           county_state Diocese  \
0    New York          NY    36  Greene County, New York  Albany
1    New York          NY    36  Delaware County, New York  Albany
2    New York          NY    36  Saratoga County, New York  Albany
3    New York          NY    36  Albany County, New York  Albany
4    New York          NY    36  Herkimer County, New York  Albany

      Diocese_Detail Province_Detail  \
0            Albany        New York
1            Albany        New York
2            Albany        New York
3            Albany        New York
4  Albany, Ogdensburg        New York

      geometry  Province  \
0  POLYGON ((-74.04239 42.17039, -74.07480 42.096...  New York
1  POLYGON ((-74.78069 42.01637, -75.15150 41.849...  New York
2  POLYGON ((-73.67891 42.91221, -73.68447 42.891...  New York
3  POLYGON ((-73.96379 42.44162, -74.26347 42.407...  New York
4  POLYGON ((-74.74371 42.99941, -74.76330 42.863...  New York

      Diocese_Color_Code
0                  0
1                  0
2                  0
3                  0
4                  0

```

This project will focus on dioceses in states that belong to the US Conference of Catholic Bishops. Therefore, the following code block removes counties in other regions from df\_dioceses.

```
[ ]: regions_not_in_us_episcopal_conference = ['Puerto Rico', 'Guam', 'Northern Mariana Islands', 'American Samoa']
df_dioceses = df_dioceses.query(
    "State_Name not in @regions_not_in_us_episcopal_conference").copy()
```

## 2.2 Matching US Counties to Dioceses

The vast majority of U.S. counties belong to a single U.S. diocese. Therefore, in order to create a first draft of my US dioceses map, I'll first assign each U.S. county to a particular diocese.

```
[ ]: df_dioceses['Diocese'] = 'Not_Set'
```

I'll first assign all counties in each U.S. state to a particular diocese, which will be faster than manually assigning all counties in a state to all dioceses in that state. I'll complete this operation using np.select. In order for this code to work, it's crucial that the lists of states and dioceses are in the same order.

```
[ ]: condlist = [
df_dioceses['State_Name'] == 'Alabama',
df_dioceses['State_Name'] == 'Alaska',
df_dioceses['State_Name'] == 'Arizona',
df_dioceses['State_Name'] == 'Arkansas',
df_dioceses['State_Name'] == 'California',
df_dioceses['State_Name'] == 'Colorado',
df_dioceses['State_Name'] == 'Connecticut',
df_dioceses['State_Name'] == 'Delaware',
df_dioceses['State_Name'] == 'Florida',
df_dioceses['State_Name'] == 'Georgia',
df_dioceses['State_Name'] == 'Hawaii',
df_dioceses['State_Name'] == 'Idaho',
df_dioceses['State_Name'] == 'Illinois',
df_dioceses['State_Name'] == 'Indiana',
df_dioceses['State_Name'] == 'Iowa',
df_dioceses['State_Name'] == 'Kansas',
df_dioceses['State_Name'] == 'Kentucky',
df_dioceses['State_Name'] == 'Louisiana',
df_dioceses['State_Name'] == 'Maine',
df_dioceses['State_Name'] == 'Maryland',
df_dioceses['State_Name'] == 'Massachusetts',
df_dioceses['State_Name'] == 'Michigan',
df_dioceses['State_Name'] == 'Minnesota',
df_dioceses['State_Name'] == 'Mississippi',
df_dioceses['State_Name'] == 'Missouri',
df_dioceses['State_Name'] == 'Montana',
df_dioceses['State_Name'] == 'Nebraska',
df_dioceses['State_Name'] == 'Nevada',
df_dioceses['State_Name'] == 'New Hampshire',
df_dioceses['State_Name'] == 'New Jersey',
df_dioceses['State_Name'] == 'New Mexico',
df_dioceses['State_Name'] == 'New York',
df_dioceses['State_Name'] == 'North Carolina',
df_dioceses['State_Name'] == 'North Dakota',
df_dioceses['State_Name'] == 'Ohio',
df_dioceses['State_Name'] == 'Oklahoma',
df_dioceses['State_Name'] == 'Oregon',
df_dioceses['State_Name'] == 'Pennsylvania',
df_dioceses['State_Name'] == 'Rhode Island',
df_dioceses['State_Name'] == 'South Carolina',
df_dioceses['State_Name'] == 'South Dakota',
df_dioceses['State_Name'] == 'Tennessee',
```

```

df_dioceses['State_Name'] == 'Texas',
df_dioceses['State_Name'] == 'Utah',
df_dioceses['State_Name'] == 'Vermont',
df_dioceses['State_Name'] == 'Virginia',
df_dioceses['State_Name'] == 'Washington',
df_dioceses['State_Name'] == 'West Virginia',
df_dioceses['State_Name'] == 'Wisconsin',
df_dioceses['State_Name'] == 'Wyoming',
df_dioceses['State_Name'] == 'District of Columbia',
df_dioceses['State_Name'] == 'Virgin Islands'
]

```

I generally chose to assign all counties in a given state to the diocese that appeared to encompass the highest number of counties in that state. However, if information on which counties belonged to a given diocese was lacking, I sometimes chose to assign all counties to that diocese instead. That way, I could determine that diocese's counties by assigning all of the state's other counties to its other dioceses.

```

[ ]: choicelist = [
    # df_dioceses['State_Name'] == 'Alabama',
    'Mobile',

    # df_dioceses['State_Name'] == 'Alaska',
    'Fairbanks',

    # df_dioceses['State_Name'] == 'Arizona',
    'Phoenix',

    # df_dioceses['State_Name'] == 'Arkansas',
    'Little Rock', # Statewide diocese

    # df_dioceses['State_Name'] == 'California',
    'Los Angeles',

    # df_dioceses['State_Name'] == 'Colorado',
    'Pueblo',

    # df_dioceses['State_Name'] == 'Connecticut',
    'Norwich',

    # df_dioceses['State_Name'] == 'Delaware',
    'Wilmington', # Statewide diocese

    # df_dioceses['State_Name'] == 'Florida',
    'Orlando',
]

```

```

# df_dioceses['State_Name'] == 'Georgia',
'Savannah',

# df_dioceses['State_Name'] == 'Hawaii',
'Honolulu', # Statewide diocese

# df_dioceses['State_Name'] == 'Idaho',
'Boise', #Statewide diocese

# df_dioceses['State_Name'] == 'Illinois',
'Peoria',

# df_dioceses['State_Name'] == 'Indiana',
'Indianapolis',

# df_dioceses['State_Name'] == 'Iowa',
'Dubuque',

# df_dioceses['State_Name'] == 'Kansas',
'Salina',

# df_dioceses['State_Name'] == 'Kentucky',
'Lexington',

# df_dioceses['State_Name'] == 'Louisiana',
'Shreveport',

# df_dioceses['State_Name'] == 'Maine',
'Portland in Maine', # Statewide diocese

# df_dioceses['State_Name'] == 'Maryland',
'Wilmington',

# df_dioceses['State_Name'] == 'Massachusetts',
'Boston',

# df_dioceses['State_Name'] == 'Michigan',
'Marquette',

# df_dioceses['State_Name'] == 'Minnesota',
'Duluth',

# df_dioceses['State_Name'] == 'Mississippi',
'Jackson',

# df_dioceses['State_Name'] == 'Missouri',
'Springfield-Cape Girardeau',

```

```

# df_dioceses['State_Name'] == 'Montana',
'Helena',

# df_dioceses['State_Name'] == 'Nebraska',
'Grand Island',

# df_dioceses['State_Name'] == 'Nevada',
'Reno',

# df_dioceses['State_Name'] == 'New Hampshire',
'Manchester', # Statewide diocese

# df_dioceses['State_Name'] == 'New Jersey',
'Camden',

# df_dioceses['State_Name'] == 'New Mexico',
'Santa Fe',

# df_dioceses['State_Name'] == 'New York',
'Albany',

# df_dioceses['State_Name'] == 'North Carolina',
'Raleigh',

# df_dioceses['State_Name'] == 'North Dakota',
'Fargo',

# df_dioceses['State_Name'] == 'Ohio',
'Columbus',

# df_dioceses['State_Name'] == 'Oklahoma',
'Oklahoma City',

# df_dioceses['State_Name'] == 'Oregon',
'Portland in Oregon',

# df_dioceses['State_Name'] == 'Pennsylvania',
'Erie',

# df_dioceses['State_Name'] == 'Rhode Island',
'Providence', # Statewide diocese

# df_dioceses['State_Name'] == 'South Carolina',
'Charleston', # Statewide diocese

# df_dioceses['State_Name'] == 'South Dakota',

```

```

'Sioux Falls',

# df_dioceses['State_Name'] == 'Tennessee',
'Nashville',

# df_dioceses['State_Name'] == 'Texas',
'Lubbock',

# df_dioceses['State_Name'] == 'Utah',
'Salt Lake City', # Statewide Diocese

# df_dioceses['State_Name'] == 'Vermont',
'Burlington', # Statewide diocese

# df_dioceses['State_Name'] == 'Virginia',
'Richmond',

# df_dioceses['State_Name'] == 'Washington',
'Seattle',

# df_dioceses['State_Name'] == 'West Virginia',
'Wheeling-Charleston', # Statewide diocese

# df_dioceses['State_Name'] == 'Wisconsin',
'La Crosse',

# df_dioceses['State_Name'] == 'Wyoming',
'Cheyenne', # Statewide diocese

# df_dioceses['State_Name'] == 'District of Columbia',
'Washington',

# df_dioceses['State_Name'] == 'Virgin Islands'
'St. Thomas'

]

```

[ ]: df\_dioceses['Diocese'] = np.select(condlist, choicelist, df\_dioceses['Diocese'])  
*# https://numpy.org/doc/stable/reference/generated/numpy.select.html*

[ ]: len(df\_dioceses) # The number of counties within the DataFrame

[ ]: 3146

Currently, all counties within a given state are assigned to the same diocese in the ‘Diocese’ column. (If df\_dioceses was loaded in from a saved file, it will also contain a ‘Diocese\_Detail’ column with the actual diocese(s) to which that county belongs. This column will be created and/or modified later.)

[ ]: df_dioceses																		
[ ]:	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMESAD	LSAD	\										
0	31	039	00835841	31039	Cuming	Cuming County	06											
1	53	069	01513275	53069	Wahkiakum	Wahkiakum County	06											
2	35	011	00933054	35011	De Baca	De Baca County	06											
3	31	109	00835876	31109	Lancaster	Lancaster County	06											
4	31	129	00835886	31129	Nuckolls	Nuckolls County	06											
...	...	...	...	...	...	...	...	\										
3141	13	123	00351260	13123	Gilmer	Gilmer County	06											
3142	27	135	00659513	27135	Roseau	Roseau County	06											
3143	28	089	00695768	28089	Madison	Madison County	06											
3144	48	227	01383899	48227	Howard	Howard County	06											
3145	54	099	01550056	54099	Wayne	Wayne County	06											
State_Name State_Code FIPS county_state \																		
0	Nebraska	NE	31	Cuming County, Nebraska														
1	Washington	WA	53	Wahkiakum County, Washington														
2	New Mexico	NM	35	De Baca County, New Mexico														
3	Nebraska	NE	31	Lancaster County, Nebraska														
4	Nebraska	NE	31	Nuckolls County, Nebraska														
...	...	...	...	...														
3141	Georgia	GA	13	Gilmer County, Georgia														
3142	Minnesota	MN	27	Roseau County, Minnesota														
3143	Mississippi	MS	28	Madison County, Mississippi														
3144	Texas	TX	48	Howard County, Texas														
3145	West Virginia	WV	54	Wayne County, West Virginia														
Diocese Diocese_Detail Province_Detail \																		
0	Grand Island				Omaha	Omaha												
1	Seattle				Seattle	Seattle												
2	Santa Fe				Santa Fe	Santa Fe												
3	Grand Island				Lincoln	Omaha												
4	Grand Island				Lincoln	Omaha												
...	...				...	...												
3141	Savannah				Atlanta	Atlanta												
3142	Duluth				Crookston	St. Paul and Minneapolis												
3143	Jackson				Jackson	Mobile												
3144	Lubbock				San Angelo	San Antonio												
3145	Wheeling-Charleston	Wheeling-Charleston			Baltimore													
Province \																		
0	Omaha																	
1	Seattle																	
2	Santa Fe																	
3	Omaha																	
4	Omaha																	

```

...
3141          Atlanta
3142 St. Paul and Minneapolis
3143          Mobile
3144          San Antonio
3145          Baltimore

                           geometry
0    POLYGON ((-96.55515 41.91587, -96.55517 41.742...
1    POLYGON ((-123.49077 46.38358, -123.21795 46.3...
2    POLYGON ((-104.38368 34.69213, -104.33973 34.6...
3    POLYGON ((-96.68140 41.04566, -96.46387 41.045...
4    POLYGON ((-98.04802 40.35066, -97.82082 40.350...

...
3141 POLYGON ((-84.30237 34.57832, -84.32878 34.583...
3142 POLYGON ((-95.25857 48.88666, -95.23104 48.881...
3143 POLYGON ((-90.14883 32.40026, -90.24376 32.400...
3144 POLYGON ((-101.18138 32.21252, -101.18400 32.0...
3145 POLYGON ((-82.30872 38.28106, -82.31149 38.256...

```

[3146 rows x 16 columns]

```
[ ]: initial_version_of_df_dioceses = \
df_dioceses.copy() # Will be compared to a later version of df_dioceses
```

It's now time to assign the counties in df\_dioceses to their actual dioceses. To speed this process up, I'll define a function below that will allow me to simultaneously assign a list of counties to a given diocese.

```
[ ]: def add_dioceses(df, county_list, state, diocese):
    # Updates the 'Diocese' value within df_dioceses for a list
    # of counties in a given state. If a diocese spans
    # multiple states, this function will need to be called once for each
    # state.
    # If a given 'county' variable does not have any spaces,
    # the loop below will add ' County' to that string before
    # adding in the state. Otherwise, the code assumes that the 'county' is
    # either a non-county (e.g. a municipality, city, census area, parish,
    # or borough), and will only add the state to this string.
    # Therefore, in order to run this function successfully, enter the
    # area designation (county, city, etc.) after all non-counties and
    # counties with more than one word when building the county list.
    # However, you don't need to add in 'County' for counties with only
    # one word.
    for county in county_list:
        if ' ' not in county:
            county_string = county + ' County, ' + state
```

```

    else:
        county_string = county + ', ' + state
    if county_string not in df.index:
        raise ValueError(county_string, "not found in index")
    df.at[county_string, 'Diocese'] = diocese
    # https://pandas.pydata.org/docs/reference/api/pandas.DataFrame.at.html
    # df.at updates the 'Diocese' value for a given county_string. For
    # this function to work, the DataFrame's index must be set to
    # county_string.
return df

```

## 2.3 Assigning Dioceses' Counties to Those Dioceses

The following loooooong code block uses add\_dioceses() to update the diocese listings for most counties in the US. (Some counties are already assigned to their correct diocese, so those won't need to be modified here.)

Writing this code block required me to determine which counties belonged to which U.S. diocese. I relied mostly on Wikipedia for this information, although I also referenced diocesan websites where needed. Wikipedia pages for different dioceses sometimes disagreed with one another regarding diocesan county affiliation, and this even proved to be the case for some diocesan websites also. Therefore, the county listings created by this code block may be inaccurate at times.

I also learned through this process that some counties are in multiple dioceses and even multiple provinces. Within this code block, I resolved this issue by assigning those counties to the dioceses that appeared to encompass the largest proportion of the counties, but this was only a temporary fix. Later on, I edited the diocesan and provincial boundaries using geojson.io to make them more accurate.

I also relied on the following listing of U.S. dioceses: [https://en.wikipedia.org/wiki/List\\_of\\_Catholic\\_dioceses\\_in\\_United\\_States](https://en.wikipedia.org/wiki/List_of_Catholic_dioceses_in_United_States)

```
[ ]: df_dioceses.set_index('county_state', drop = False, inplace = True) # This
# temporary change is made to facilitate the use of df.at within the
# add_dioceses function. The county_state column is retained for later use.

# Archdiocese of Anchorage-Juneau:
# Source: Wikipedia province map

anchorage_juneau_county_list = [
'Aleutians West Census Area',
'Aleutians East Borough', 'Lake and Peninsula Borough',
'Bristol Bay Borough', 'Dillingham Census Area', 'Kodiak Island Borough',
'Kenai Peninsula Borough', 'Chugach Census Area', 'Yakutat City and Borough',
'Aleutians West Census Area', 'Hoonah-Angoon Census Area',
'Petersburg Borough', 'Wrangell City and Borough', 'Ketchikan Gateway Borough',
'Prince of Wales-Hyder Census Area', 'Sitka City and Borough',
'Copper River Census Area', 'Matanuska-Susitna Borough',
'Anchorage Municipality', 'Juneau City and Borough', 'Skagway Municipality',
'Haines Borough'
```

```

]

# In the following line of code, add_dioceses will go through each county
# (or, in this case, county equivalent) in anchorage_juneau_county list
# and set its 'Diocese' value within df_dioceses to Anchorage-Juneau.
df_dioceses = add_dioceses(df_dioceses,
anchorage_juneau_county_list, state = 'Alaska', diocese = 'Anchorage-Juneau')

# Archdiocese of Atlanta:
# (Source: Diocesan website: https://archatl.com/about/
# ↪about-the-archdiocese-of-atlanta/)

# This site noted the counties within the Archdiocese of Atlanta that border
# the Diocese of Savannah. I entered in those counties first, then added in
# all other counties to the north of those.

atlanta_county_list = [
'Gilmer', 'Carroll', 'Douglas', 'Clayton', 'Spalding', 'Henry', 'Rockdale',
'Oconee', 'Barrow', 'Jackson', 'Madison', 'Elbert', 'Rabun', 'Towns',
'Union', 'Fannin', 'Murray', 'Catoosa', 'Whitfield', 'Dade', 'Walker',
'Chattooga', 'Gordon', 'Pickens', 'Dawson', 'Lumpkin', 'White', 'Habersham',
'Stephens', 'Hart', 'Franklin', 'Banks', 'Hall', 'Forsyth', 'Fulton',
'Cherokee', 'Bartow', 'Floyd', 'Polk', 'Haralson', 'Paulding', 'Cobb',
'DeKalb', 'Gwinnett', 'Walton', 'Clarke', 'Oglethorpe', 'Coweta', 'Wilkes',
'Coweta', 'Taliaferro', 'Greene', 'Morgan', 'Coweta', 'Newton', 'Butts',
'Lamar', 'Pike', 'Coweta', 'Fayette', 'Coweta', 'Heard', 'Troup', 'Meriwether',
'Upson', 'Monroe', 'Jasper', 'Putnam', 'Baldwin', 'Hancock', 'Warren',
'McDuffie', 'Lincoln'
]
df_dioceses = add_dioceses(df_dioceses,
atlanta_county_list, state = 'Georgia', diocese = 'Atlanta')

# # Diocese of Charlotte:
# Source: https://web.archive.org/web/20110504140939/http://www.
# ↪charlottediocese.org/atlasofthediocese.html (See also:
# https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Charlotte#/media/File:
# ↪Diocese_of_Charlotte.jpg)

charlotte_county_list = [
'Richmond', 'Montgomery', 'Randolph', 'Guilford', 'Rockingham', 'Mecklenburg',
'Davie', 'Yadkin', 'Surry', 'Alleghany', 'Wilkes', 'Iredell', 'Catawba',
'Lincoln', 'Gaston', 'Cleveland', 'Stokes', 'Forsyth', 'Davidson', 'Rowan',
'Stanly', 'Anson', 'Union', 'Cabarrus', 'Cherokee', 'Graham', 'Swain',
'Haywood', 'Madison', 'Ashe', 'Watauga', 'Caldwell', 'Alexander', 'Burke',
'McDowell', 'Rutherford', 'Polk', 'Henderson', 'Buncombe', 'Yancey', 'Mitchell',
'Clay', 'Macon', 'Jackson', 'Transylvania', 'Avery'
]
df_dioceses = add_dioceses(df_dioceses,
charlotte_county_list, state = 'North Carolina', diocese = 'Charlotte')

```

```

# Archdiocese of Baltimore:
# https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_Baltimore

baltimore_county_list = [
'Anne Arundel County', 'Baltimore', 'Carroll', 'Frederick', 'Garrett',
'Harford', 'Howard', 'Washington', 'Baltimore city', 'Allegany'
]
df_dioceses = add_dioceses(df_dioceses,
baltimore_county_list, state = 'Maryland', diocese = 'Baltimore')

# Diocese of Arlington:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Arlington

arlington_county_list = [
'Arlington', 'Clarke', 'Culpeper', 'Fairfax', 'Fauquier', 'Frederick',
'King George County', 'Lancaster', 'Loudoun', 'Madison', 'Northumberland',
'Orange', 'Page', 'Prince William County', 'Rappahannock', 'Richmond',
'Shenandoah', 'Spotsylvania', 'Stafford', 'Warren', 'Westmoreland',
'Alexandria city', 'Falls Church city', 'Fairfax city', 'Fredericksburg city',
'Manassas city', 'Manassas Park city', 'Winchester city'
]
df_dioceses = add_dioceses(df_dioceses,
arlington_county_list, state = 'Virginia', diocese = 'Arlington')

# Archdiocese of Washington:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_Washington
# Note that the Archdiocese of Washington includes a number of counties
# in Maryland, which will be added here. The District of Columbia is already
# listed as belonging to the Diocese of Washington.
washington_county_list = [
'Calvert', 'Charles', 'Montgomery',
"Prince George's County", "St. Mary's County"
]
df_dioceses = add_dioceses(df_dioceses,
washington_county_list, state = 'Maryland', diocese = 'Washington')

# Diocese of Fall River:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Fall_River

fall_river_county_list = [
'Barnstable', 'Bristol', 'Dukes', 'Nantucket'
]
df_dioceses = add_dioceses(df_dioceses,
fall_river_county_list, state = 'Massachusetts', diocese = 'Fall River')

```

```

# Diocese of Springfield in Massachusetts:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Springfield\_in\_Massachusetts

springfield_in_massachusetts_county_list = [
'Berkshire', 'Franklin', 'Hampshire', 'Hampden'
]
df_dioceses = add_dioceses(df_dioceses,
springfield_in_massachusetts_county_list, state = 'Massachusetts', diocese =
'Springfield in Massachusetts')

# Diocese of Worcester:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Worcester

df_dioceses.at[
"Worcester County, Massachusetts", 'Diocese'] = 'Worcester'
# The Diocese of Worcester includes only one county, so it can
# be added directly to the DataFrame.

# Archdiocese of Chicago:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Archdiocese\_of\_Chicago

chicago_county_list = [
'Cook', 'Lake'
]
df_dioceses = add_dioceses(df_dioceses,
chicago_county_list, state = 'Illinois', diocese =
'Chicago')

# Diocese of Belleville:
# I couldn't find a list of counties on the diocese's website
# or on the Diocese's Wikipedia page, so I based the county
# list off this map:
# https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Belleville#/media/File:Diocese\_of\_Belleville\_map\_1.png

belleville_county_list = [
"St. Clair County", "Clinton", "Marion", "Clay", "Richland", "Lawrence",
"Wabash", "Edwards", "Wayne", "Monroe", "Washington", "Jefferson", "Hamilton",
"White", "Gallatin", "Saline", "Williamson", "Jackson", "Union", "Johnson",
"Pope", "Massac", "Pulaski", "Alexander", "Randolph", "Perry", "Franklin",
"Hardin"
]
df_dioceses = add_dioceses(df_dioceses,
belleville_county_list, state = 'Illinois', diocese =
'Belleville')

```

```

# Diocese of Joliet:
# Source: Roman\_Catholic\_Diocese\_of\_Joliet\_in\_Illinois

joliet_county_list = [
    "DuPage", "Ford", "Grundy", "Iroquois", "Kankakee", "Kendall", "Will"
]
df_dioceses = add_dioceses(df_dioceses,
joliet_county_list, state = 'Illinois', diocese =
'Joliet')

# Diocese of Rockford:
# Source: Roman\_Catholic\_Diocese\_of\_Rockford

rockford_county_list = [
    "Boone", "Carroll", "DeKalb", "Jo Daviess County", "Kane", "Lee", "McHenry",
    "Ogle", "Stephenson", "Whiteside", "Winnebago"
]
df_dioceses = add_dioceses(df_dioceses,
rockford_county_list, state = 'Illinois', diocese =
'Rockford')

springfield_in_illinois_county_list = [
    "Adams", "Bond", "Brown", "Calhoun", "Cass", "Christian", "Clark", "Coles",
    "Crawford", "Cumberland", "Douglas", "Edgar", "Effingham", "Fayette", "Greene",
    "Jasper", "Jersey", "Macon", "Macoupin", "Madison", "Menard", "Moultrie",
    "Montgomery", "Morgan", "Pike", "Sangamon", "Scott", "Shelby"
]
df_dioceses = add_dioceses(df_dioceses,
springfield_in_illinois_county_list, state = 'Illinois', diocese =
'Springfield in Illinois')

# Archdiocese of Cincinnati:
# Source: catholicaoc.org/about/geography

cincinnati_county_list = [
    'Mercer', 'Auglaize', 'Logan', 'Darke', 'Shelby', 'Miami', 'Clark', 'Preble',
    'Montgomery', 'Greene', 'Butler', 'Warren', 'Clinton', 'Hamilton', 'Clermont',
    'Brown', 'Highland', 'Adams', 'Champaign'
]
df_dioceses = add_dioceses(df_dioceses,
cincinnati_county_list, state = 'Ohio', diocese =
'Cincinnati')

# Diocese of Cleveland:
# Source: Roman\_Catholic\_Diocese\_of\_Cleveland
cleveland_county_list = [

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'Ashland', 'Cuyahoga', 'Geauga', 'Lake', 'Lorain',
'Medina', 'Summit', 'Wayne'
]
df_dioceses = add_dioceses(df_dioceses,
cleveland_county_list, state = 'Ohio', diocese =
'Cleveland')

# Diocese of Steubenville:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Steubenville
steubenville_county_list = [
'Athens', 'Belmont', 'Carroll', 'Gallia', 'Guernsey', 'Harrison', 'Jefferson',
'Lawrence', 'Meigs', 'Morgan', 'Monroe', 'Noble', 'Washington'
]
df_dioceses = add_dioceses(df_dioceses,
steubenville_county_list, state = 'Ohio', diocese =
'Steubenville')

# Diocese of Toledo:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Toledo

toledo_county_list = [
'Allen', 'Crawford', 'Defiance', 'Erie', 'Fulton',
'Hancock', 'Henry', 'Huron', 'Lucas', 'Ottawa', 'Paulding', 'Putnam',
'Richland', 'Sandusky', 'Seneca', 'Van Wert County', 'Williams', 'Wood',
'Wyandot'
]
df_dioceses = add_dioceses(df_dioceses,
toledo_county_list, state = 'Ohio', diocese =
'Toledo')

# Diocese of Youngstown:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Youngstown

youngstown_county_list = [
'Mahoning', 'Trumbull', 'Columbiana', 'Stark', 'Portage', 'Ashtabula'
]
df_dioceses = add_dioceses(df_dioceses,
youngstown_county_list, state = 'Ohio', diocese =
'Youngstown')

# Archdiocese of Denver:
# Source: https://archden.org/wp-content/uploads/2021/11/2021\_media\_kit\_updated\_11-3-21.pdf
# This source incorrectly spells Broomfield County as
# 'Bromfield.'

denver_county_list = [

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'Adams', 'Arapahoe', 'Boulder', 'Broomfield',
'Clear Creek County', 'Denver', 'Eagle', 'Garfield',
'Gilpin', 'Grand', 'Jackson', 'Jefferson', 'Larimer',
'Logan', 'Moffat', 'Morgan', 'Phillips', 'Pitkin',
'Rio Blanco County', 'Routt', 'Sedgwick', 'Summit',
'Washington', 'Weld', 'Yuma'
]
df_dioceses = add_dioceses(df_dioceses,
denver_county_list, state = 'Colorado', diocese =
'Denver')

# Diocese of Colorado Springs:
# Source: Roman\_Catholic\_Diocese\_of\_Colorado\_Springs

colorado_springs_county_list = [
'Chaffee', 'Lake', 'Park', 'Teller', 'Douglas',
'El Paso County', 'Elbert', 'Lincoln',
'Kit Carson County', 'Cheyenne'
]
df_dioceses = add_dioceses(df_dioceses,
colorado_springs_county_list, state = 'Colorado', diocese =
'Colorado Springs')

# Archdiocese of Detroit:
# Source: Roman\_Catholic\_Archdiocese\_of\_Detroit

detroit_county_list = [
'Lapeer', 'Macomb', 'Monroe', 'Oakland', 'St. Clair County', 'Wayne'
]
df_dioceses = add_dioceses(df_dioceses,
detroit_county_list, state = 'Michigan', diocese =
'Detroit')

# Diocese of Gaylord:
# Source: Roman\_Catholic\_Diocese\_of\_Gaylord

gaylord_county_list = [
'Charlevoix', 'Emmet', 'Cheboygan', 'Presque Isle County',
'Leelanau', 'Antrim', 'Otsego', 'Montmorency', 'Alpena', 'Benzie',
'Grand Traverse County', 'Kalkaska', 'Crawford', 'Oscoda', 'Alcona',
'Manistee', 'Wexford', 'Missaukee', 'Roscommon', 'Ogemaw', 'Iosco'
]
df_dioceses = add_dioceses(df_dioceses,
gaylord_county_list, state = 'Michigan', diocese =

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'Gaylord')

# Diocese of Grand Rapids:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Grand_Rapids

grand_rapids_county_list = [
    'Ottawa', 'Kent', 'Ionia', 'Muskegon', 'Newaygo', 'Oceana',
    'Montcalm', 'Mecosta', 'Lake', 'Mason', 'Osceola'
]
df_dioceses = add_dioceses(df_dioceses,
    grand_rapids_county_list, state = 'Michigan', diocese =
    'Grand Rapids')


# Diocese of Kalamazoo:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Kalamazoo
kalamazoo_county_list = [
    'Allegan', 'Barry', 'Van Buren County', 'Kalamazoo', 'Calhoun',
    'Berrien', 'Cass', 'St. Joseph County', 'Branch'
]
df_dioceses = add_dioceses(df_dioceses,
    kalamazoo_county_list, state = 'Michigan', diocese =
    'Kalamazoo')


# Diocese of Lansing:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Lansing

lansing_county_list = [
    'Clinton', 'Eaton', 'Genesee', 'Hillsdale', 'Ingham', 'Jackson',
    'Lenawee', 'Livingston', 'Shiawassee', 'Washtenaw'
]
df_dioceses = add_dioceses(df_dioceses,
    lansing_county_list, state = 'Michigan', diocese =
    'Lansing')


# Diocese of Saginaw:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Saginaw
saginaw_county_list = [
    'Arenac', 'Bay', 'Clare', 'Gladwin', 'Gratiot', 'Huron', 'Isabella',
    'Midland', 'Saginaw', 'Sanilac', 'Tuscola']

df_dioceses = add_dioceses(df_dioceses,
    saginaw_county_list, state = 'Michigan', diocese =
    'Saginaw')


# Diocese of Davenport:

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# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Davenport
# See also:
# https://d2y1pz2y630308.cloudfront.net/13543/documents/2020/8/
# ↪Parishes%20Map%207-1-20.pdf
davenport_county_list = [
    'Jasper', 'Poweshiek', 'Iowa', 'Johnson', 'Cedar', 'Clinton', 'Marion',
    'Monroe', 'Appanoose', 'Mahaska', 'Wapello', 'Davis', 'Keokuk',
    'Washington', 'Muscatine', 'Scott', 'Louisa', 'Des Moines County',
    'Henry', 'Lee', 'Van Buren County', 'Jefferson']

df_dioceses = add_dioceses(df_dioceses,
    davenport_county_list, state = 'Iowa', diocese =
    'Davenport')

# Diocese of Sioux City:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Sioux_City#/media/File:Diocese_of_Sioux_City.jpg

sioux_city_county_list = [
    'Boone', 'Greene', 'Carroll', 'Crawford', 'Monona', 'Webster', 'Humboldt',
    'Kossuth', 'Dickinson', 'Lyon', 'Sioux', 'Plymouth', 'Woodbury', 'Osceola',
    'Emmet', "O'Brien", 'Clay', 'Palo Alto County', 'Cherokee',
    'Buena Vista County', 'Pocahontas', 'Ida', 'Sac', 'Calhoun'
]
df_dioceses = add_dioceses(df_dioceses,
    sioux_city_county_list, state = 'Iowa', diocese =
    'Sioux City')

# Diocese of Des Moines:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Des_Moines#/media/File:Diocese_of_Des_Moines.jpg

des_moines_county_list = [
    'Harrison', 'Shelby', 'Audubon', 'Guthrie', 'Dallas', 'Polk',
    'Pottawattamie', 'Cass', 'Adair', 'Madison', 'Warren', 'Mills',
    'Montgomery', 'Adams', 'Union', 'Clarke', 'Lucas', 'Fremont',
    'Page', 'Taylor', 'Ringgold', 'Decatur', 'Wayne'
]
df_dioceses = add_dioceses(df_dioceses,
    des_moines_county_list, state = 'Iowa', diocese =
    'Des Moines')

# Archdiocese of Galveston-Houston:
# Source: https://en.wikipedia.org/wiki/
# ↪Roman_Catholic_Archdiocese_of_Galveston%20Houston
galveston_houston_county_list = [
    'Galveston', 'Harris', 'Austin', 'Brazoria', 'Fort Bend County', 'Grimes',

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'Montgomery', 'San Jacinto County', 'Walker', 'Waller']

df_dioceses = add_dioceses(df_dioceses,
galveston_houston_county_list, state = 'Texas', diocese =
'Galveston-Houston')

# Diocese of Austin:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Austin
austin_county_list = [
'Bastrop', 'Bell', 'Blanco', 'Brazos', 'Burleson', 'Burnet', 'Caldwell',
'Coryell', 'Falls', 'Hamilton', 'Hays', 'Lampasas', 'Lee', 'Limestone',
'Llano', 'Mason', 'McLennan', 'Milam', 'Mills', 'Robertson', 'San Saba County',
'Travis', 'Washington', 'Williamson'
]

df_dioceses = add_dioceses(df_dioceses,
austin_county_list, state = 'Texas', diocese =
'Austin')

# Diocese of Beaumont:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Beaumont

beaumont_county_list = [
'Chambers', 'Hardin', 'Jasper', 'Jefferson', 'Liberty', 'Newton', 'Orange',
'Polk', 'Tyler'
]
df_dioceses = add_dioceses(df_dioceses,
beaumont_county_list, state = 'Texas', diocese =
'Beaumont')

# Diocese of Brownsville:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Brownsville
brownsville_county_list = [
'Starr', 'Willacy', 'Hidalgo', 'Cameron'
]
df_dioceses = add_dioceses(df_dioceses,
brownsville_county_list, state = 'Texas', diocese =
'Brownsville')

# Diocese of Corpus Christi:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Corpus\_Christi

corpus_christi_county_list = [
'Aransas', 'Bee', 'Brooks', 'Duval', 'Jim Wells County', 'Kenedy', 'Kleberg',
'Live Oak County', 'Nueces', 'Refugio', 'San Patricio County'
]

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```

df_dioceses = add_dioceses(df_dioceses,
corpus_christi_county_list, state = 'Texas', diocese =
'Corpus Christi')

# Diocese of Tyler:
# Source: Roman\_Catholic\_Diocese\_of\_Tyler

tyler_county_list = ['Anderson', 'Angelina', 'Bowie', 'Camp', 'Cass',
'Cherokee', 'Delta', 'Franklin', 'Freestone', 'Gregg', 'Harrison',
'Henderson', 'Hopkins', 'Houston', 'Lamar', 'Leon', 'Madison', 'Marion',
'Morris', 'Nacogdoches', 'Panola', 'Rains', 'Red River County', 'Rusk',
'Sabine', 'San Augustine County', 'Shelby', 'Smith', 'Titus', 'Trinity',
'Upshur', 'Van Zandt County', 'Wood']

df_dioceses = add_dioceses(df_dioceses,
tyler_county_list, state = 'Texas', diocese =
'Tyler')

# Diocese of Victoria:
# Source: Roman\_Catholic\_Diocese\_of\_Victoria\_in\_Texas

victoria_in_texas_county_list = [
'Calhoun', 'Colorado', 'DeWitt', 'Fayette', 'Goliad', 'Jackson', 'Lavaca',
'Matagorda', 'Victoria', 'Wharton'
]
df_dioceses = add_dioceses(df_dioceses,
victoria_in_texas_county_list, state = 'Texas', diocese =
'Victoria in Texas')

# Archdiocese of San Antonio:
# Source: Roman\_Catholic\_Archdiocese\_of\_San\_Antonio

san_antonio_county_list = [
'Val Verde County', 'Edwards', 'Kerr', 'Gillespie', 'Kendall', 'Comal',
'Guadalupe', 'Gonzales', 'Uvalde', 'Bandera', 'Real', 'Kinney', 'Medina',
'Bexar', 'Wilson', 'Karnes', 'Frio', 'Atascosa', 'McMullen'
]
df_dioceses = add_dioceses(df_dioceses,
san_antonio_county_list, state = 'Texas', diocese =
'San Antonio')

# Diocese of Amarillo:
# Source: Roman\_Catholic\_Diocese\_of\_Amarillo

amarillo_county_list = [

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'Armstrong', 'Briscoe', 'Carson', 'Castro', 'Childress', 'Collingsworth',
'Dallam', 'Deaf Smith County', 'Donley', 'Gray', 'Hall', 'Hansford', 'Hartley',
'Hemphill', 'Hutchinson', 'Lipscomb', 'Moore', 'Ochiltree', 'Oldham', 'Parmer',
'Potter', 'Randall', 'Roberts', 'Sherman', 'Swisher', 'Wheeler'
]
df_dioceses = add_dioceses(df_dioceses,
amarillo_county_list, state = 'Texas', diocese =
'Amarillo')

# Diocese of Dallas:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Dallas

dallas_county_list = [
'Collin', 'Dallas', 'Ellis', 'Fannin', 'Grayson', 'Hunt', 'Kaufman', 'Navarro',
'Rockwall'
]
df_dioceses = add_dioceses(df_dioceses,
dallas_county_list, state = 'Texas', diocese =
'Dallas')

# Diocese of El Paso:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_El\_Paso
el_paso_county_list = [
'El Paso County', 'Brewster', 'Culberson', 'Hudspeth', 'Jeff Davis County',
'Loving', 'Presidio', 'Reeves', 'Ward', 'Winkler'
]
df_dioceses = add_dioceses(df_dioceses,
el_paso_county_list, state = 'Texas', diocese =
'El Paso')

# Diocese of Fort Worth:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Fort\_Worth

fort_worth_county_list = [
'Archer', 'Baylor', 'Bosque', 'Clay', 'Comanche', 'Cooke', 'Denton', 'Eastland',
'Erath', 'Foard', 'Hardeman', 'Hill', 'Hood', 'Jack', 'Johnson', 'Knox',
'Montague', 'Palo Pinto County', 'Parker', 'Shackelford', 'Somervell',
'Stephens', 'Tarrant', 'Throckmorton', 'Wichita', 'Wilbarger', 'Wise', 'Young'
]
df_dioceses = add_dioceses(df_dioceses,
fort_worth_county_list, state = 'Texas', diocese =
'Fort Worth')

# Diocese of Laredo:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Laredo

laredo_county_list = [

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'Dimmit', 'Jim Hogg County', 'La Salle County', 'Maverick', 'Webb', 'Zapata',
'Zavala']
df_dioceses = add_dioceses(df_dioceses,
laredo_county_list, state = 'Texas', diocese =
'Laredo')

# Diocese of San Angelo:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_San\_Angelo

san_angelo_county_list = [
'Andrews', 'Brown', 'Callahan', 'Coke', 'Coleman', 'Concho', 'Crane',
'Crockett', 'Ector', 'Glasscock', 'Howard', 'Irion', 'Kimble', 'Martin',
'McCulloch', 'Menard', 'Midland', 'Mitchell', 'Nolan', 'Pecos', 'Reagan',
'Runnels', 'Schleicher', 'Sterling', 'Sutton', 'Taylor', 'Terrell',
'Tom Green County', 'Upton'
]
df_dioceses = add_dioceses(df_dioceses,
san_angelo_county_list, state = 'Texas', diocese =
'San Angelo')

# Archdiocese of Hartford:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Archdiocese\_of\_Hartford

hartford_county_list = [
'Hartford', 'Litchfield', 'New Haven County'
]

df_dioceses = add_dioceses(df_dioceses,
hartford_county_list, state = 'Connecticut', diocese =
'Hartford')

# Diocese of Bridgeport:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Bridgeport

df_dioceses.at[
"Fairfield County, Connecticut", 'Diocese'] = 'Bridgeport'
# The Diocese of Bridgeport includes only one county, so it can
# be added directly to the DataFrame.

# Diocese of Evansville:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Evansville
evansville_county_list = ['Warrick', 'Greene', 'Knox', 'Sullivan', 'Daviess',
'Martin', 'Dubois', 'Spencer', 'Gibson', 'Pike', 'Posey', 'Vanderburgh']
df_dioceses = add_dioceses(df_dioceses,
evansville_county_list, state = 'Indiana', diocese =
'Evansville')

```

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# Diocese of Fort Wayne-South Bend:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Fort\_Wayne
# Roman Catholic Diocese of Fort Wayne%E2%80%93South Bend

fort_wayne_south_bend_county_list = [
    'Adams', 'Allen', 'DeKalb', 'Elkhart', 'Huntington', 'Kosciusko', 'LaGrange',
    'Marshall', 'Noble', 'Steuben', 'St. Joseph County', 'Wabash', 'Wells',
    'Whitley'
]
df_dioceses = add_dioceses(df_dioceses,
    fort_wayne_south_bend_county_list, state = 'Indiana', diocese =
    'Fort Wayne-South Bend')

# Diocese of Gary:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Gary

gary_county_list = [
    'Lake', 'Porter', 'LaPorte', 'Starke'
]
df_dioceses = add_dioceses(df_dioceses,
    gary_county_list, state = 'Indiana', diocese =
    'Gary')

# Diocese of Lafayette in Indiana:
# Source: https://dol-in.org/uih-maps

lafayette_in_indiana_county_list = [
    'Newton', 'Jasper', 'Pulaski', 'Fulton', 'Benton', 'White', 'Carroll', 'Cass',
    'Miami', 'Warren', 'Tippecanoe', 'Clinton', 'Tipton', 'Grant', 'Blackford',
    'Jay', 'Fountain', 'Montgomery', 'Boone', 'Madison', 'Hamilton', 'Delaware',
    'Randolph', 'Howard'
]
df_dioceses = add_dioceses(df_dioceses,
    lafayette_in_indiana_county_list, state = 'Indiana', diocese =
    'Lafayette in Indiana')

# Diocese of Kansas City in Kansas:
# Source:

kansas_city_in_kansas_county_list = [
    'Anderson', 'Atchison', 'Brown', 'Coffey', 'Doniphan', 'Douglas', 'Franklin',
    'Jackson', 'Jefferson', 'Johnson', 'Leavenworth', 'Linn', 'Lyon', 'Marshall',
    'Miami', 'Nemaha', 'Osage', 'Pottawatomie', 'Shawnee', 'Wabaunsee', 'Wyandotte'
]

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df_dioceses = add_dioceses(df_dioceses,
kansas_city_in_kansas_county_list, state = 'Kansas', diocese =
'Kansas City in Kansas')

# Diocese of Dodge City:
# Source: https://www.dcdiocese.org/about/history
# Note: This website misspells Comanche as Commanche and Kearny as Kearney.
dodge_city_county_list = [
'Barber', 'Barton', 'Clark', 'Comanche', 'Edwards', 'Finney', 'Ford', 'Grant',
'Gray', 'Greeley', 'Hamilton', 'Haskell', 'Hodgeman', 'Kearny', 'Kiowa',
'Lane', 'Meade', 'Morton', 'Ness', 'Pawnee', 'Pratt', 'Rush', 'Scott', 'Seward',
'Stafford', 'Stanton', 'Stevens', 'Wichita'
]

df_dioceses = add_dioceses(df_dioceses,
dodge_city_county_list, state = 'Kansas', diocese =
'Dodge City')

# Diocese of Wichita:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Wichita
# Note: The map on this page shows Ellsworth County as belonging to
# the Diocese of Wichita. However, Ellsworth County actually belongs
# to the Diocese of Salina: https://salinadiocese.org/wp-content/uploads/2021/08/2021-Salina-Diocese-Map-PARISH-1.pdf

wichita_county_list = [
'Allen', 'Bourbon', 'Butler', 'Chase', 'Chautauqua', 'Cherokee', 'Cowley',
'Crawford', 'Elk', 'Greenwood', 'Harper', 'Harvey', 'Kingman', 'Labette',
'Marion', 'McPherson', 'Montgomery', 'Morris', 'Neosho', 'Reno', 'Rice',
'Sedgwick', 'Sumner', 'Wilson', 'Woodson'
]

df_dioceses = add_dioceses(df_dioceses,
wichita_county_list, state = 'Kansas', diocese =
'Wichita')

# Diocese of Fresno:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Fresno

fresno_county_list = [
'Fresno', 'Inyo', 'Kern', 'Kings', 'Madera', 'Mariposa', 'Merced', 'Tulare'
]
df_dioceses = add_dioceses(df_dioceses,
fresno_county_list, state = 'California', diocese = 'Fresno')

# Diocese of Monterey

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monterey_in_california_county_list = [
'Monterey', 'San Benito County', 'San Luis Obispo County', 'Santa Cruz County'
]

df_dioceses = add_dioceses(df_dioceses,
monterey_in_california_county_list, state = 'California',
diocese = 'Monterey')

# Diocese of Orange:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Orange
df_dioceses.at[
"Orange County, California", 'Diocese'] = 'Orange'

# Diocese of San Bernardino:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_San_Bernardino
san_bernardino_county_list = ['San Bernardino County', 'Riverside']
df_dioceses = add_dioceses(df_dioceses,
san_bernardino_county_list, state = 'California',
diocese = 'San Bernardino')

# Diocese of San Diego:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_San_Diego

san_diego_county_list = [
'San Diego County', 'Imperial'
]
df_dioceses = add_dioceses(df_dioceses,
san_diego_county_list, state = 'California',
diocese = 'San Diego')

# Diocese of San Francisco:
# Source: https://en.wikipedia.org/wiki/
→Roman_Catholic_Archdiocese_of_San_Francisco

san_francisco_county_list = [
'San Francisco County', 'Marin', 'San Mateo County'
]
df_dioceses = add_dioceses(df_dioceses,
san_francisco_county_list, state = 'California',
diocese = 'San Francisco')

# Diocese of Oakland:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Oakland

oakland_county_list = [
'Alameda', 'Contra Costa County'
]

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]

df_dioceses = add_dioceses(df_dioceses,
oakland_county_list, state = 'California',
diocese = 'Oakland')

# Diocese of Sacramento:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Sacramento
sacramento_county_list = [
'Siskiyou', 'Modoc', 'Trinity', 'Shasta', 'Lassen', 'Tehama', 'Plumas', 'Glenn',
'Butte', 'Sierra', 'Colusa', 'Sutter', 'Yuba', 'Nevada', 'Yolo', 'Placer',
'Solano', 'Sacramento', 'El Dorado County', 'Amador'
]
df_dioceses = add_dioceses(df_dioceses,
sacramento_county_list, state = 'California',
diocese = 'Sacramento')

# Diocese of San Jose:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_San\_Jose\_in\_California

df_dioceses.at[
"Santa Clara County, California", 'Diocese'] = 'San Jose'

# Diocese of Santa Rosa:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Santa\_Rosa\_in\_California

santa_rosa_in_california_county_list = [
'Del Norte County', 'Humboldt', 'Lake', 'Mendocino', 'Napa', 'Sonoma'
]

df_dioceses = add_dioceses(df_dioceses,
santa_rosa_in_california_county_list, state = 'California',
diocese = 'Santa Rosa')

# Diocese of Stockton:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Stockton

stockton_county_list = [
'Alpine', 'Calaveras', 'Mono', 'San Joaquin County', 'Stanislaus', 'Tuolumne'
]
df_dioceses = add_dioceses(df_dioceses,
stockton_county_list, state = 'California',
diocese = 'Stockton')

# Diocese of Las Vegas:

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# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Las\_Vegas

las_vegas_county_list = [
    'Clark', 'Esmeralda', 'Lincoln', 'Nye', 'White Pine County'
]
df_dioceses = add_dioceses(df_dioceses,
    las_vegas_county_list, state = 'Nevada',
    diocese = 'Las Vegas')


# Diocese of Gallup:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Gallup
gallup_county_list_nm = [
    'San Juan County', 'McKinley', 'Cibola', 'Catron']
df_dioceses = add_dioceses(df_dioceses,
    gallup_county_list_nm, state = 'New Mexico',
    diocese = 'Gallup')

# Gallup also has territory in Arizona:
gallup_county_list_az = [
    'Navajo', 'Apache'
]
df_dioceses = add_dioceses(df_dioceses,
    gallup_county_list_az, state = 'Arizona',
    diocese = 'Gallup')


# Diocese of Las Cruces:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Las\_Cruces

las_cruces_county_list = [
    'Hidalgo', 'Grant', 'Luna', 'Sierra', 'Doña Ana County', 'Otero', 'Lincoln',
    'Chaves', 'Eddy', 'Lea'
]
df_dioceses = add_dioceses(df_dioceses,
    las_cruces_county_list, state = 'New Mexico',
    diocese = 'Las Cruces')


# Diocese of Tucson:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Tucson
tucson_county_list = [
    'Gila', 'Graham', 'Greenlee', 'Pinal', 'Cochise', 'Santa Cruz County',
    'Pima', 'Yuma', 'La Paz County'
]
df_dioceses = add_dioceses(df_dioceses,
    tucson_county_list, state = 'Arizona',
    diocese = 'Tucson')

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# Archdiocese of Louisville:
# Source: https://www.archlou.org/about-the-archdiocese/history/statistics/
# Note: This list misspells Metcalfe County as 'Metcalf' and Russell County
# as 'Russel.'
louisville_county_list = [
    'Meade', 'Trimble', 'Oldham', 'Henry', 'Jefferson',
    'Shelby', 'Spencer', 'Bullitt', 'Hardin', 'Nelson', 'Washington', 'Larue',
    'Marion', 'Hart', 'Green', 'Taylor', 'Casey', 'Barren', 'Metcalfe', 'Adair',
    'Russell', 'Monroe', 'Cumberland', 'Clinton'
]
df_dioceses = add_dioceses(df_dioceses,
louisville_county_list, state = 'Kentucky',
diocese = 'Louisville')

# The Diocese of Lexington counties were added in earlier, but here's a map of
# the diocese's counties anyway:
# https://www.stjoan hershey.org/blog/
#special-collection-mission-cooperative-aug-5-6-2017

# Diocese of Covington:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Covington
covington_county_list = [
    'Boone', 'Kenton', 'Campbell', 'Gallatin', 'Carroll', 'Grant', 'Owen',
    'Pendleton', 'Harrison', 'Bracken', 'Robertson', 'Mason', 'Fleming', 'Lewis']
df_dioceses = add_dioceses(df_dioceses,
covington_county_list, state = 'Kentucky',
diocese = 'Covington')

# Diocese of Owensboro:
# Source: https://owensborodiocese.org/our-diocese/
owensboro_county_list = [
    'Fulton', 'Hickman', 'Carlisle', 'Ballard', 'McCracken', 'Graves', 'Marshall',
    'Calloway', 'Trigg', 'Lyon', 'Caldwell', 'Crittenden', 'Union', 'Henderson',
    'Webster', 'Hancock', 'Ohio', 'Butler', 'Warren', 'Edmonson', 'Grayson',
    'Breckinridge', 'Todd', 'Logan', 'Simpson', 'Allen', 'Livingston',
    'Christian', 'Hopkins', 'Muhlenberg', 'McLean', 'Daviess'
]
df_dioceses = add_dioceses(df_dioceses,
owensboro_county_list, state = 'Kentucky',
diocese = 'Owensboro')

# Diocese of Knoxville:
# Source: https://dioknox.org/about (Doesn't include county names, so I looked
# on the map of US County shapefiles to identify them)

knoxville_county_list = [

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'Polk', 'Bradley', 'Hamilton', 'Marion', 'Sequatchie',
'Bledsoe', 'Cumberland', 'Fentress', 'Pickett', 'Scott', 'Morgan', 'Roane',
'Rhea', 'Meigs', 'McMinn', 'Monroe', 'Blount', 'Knox', 'Anderson', 'Campbell',
'Claiborne', 'Union', 'Grainger', 'Jefferson', 'Sevier', 'Cocke', 'Greene',
'Hawkins', 'Sullivan', 'Washington', 'Unicoi', 'Carter', 'Johnson', 'Loudon',
'Hamblen', 'Hancock'
]
df_dioceses = add_dioceses(df_dioceses,
knoxville_county_list, state = 'Tennessee',
diocese = 'Knoxville')

# Diocese of Memphis:
# Source: Aug-2021-Parish-Directory-Public.pdf
# (Doesn't include county names, so I used the map of US County shapefiles
# to identify them)
memphis_county_list = [
'Shelby', 'Tipton', 'Lauderdale', 'Dyer', 'Lake', 'Obion', 'Crockett',
'Hardin', 'Decatur', 'Benton', 'Henry', 'Carroll', 'Henderson', 'Chester',
'McNairy', 'Hardeeman', 'Fayette', 'Haywood', 'Gibson', 'Weakley', 'Madison'
]
df_dioceses = add_dioceses(df_dioceses,
memphis_county_list, state = 'Tennessee',
diocese = 'Memphis')

# Archdiocese of Miami:
# Source: Miami
miami_county_list = [
'Broward', 'Miami-Dade', 'Monroe'
]
df_dioceses = add_dioceses(df_dioceses,
miami_county_list, state = 'Florida',
diocese = 'Miami')

# Diocese of Palm Beach:
# Source: Palm Beach

palm_beach_county_list = [
'Palm Beach County', 'Martin', 'St. Lucie County', 'Indian River County',
'Okeechobee'
]
df_dioceses = add_dioceses(df_dioceses,
palm_beach_county_list, state = 'Florida',
diocese = 'Palm Beach')

# Diocese of Venice:

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# Source: https://en.wikipedia.org/wiki/
    ↵Roman_Catholic_Diocese_of_Venice_in_Florida

venice_in_florida_county_list = [
    'Charlotte', 'Collier', 'DeSoto', 'Glades', 'Hardee', 'Hendry', 'Highlands',
    'Lee', 'Manatee', 'Sarasota'
]
df_dioceses = add_dioceses(df_dioceses,
    venice_in_florida_county_list, state = 'Florida',
    diocese = 'Venice')

# Diocese of Pensacola-Tallahassee:
# Source: https://ptdiocese.org/pictures/2017/1/Standard%20Deanery%20Map%202017.
    ↵png

pensacola_tallahassee_county_list = [
    'Escambia', 'Santa Rosa County', 'Okaloosa', 'Walton', 'Holmes', 'Washington',
    'Jackson', 'Bay', 'Calhoun', 'Gulf', 'Liberty', 'Franklin', 'Wakulla',
    'Leon', 'Gadsden', 'Jefferson', 'Madison', 'Taylor'
]
df_dioceses = add_dioceses(df_dioceses,
    pensacola_tallahassee_county_list, state = 'Florida',
    diocese = 'Pensacola-Tallahassee')

# Diocese of St. Petersburg:
# Source: https://en.wikipedia.org/wiki/
    ↵Roman_Catholic_Diocese_of_Saint_Petersburg
saint_petersburg_county_list = [
    'Pinellas', 'Hillsborough', 'Pasco', 'Hernando', 'Citrus'
]
df_dioceses = add_dioceses(df_dioceses,
    saint_petersburg_county_list, state = 'Florida',
    diocese = 'St. Petersburg')

# Diocese of St. Augustine:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_St._Augustine
st_augustine_county_list = [
    'Alachua', 'Baker', 'Bradford', 'Clay', 'Columbia', 'Dixie', 'Duval', 'Flagler',
    'Gilchrist', 'Hamilton', 'Lafayette', 'Levy', 'Nassau', 'Putnam',
    'St. Johns County', 'Suwannee', 'Union'
]
df_dioceses = add_dioceses(df_dioceses,
    st_augustine_county_list, state = 'Florida',
    diocese = 'St. Augustine')

# Archdiocese of Milwaukee:

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# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Archdiocese\_of\_Milwaukee

milwaukee_county_list = [
'Dodge', 'Fond du Lac County', 'Kenosha', 'Milwaukee', 'Ozaukee', 'Racine',
'Sheboygan', 'Walworth', 'Washington', 'Waukesha'
]
df_dioceses = add_dioceses(df_dioceses,
milwaukee_county_list, state = 'Wisconsin',
diocese = 'Milwaukee')

# Diocese of Green Bay:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Green\_Bay

green_bay_county_list = [
'Brown', 'Calumet', 'Door', 'Florence', 'Forest', 'Kewaunee', 'Langlade',
'Manitowoc', 'Marinette', 'Menominee', 'Oconto', 'Outagamie', 'Shawano',
'Waupaca', 'Waushara', 'Winnebago'
]
df_dioceses = add_dioceses(df_dioceses,
green_bay_county_list, state = 'Wisconsin',
diocese = 'Green Bay')

# Diocese of Madison:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Madison

madison_county_list = ['Columbia', 'Dane', 'Grant', 'Green',
'Green Lake County', 'Iowa', 'Jefferson', 'Lafayette', 'Marquette',
'Rock', 'Sauk'
]
df_dioceses = add_dioceses(df_dioceses,
madison_county_list, state = 'Wisconsin',
diocese = 'Madison')

# Diocese of Superior:
# https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Superior

superior_county_list = [
'Ashland', 'Barron', 'Bayfield', 'Burnett', 'Douglas', 'Iron', 'Lincoln',
'Oneida', 'Price', 'Polk', 'Rusk', 'Sawyer', 'St. Croix County', 'Taylor',
'Vilas', 'Washburn'
]
df_dioceses = add_dioceses(df_dioceses,
superior_county_list, state = 'Wisconsin',
diocese = 'Superior')

# Diocese of Biloxi:
# Source: https://biloxidiocese.org/geographics

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biloxi_county_list = [
    'Covington', 'Forrest', 'George', 'Greene', 'Hancock', 'Harrison', 'Jackson',
    'Jefferson Davis County', 'Jones', 'Lamar', 'Lawrence', 'Marion',
    'Pearl River County', 'Perry', 'Stone', 'Walthall', 'Wayne'
]
df_dioceses = add_dioceses(df_dioceses,
    biloxi_county_list, state = 'Mississippi',
    diocese = 'Biloxi')

# Diocese of Birmingham:
# Source: https://bhmdiocese.org/documents/2021/12/Dio%20info%2012-13-21.pdf

birmingham_county_list = [
    'Lauderdale', 'Limestone', 'Madison', 'Jackson', 'Colbert', 'Franklin',
    'Lawrence', 'Morgan', 'Marshall', 'DeKalb', 'Marion', 'Winston', 'Cullman',
    'Blount', 'Etowah', 'Cherokee', 'Lamar', 'Fayette', 'Walker', 'Jefferson',
    'St. Clair County', 'Calhoun', 'Cleburne', 'Pickens', 'Tuscaloosa', 'Bibb',
    'Shelby', 'Talladega', 'Clay', 'Randolph', 'Sumter', 'Greene', 'Hale', 'Perry',
    'Chilton', 'Coosa', 'Tallapoosa', 'Chambers', 'Marengo'
]
df_dioceses = add_dioceses(df_dioceses,
    birmingham_county_list, state = 'Alabama',
    diocese = 'Birmingham')

# Archdiocese of New Orleans:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Archdiocese\_of\_New\_Orleans
new_orleans_county_list = [
    'Jefferson Parish', 'Orleans Parish', 'Plaquemines Parish',
    'St. Bernard Parish', 'St. Charles Parish', 'St. John the Baptist Parish',
    'St. Tammany Parish', 'Washington Parish'
]

df_dioceses = add_dioceses(df_dioceses,
    new_orleans_county_list, state = 'Louisiana',
    diocese = 'New Orleans')

# Diocese of Houma-Thibodaux:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Houma-Thibodaux

houma_thibodaux_county_list = ['Terrebonne Parish', 'Lafourche Parish']
df_dioceses = add_dioceses(df_dioceses,
    houma_thibodaux_county_list, state = 'Louisiana',
    diocese = 'Houma-Thibodaux')

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# Diocese of Lafayette in Louisiana:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Lafayette\_in\_Louisiana

lafayette_in_louisiana_county_list = [
    'St. Landry Parish', 'Evangeline Parish', 'Lafayette Parish',
    'St. Martin Parish', 'Iberia Parish', 'St. Mary Parish', 'Acadia Parish',
    'Vermilion Parish'
]
df_dioceses = add_dioceses(df_dioceses,
lafayette_in_louisiana_county_list, state = 'Louisiana',
diocese = 'Lafayette in Louisiana')

# Diocese of Baton Rouge:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Baton\_Rouge

baton_rouge_county_list = [
    'Ascension Parish', 'Assumption Parish', 'East Baton Rouge Parish',
    'East Feliciana Parish', 'Iberville Parish', 'Livingston Parish',
    'Pointe Coupee Parish', 'Tangipahoa Parish', 'St. Helena Parish',
    'St. James Parish', 'West Baton Rouge Parish', 'West Feliciana Parish'
]
df_dioceses = add_dioceses(df_dioceses,
baton_rouge_county_list, state = 'Louisiana',
diocese = 'Baton Rouge')

# Diocese of Lake Charles:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Lake\_Charles

lake_charles_county_list = [
    'Allen Parish', 'Beauregard Parish', 'Calcasieu Parish', 'Cameron Parish',
    'Jefferson Davis Parish'
]
df_dioceses = add_dioceses(df_dioceses,
lake_charles_county_list, state = 'Louisiana',
diocese = 'Lake Charles')

# Diocese of Alexandria:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Alexandria\_in\_Louisiana

alexandria_in_louisiana_county_list = [
    'Avoyelles Parish', 'Rapides Parish', 'Vernon Parish', 'Natchitoches Parish',
    'Winn Parish', 'Caldwell Parish', 'Madison Parish', 'Franklin Parish',
    'Tensas Parish', 'Concordia Parish', 'Catahoula Parish', 'LaSalle Parish',
]

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'Grant Parish'
]
df_dioceses = add_dioceses(df_dioceses,
alexandria_in_louisiana_county_list, state = 'Louisiana',
diocese = 'Alexandria')

# Archdiocese of New York:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_New_York
new_york_county_list = ['New York County', 'Richmond', 'Bronx', 'Dutchess',
'Orange', 'Putnam', 'Rockland', 'Sullivan', 'Ulster', 'Westchester']
]
df_dioceses = add_dioceses(df_dioceses,
new_york_county_list, state = 'New York',
diocese = 'New York')

# Diocese of Brooklyn:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Brooklyn
brooklyn_county_list = [
'Kings', 'Queens'
]
df_dioceses = add_dioceses(df_dioceses,
brooklyn_county_list, state = 'New York',
diocese = 'Brooklyn')

# Diocese of Buffalo:
# https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Buffalo

buffalo_county_list = [
'Erie', 'Niagara', 'Genesee', 'Orleans', 'Chautauqua', 'Wyoming',
'Cattaraugus', 'Allegany'
]
df_dioceses = add_dioceses(df_dioceses,
buffalo_county_list, state = 'New York',
diocese = 'Buffalo')

# Diocese of Rockville Centre:
# Source: https://en.wikipedia.org/wiki/
→Roman_Catholic_Diocese_of_Rockville_Centre

rockville_centre_county_list = [
'Nassau', 'Suffolk'
]
df_dioceses = add_dioceses(df_dioceses,
rockville_centre_county_list, state = 'New York',
diocese = 'Rockville Centre')

# Diocese of Ogdensburg:

```

```

# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Ogdensburg

ogdensburg_county_list = [
    'Clinton', 'Essex', 'Franklin', 'Jefferson', 'Lewis', 'St. Lawrence County',
    'Hamilton'
]

df_dioceses = add_dioceses(df_dioceses,
    ogdensburg_county_list, state = 'New York',
    diocese = 'Ogdensburg')

# Diocese of Rochester:
# Source:

rochester_county_list = [
    'Monroe', 'Cayuga', 'Livingston', 'Wayne', 'Tioga', 'Tompkins', 'Ontario',
    'Seneca', 'Schuyler', 'Yates', 'Steuben', 'Chemung'
]
df_dioceses = add_dioceses(df_dioceses,
    rochester_county_list, state = 'New York',
    diocese = 'Rochester')

# Diocese of Syracuse:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Syracuse

syracuse_county_list = [
    'Broome', 'Chenango', 'Cortland', 'Madison', 'Oneida', 'Onondaga', 'Oswego']
df_dioceses = add_dioceses(df_dioceses,
    syracuse_county_list, state = 'New York',
    diocese = 'Syracuse')

# Archdiocese of Newark:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Archdiocese\_of\_Newark

newark_county_list = ['Bergen', 'Union', 'Hudson', 'Essex']
df_dioceses = add_dioceses(df_dioceses,
    newark_county_list, state = 'New Jersey',
    diocese = 'Newark')

# Diocese of Metuchen:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Metuchen

metuchen_county_list = [
    'Middlesex', 'Somerset', 'Hunterdon', 'Warren'
]
df_dioceses = add_dioceses(df_dioceses,
    metuchen_county_list, state = 'New Jersey',

```

```

diocese = 'Metuchen')

# Diocese of Paterson:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Paterson

paterson_county_list = [
    'Passaic', 'Morris', 'Sussex'
]
df_dioceses = add_dioceses(df_dioceses,
    paterson_county_list, state = 'New Jersey',
    diocese = 'Paterson')

# Diocese of Trenton:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Trenton

trenton_county_list = [
    'Burlington', 'Mercer', 'Monmouth', 'Ocean'
]
df_dioceses = add_dioceses(df_dioceses,
    trenton_county_list, state = 'New Jersey',
    diocese = 'Trenton')

# Diocese of Tulsa:
# Source: https://d2y1pz2y630308.cloudfront.net/2682/documents/2022/3/revised%20vicariate%20full%20map.pdf
# (This map does not include county names, so I used the county shapefile
# map to identify counties within the diocese.)

tulsa_county_list = [
    'McCurtain', 'Choctaw', 'Bryan', 'Atoka', 'Pushmataha', 'Latimer', 'Coal',
    'Hughes', 'Okfuskee', 'Creek', 'Payne', 'Pawnee', 'Osage',
    'Washington', 'Nowata', 'Craig', 'Ottawa', 'Delaware', 'Adair', 'Sequoyah',
    'Le Flore County', 'Pittsburg', 'McIntosh', 'Okmulgee',
    'Tulsa', 'Rogers', 'Wagoner', 'Cherokee', 'Muskogee', 'Haskell', 'Mayes']
df_dioceses = add_dioceses(df_dioceses,
    tulsa_county_list, state = 'Oklahoma',
    diocese = 'Tulsa')

# Archdiocese of Omaha:
# Source: https://archomaha.org/about-us/
# Note: Parish data on the Grand Island and Lincoln diocesan webpages
# indicate that Wheeler, Greeley, Howard, and Hall Counties do not belong
# to the Archdiocese of Omaha, so I've excluded them from the list below.
# See https://gidiocease.org/parishfinder (note that one of the parishes is
# in Wheeler County) and https://www.lincolndiocese.org/directory/parish-map .

```

```

omaha_county_list = [
    'Boyd', 'Holt', 'Merrick', 'Nance', 'Boone', 'Antelope', 'Knox', 'Pierce',
    'Madison', 'Platte', 'Colfax', 'Stanton', 'Wayne', 'Cedar', 'Dixon', 'Dakota',
    'Thurston', 'Cuming', 'Dodge', 'Burt', 'Washington',
    'Douglas', 'Sarpy']

df_dioceses = add_dioceses(df_dioceses,
    omaha_county_list, state = 'Nebraska',
    diocese = 'Omaha')

# Archdiocese of Lincoln:
# Source: https://commons.wikimedia.org/wiki/File:Diocese_of_Lincoln_map_1.png
# See also: https://www.lincolndiocese.org/diocese/about-the-diocese/
↪history-of-the-diocese

lincoln_county_list = [
    'Richardson', 'Nemaha', 'Otoe', 'Cass', 'Pawnee', 'Johnson', 'Lancaster',
    'Saunders', 'Butler', 'Polk', 'Hamilton', 'Clay', 'Nuckolls', 'Thayer',
    'Jefferson', 'Gage', 'Webster', 'Adams', 'Kearney', 'Franklin', 'Harlan',
    'Furnas', 'Gosper', 'Lincoln', 'Frontier', 'Red Willow County', 'Hitchcock',
    'Dundy', 'Hayes', 'Chase', 'Perkins', 'Phelps', 'York', 'Seward', 'Fillmore',
    'Saline'
]
df_dioceses = add_dioceses(df_dioceses,
    lincoln_county_list, state = 'Nebraska',
    diocese = 'Lincoln')

# Archdiocese of Philadelphia:
# Source: https://en.wikipedia.org/wiki/
↪Roman_Catholic_Archdiocese_of_Philadelphia

philadelphia_county_list = [
    'Bucks', 'Chester', 'Delaware', 'Montgomery', 'Philadelphia'
]
df_dioceses = add_dioceses(df_dioceses,
    philadelphia_county_list, state = 'Pennsylvania',
    diocese = 'Philadelphia')

# Diocese of Allentown:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Allentown

allentown_county_list = [
    'Berks', 'Carbon', 'Lehigh', 'Northampton', 'Schuylkill'
]
df_dioceses = add_dioceses(df_dioceses,
    allentown_county_list, state = 'Pennsylvania',
    diocese = 'Allentown')

```

```

# Diocese of Altoona-Johnstown:
# Source: https://en.wikipedia.org/wiki/
↳Roman_Catholic_Diocese_of_Altoona%E2%80%93Johnstown

altoona_johnstown_county_list = [
    'Bedford', 'Blair', 'Cambria', 'Centre', 'Clinton', 'Fulton', 'Huntingdon',
    'Somerset'
]
df_dioceses = add_dioceses(df_dioceses,
    altoona_johnstown_county_list, state = 'Pennsylvania',
    diocese = 'Altoona-Johnstown')

# Diocese of Harrisburg:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Harrisburg

harrisburg_county_list = [
    'Adams', 'Columbia', 'Cumberland', 'Dauphin', 'Franklin', 'Juniata',
    'Lancaster', 'Lebanon', 'Mifflin', 'Montour', 'Northumberland', 'Perry',
    'Snyder', 'Union', 'York'
]
df_dioceses = add_dioceses(df_dioceses,
    harrisburg_county_list, state = 'Pennsylvania',
    diocese = 'Harrisburg')

# Diocese of Greensburg:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Greensburg

greensburg_county_list = [
    'Armstrong', 'Fayette', 'Indiana', 'Westmoreland'
]
df_dioceses = add_dioceses(df_dioceses,
    greensburg_county_list, state = 'Pennsylvania',
    diocese = 'Greensburg')

# Diocese of Pittsburgh:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Pittsburgh

pittsburgh_county_list = [
    'Allegheny', 'Beaver', 'Butler', 'Greene', 'Lawrence', 'Washington'
]
df_dioceses = add_dioceses(df_dioceses,
    pittsburgh_county_list, state = 'Pennsylvania',
    diocese = 'Pittsburgh')

# Diocese of Scranton:

```

```

# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Scranton
scranton_county_list = [
    'Lackawanna', 'Luzerne', 'Bradford', 'Susquehanna', 'Wayne', 'Tioga',
    'Sullivan', 'Wyoming', 'Lycoming', 'Pike', 'Monroe'
]
df_dioceses = add_dioceses(df_dioceses,
scranton_county_list, state = 'Pennsylvania',
diocese = 'Scranton')

# Diocese of Baker:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Baker

baker_county_list = [
    'Baker', 'Crook', 'Deschutes', 'Gilliam', 'Grant', 'Harney',
    'Hood River County', 'Jefferson', 'Klamath', 'Lake', 'Malheur', 'Morrow',
    'Sherman', 'Umatilla', 'Union', 'Wallowa', 'Wasco', 'Wheeler'
]
df_dioceses = add_dioceses(df_dioceses,
baker_county_list, state = 'Oregon',
diocese = 'Baker')

# Diocese of Great Falls-Billings:
# Source: https://en.wikipedia.org/wiki/
# Roman_Catholic_Diocese_of_Great_Falls%20%93Billings
# Note: I updated the source to include McCone county, which is encompassed
# by other counties in the diocese.

great_falls_billings_county_list = [
    'Big Horn County', 'Blaine', 'Carbon', 'Carter', 'Cascade', 'Chouteau',
    'Custer', 'Daniels', 'Dawson', 'Fallon', 'Fergus', 'Garfield',
    'Golden Valley County', 'Hill', 'Judith Basin County', 'Liberty', 'McCone',
    'Musselshell', 'Park', 'Petroleum', 'Phillips', 'Powder River County',
    'Prairie', 'Richland', 'Roosevelt', 'Rosebud', 'Sheridan', 'Stillwater',
    'Sweet Grass County', 'Treasure', 'Valley', 'Wibaux', 'Yellowstone'
]

df_dioceses = add_dioceses(df_dioceses,
great_falls_billings_county_list, state = 'Montana',
diocese = 'Great Falls-Billings')

# Archdiocese of St. Louis:
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_St._Louis

st_louis_county_list = [
    'Franklin', 'Jefferson', 'Lincoln', 'Perry', 'St. Charles County',
    'St. Francois County', 'Ste. Genevieve County', 'St. Louis County', 'Warren',
    'Washington', 'St. Louis city']

```

```

df_dioceses = add_dioceses(df_dioceses,
st_louis_county_list, state = 'Missouri',
diocese = 'St. Louis')

# Diocese of Kansas City-St. Joseph:
# Source: https://www.lifeandjusticekcsj.org/diocese-map.html
# (Website is affiliated with two diocesan offices)

kansas_city_st_joseph_county_list = [
'Andrew', 'Atchison', 'Bates', 'Buchanan', 'Caldwell', 'Carroll', 'Cass',
'Clay', 'Clinton', 'Daviess', 'DeKalb', 'Gentry', 'Grundy', 'Harrison', 'Henry',
'Holt', 'Jackson', 'Johnson', 'Lafayette', 'Livingston', 'Mercer', 'Nodaway',
'Platte', 'Ray', 'St. Clair County', 'Vernon', 'Worth']

df_dioceses = add_dioceses(df_dioceses,
kansas_city_st_joseph_county_list, state = 'Missouri',
diocese = 'Kansas City-St. Joseph')

# Diocese of Jefferson City:
# Source: https://diojeffcity.org/about-us/

jefferson_city_county_list = [
'Putnam', 'Schuyler', 'Scotland', 'Clark', 'Sullivan', 'Adair', 'Knox', 'Lewis',
'Linn', 'Macon', 'Shelby', 'Marion', 'Chariton', 'Randolph', 'Monroe', 'Ralls',
'Pike', 'Saline', 'Howard', 'Boone', 'Audrain', 'Pettis', 'Cooper', 'Moniteau',
'Cole', 'Callaway', 'Osage', 'Montgomery', 'Gasconade', 'Benton', 'Morgan',
'Hickory', 'Camden', 'Miller', 'Maries', 'Pulaski', 'Phelps', 'Crawford'
]
df_dioceses = add_dioceses(df_dioceses,
jefferson_city_county_list, state = 'Missouri',
diocese = 'Jefferson City')

# Archdiocese of St. Paul and Minneapolis:
# Source: https://commons.wikimedia.org/wiki/File:
↳Map_of_the_Catholic_archdiocese_of_Saint_Paul_%26_Minneapolis.svg
# See also: https://s3.amazonaws.com/archspmmainsite/Resources/
↳ArchMap--Parishes-Deaneries-COLORRamped_061516.pdf

saint_paul_and_minneapolis_county_list = [
'Goodhue', 'Rice', 'Le Sueur County', 'Scott', 'Dakota', 'Washington', 'Ramsey',
'Hennepin', 'Wright', 'Anoka', 'Chisago', 'Carver'
]
df_dioceses = add_dioceses(df_dioceses,
saint_paul_and_minneapolis_county_list, state = 'Minnesota',
diocese = 'St. Paul and Minneapolis')

# Diocese of Crookston:

```

```

# https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Crookston

crookston_county_list = [
    'Kittson', 'Roseau', 'Lake of the Woods County', 'Marshall', 'Polk',
    'Red Lake County', 'Pennington', 'Clearwater', 'Beltrami', 'Norman', 'Mahnomen',
    'Hubbard', 'Clay', 'Becker'
]
df_dioceses = add_dioceses(df_dioceses,
    crookston_county_list, state = 'Minnesota',
    diocese = 'Crookston')

# Diocese of New Ulm:
# Source: https://www.dnu.org/about

new_ulm_county_list = [
    'Big Stone County', 'Brown', 'Chippewa', 'Kandiyohi', 'Lac qui Parle County',
    'Lincoln', 'Lyon', 'McLeod', 'Meeker', 'Nicollet', 'Redwood', 'Renville',
    'Sibley', 'Swift', 'Yellow Medicine County'
]
df_dioceses = add_dioceses(df_dioceses,
    new_ulm_county_list, state = 'Minnesota',
    diocese = 'New Ulm')

# Diocese of St. Cloud
# Source: https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Saint_Cloud

saint_cloud_county_list = [
    'Benton', 'Douglas', 'Grant', 'Isanti', 'Kanabec', 'Mille Lacs County',
    'Morrison', 'Otter Tail County', 'Pope', 'Sherburne', 'Stearns', 'Stevens',
    'Todd', 'Traverse', 'Wadena', 'Wilkin'
]
df_dioceses = add_dioceses(df_dioceses,
    saint_cloud_county_list, state = 'Minnesota',
    diocese = 'St. Cloud')

# Diocese of Winona-Rochester:
# Source: https://en.wikipedia.org/wiki/
    ↪Roman_Catholic_Diocese_of_Winona%28%93Rochester

winona_rochester_county_list = [
    'Blue Earth County', 'Cottonwood', 'Dodge', 'Faribault', 'Fillmore', 'Freeborn',
    'Houston', 'Jackson', 'Martin', 'Mower', 'Murray', 'Nobles', 'Olmsted',
    'Pipestone', 'Rock', 'Steele', 'Wabasha', 'Waseca', 'Watonwan', 'Winona'
]
df_dioceses = add_dioceses(df_dioceses,
    winona_rochester_county_list, state = 'Minnesota',

```

```

diocese = 'Winona-Rochester')

# Diocese of Bismarck:
# Source https://bismarckdiocese.com/about

bismark_county_list = [
'Adams', 'Billings', 'Bowman', 'Burke', 'Burleigh', 'Divide', 'Dunn', 'Emmons',
'Golden Valley County', 'Grant', 'Hettinger', 'McKenzie', 'McLean', 'Mercer',
'Morton', 'Mountrail', 'Oliver', 'Renville', 'Sioux', 'Slope', 'Stark', 'Ward',
'Williams'
]
df_dioceses = add_dioceses(df_dioceses,
bismark_county_list, state = 'North Dakota',
diocese = 'Bismarck')

# Diocese of Rapid City:
# Source: https://www.rapidcitydiocese.org/wp-content/uploads/2022/01/
↳MapDeaneryDec21-1030x752-1.jpeg

rapid_city_county_list = [
'Corson', 'Dewey', 'Stanley', 'Lyman', 'Gregory', 'Tripp', 'Todd', 'Bennett',
'Oglala Lakota County', 'Fall River County', 'Custer', 'Pennington', 'Lawrence',
'Meade', 'Butte', 'Harding', 'Perkins', 'Ziebach', 'Haakon', 'Jackson',
'Jones', 'Mellette']
df_dioceses = add_dioceses(df_dioceses,
rapid_city_county_list, state = 'South Dakota',
diocese = 'Rapid City')

# Diocese of Spokane:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Spokane

spokane_county_list = [
'Okanogan', 'Ferry', 'Stevens', 'Pend Oreille County', 'Lincoln', 'Spokane',
'Adams', 'Whitman', 'Franklin', 'Walla Walla County', 'Columbia', 'Garfield',
'Asotin'
]
df_dioceses = add_dioceses(df_dioceses,
spokane_county_list, state = 'Washington',
diocese = 'Spokane')

# Diocese of Yakima:
# Source: https://en.wikipedia.org/wiki/Roman\_Catholic\_Diocese\_of\_Yakima

yakima_county_list = [
'Benton', 'Chelan', 'Douglas', 'Grant', 'Kittitas', 'Klickitat', 'Yakima'
]
df_dioceses = add_dioceses(df_dioceses,

```

```

yakima_county_list, state = 'Washington',
diocese = 'Yakima')

# county_list = [
#   '', '', '', '', '',
#   '', '', '', '', '',
#   '', '', '', '', '',
#   '', '', '', '', '',
#   '', '', '', '', '',
#   '', '', '', '',
#   ''
# ]

# List of Catholic Dioceses in the US:
# https://en.wikipedia.org/wiki/List_of_Catholic_dioceses_in_the_United_States

df_dioceses.reset_index(drop=True, inplace = True) # The county_state column
# was kept in place even when county_state also served as the index, so
# its data is preserved even after the index gets reset.

```

Here's a look at how many counties' dioceses were updated via the above block:

```
[ ]: counties_changed = [1 for i in range(len(df_dioceses))
if df_dioceses.iloc[i, df_dioceses.columns.get_loc(
'Diocese')] != initial_version_of_df_dioceses.iloc[
i, initial_version_of_df_dioceses.columns.get_loc(
'Diocese')]]
len(counties_changed) # The number of counties that were modified above
```

[ ]: 1765

```
[ ]: df_dioceses.head(5)
```

	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMESAD	LSAD	\
0	36	039	00974118	36039	Greene	Greene County	06	
1	36	025	00974111	36025	Delaware	Delaware County	06	
2	36	091	00974143	36091	Saratoga	Saratoga County	06	
3	36	001	00974099	36001	Albany	Albany County	06	
4	36	043	00974120	36043	Herkimer	Herkimer County	06	

	State_Name	State_Code	FIPS	county_state	Diocese	\
0	New York	NY	36	Greene County, New York	Albany	
1	New York	NY	36	Delaware County, New York	Albany	
2	New York	NY	36	Saratoga County, New York	Albany	
3	New York	NY	36	Albany County, New York	Albany	
4	New York	NY	36	Herkimer County, New York	Albany	

```

Diocese_Detail Province_Detail \
0          Albany      New York
1          Albany      New York
2          Albany      New York
3          Albany      New York
4  Albany, Ogdensburg      New York

                                         geometry Province \
0  POLYGON ((-74.04239 42.17039, -74.07480 42.096...  New York
1  POLYGON ((-74.78069 42.01637, -75.15150 41.849...  New York
2  POLYGON ((-73.67891 42.91221, -73.68447 42.891...  New York
3  POLYGON ((-73.96379 42.44162, -74.26347 42.407...  New York
4  POLYGON ((-74.74371 42.99941, -74.76330 42.863...  New York

Diocese_Color_Code
0          0
1          0
2          0
3          0
4          0

```

df\_dioceses now has a much more accurate portrayal of which counties belong to which dioceses. Next, I'll merge Latin-Rite province data (which I also obtained from Wikipedia) into df\_dioceses.

```
[ ]: if 'Province' in df_dioceses.columns:
    df_dioceses.drop('Province', axis = 1, inplace = True)
    # This prevents two 'Province' columns from existing within df_dioceses.

df_provinces = pd.read_csv('diocese_province_list.csv')
df_dioceses = df_dioceses.merge(df_provinces, on = 'Diocese', how = 'left')
df_dioceses.drop_duplicates('Diocese').sort_values('Province').tail(5)
```

```
[ ]: STATEFP COUNTYFP COUNTYNS GEOID           NAME \
618       6     075 00277302 06075      San Francisco
1098      6     013 01675903 06013      Contra Costa
1885      6     085 00277307 06085      Santa Clara
149       32    003 00863600 32003        Clark
444       6     097 01657246 06097      Sonoma
81        32    001 00858638 32001      Churchill
30        35    003 00929108 35003      Catron
391       4     027 00023901 04027        Yuma
832       4     013 00037026 04013      Maricopa
2         35    011 00933054 35011      De Baca
29        35    035 00929104 35035        Otero
1168      53    037 01531926 53037      Kittitas
1         53    069 01513275 53069      Wahkiakum
1129      53    013 01513273 53013      Columbia
```

91	29	103	00758506	29103	Knox
20	29	083	00758496	29083	Henry
727	29	221	00758563	29221	Washington
33	29	011	00758460	29011	Barton
141	27	073	00659482	27073	Lac qui Parle
315	27	057	00659474	27057	Hubbard
114	27	095	00659493	27095	Mille Lacs
615	27	171	00659530	27171	Wright
283	27	001	00663198	27001	Aitkin
137	38	085	01034208	38085	Sioux
139	27	045	00659468	27045	Fillmore
480	46	081	01266996	46081	Lawrence
5	46	099	01265772	46099	Minnehaha
115	38	099	01034214	38099	Walsh
79	78	030	02378250	78030	St. Thomas
613	11	001	01702382	11001	District of Columbia

		NAMESAD	LSAD		State_Name	State_Code	FIPS	\
618	San Francisco County		06		California	CA	6	
1098	Contra Costa County		06		California	CA	6	
1885	Santa Clara County		06		California	CA	6	
149	Clark County		06		Nevada	NV	32	
444	Sonoma County		06		California	CA	6	
81	Churchill County		06		Nevada	NV	32	
30	Catron County		06		New Mexico	NM	35	
391	Yuma County		06		Arizona	AZ	4	
832	Maricopa County		06		Arizona	AZ	4	
2	De Baca County		06		New Mexico	NM	35	
29	Otero County		06		New Mexico	NM	35	
1168	Kittitas County		06		Washington	WA	53	
1	Wahkiakum County		06		Washington	WA	53	
1129	Columbia County		06		Washington	WA	53	
91	Knox County		06		Missouri	MO	29	
20	Henry County		06		Missouri	MO	29	
727	Washington County		06		Missouri	MO	29	
33	Barton County		06		Missouri	MO	29	
141	Lac qui Parle County		06		Minnesota	MN	27	
315	Hubbard County		06		Minnesota	MN	27	
114	Mille Lacs County		06		Minnesota	MN	27	
615	Wright County		06		Minnesota	MN	27	
283	Aitkin County		06		Minnesota	MN	27	
137	Sioux County		06		North Dakota	ND	38	
139	Fillmore County		06		Minnesota	MN	27	
480	Lawrence County		06		South Dakota	SD	46	
5	Minnehaha County		06		South Dakota	SD	46	
115	Walsh County		06		North Dakota	ND	38	
79	St. Thomas Island		10		Virgin Islands	VI	78	

613 District of Columbia 00 District of Columbia

DC 11

	county_state	Diocese \
618	San Francisco County, California	San Francisco
1098	Contra Costa County, California	Oakland
1885	Santa Clara County, California	San Jose
149	Clark County, Nevada	Las Vegas
444	Sonoma County, California	Santa Rosa
81	Churchill County, Nevada	Reno
30	Catron County, New Mexico	Gallup
391	Yuma County, Arizona	Tucson
832	Maricopa County, Arizona	Phoenix
2	De Baca County, New Mexico	Santa Fe
29	Otero County, New Mexico	Las Cruces
1168	Kittitas County, Washington	Yakima
1	Wahkiakum County, Washington	Seattle
1129	Columbia County, Washington	Spokane
91	Knox County, Missouri	Jefferson City
20	Henry County, Missouri	Kansas City-St. Joseph
727	Washington County, Missouri	St. Louis
33	Barton County, Missouri	Springfield-Cape Girardeau
141	Lac qui Parle County, Minnesota	New Ulm
315	Hubbard County, Minnesota	Crookston
114	Mille Lacs County, Minnesota	St. Cloud
615	Wright County, Minnesota	St. Paul and Minneapolis
283	Aitkin County, Minnesota	Duluth
137	Sioux County, North Dakota	Bismark
139	Fillmore County, Minnesota	Winona-Rochester
480	Lawrence County, South Dakota	Rapid City
5	Minnehaha County, South Dakota	Sioux Falls
115	Walsh County, North Dakota	Fargo
79	St. Thomas Island, Virgin Islands	St. Thomas
613	District of Columbia, District of Columbia	Washington

	Diocese_Detail	Province_Detail \
618	San Francisco	San Francisco
1098	Oakland	San Francisco
1885	San Jose	San Francisco
149	Las Vegas	San Francisco
444	Santa Rosa	San Francisco
81	Reno	San Francisco
30	Gallup	Santa Fe
391	Tucson	Santa Fe
832	Phoenix	Santa Fe
2	Santa Fe	Santa Fe
29	Las Cruces	Santa Fe
1168	Yakima	Seattle

1		Seattle	Seattle
1129		Spokane	Seattle
91		Jefferson City	St. Louis
20		Kansas City-St. Joseph	St. Louis
727		St. Louis	St. Louis
33	Springfield-Cape Girardeau		St. Louis
141	New Ulm	St. Paul and Minneapolis	
315	Crookston	St. Paul and Minneapolis	
114	St. Cloud	St. Paul and Minneapolis	
615	St. Paul and Minneapolis	St. Paul and Minneapolis	
283	Duluth	St. Paul and Minneapolis	
137	Bismark	St. Paul and Minneapolis	
139	Winona-Rochester	St. Paul and Minneapolis	
480	Rapid City	St. Paul and Minneapolis	
5	Sioux Falls	St. Paul and Minneapolis	
115	Fargo	St. Paul and Minneapolis	
79	St. Thomas		Washington
613	Washington		Washington

geometry \

618	MULTIPOLYGON (((-122.40537 37.70826, -122.5751...	
1098	POLYGON ((-121.91046 37.73039, -121.96004 37.7...	
1885	POLYGON ((-121.47115 36.97797, -121.48895 36.9...	
149	POLYGON ((-115.89692 36.84208, -115.74075 36.8...	
444	POLYGON ((-122.63498 38.58301, -122.62085 38.5...	
81	POLYGON ((-118.18700 40.00209, -117.54175 40.0...	
30	POLYGON ((-108.20839 33.20097, -109.04758 33.2...	
391	POLYGON ((-114.47325 33.02788, -114.26880 33.0...	
832	POLYGON ((-111.89308 33.20471, -112.08349 33.2...	
2	POLYGON ((-104.38368 34.69213, -104.33973 34.6...	
29	POLYGON ((-105.93164 33.38990, -105.72717 33.3...	
1168	POLYGON ((-120.00214 46.99732, -119.96580 46.9...	
1	POLYGON ((-123.49077 46.38358, -123.21795 46.3...	
1129	POLYGON ((-117.73737 46.44933, -117.73742 46.4...	
91	POLYGON ((-91.95166 40.21395, -91.95273 39.949...	
20	POLYGON ((-93.51565 38.37395, -93.52348 38.207...	
727	POLYGON ((-90.81877 37.73553, -91.10002 37.740...	
33	POLYGON ((-94.38276 37.64914, -94.07352 37.639...	
141	POLYGON ((-96.22617 45.21949, -96.17268 45.192...	
315	POLYGON ((-94.66363 46.97693, -94.65837 46.976...	
114	POLYGON ((-93.68532 46.24476, -93.43065 46.246...	
615	POLYGON ((-93.70241 45.13162, -93.73862 45.081...	
283	POLYGON ((-93.31499 47.02822, -93.05676 47.026...	
137	POLYGON ((-100.81109 45.94369, -101.99873 45.9...	
139	POLYGON ((-92.08948 43.50068, -92.44895 43.500...	
480	POLYGON ((-103.80939 44.60478, -103.56765 44.6...	
5	POLYGON ((-96.60910 43.50043, -97.12948 43.499...	

```

115  POLYGON ((-97.40383 48.54297, -97.16139 48.542...
79   POLYGON ((-65.15388 18.28114, -65.15070 18.302...
613  POLYGON ((-77.11975 38.93435, -77.04088 38.995...

                                Province
618      San Francisco
1098     San Francisco
1885     San Francisco
149      San Francisco
444      San Francisco
81       San Francisco
30        Santa Fe
391      Santa Fe
832      Santa Fe
2         Santa Fe
29       Santa Fe
1168     Seattle
1         Seattle
1129     Seattle
91       St. Louis
20       St. Louis
727      St. Louis
33       St. Louis
141     St. Paul and Minneapolis
315     St. Paul and Minneapolis
114     St. Paul and Minneapolis
615     St. Paul and Minneapolis
283     St. Paul and Minneapolis
137     St. Paul and Minneapolis
139     St. Paul and Minneapolis
480     St. Paul and Minneapolis
5        St. Paul and Minneapolis
115     St. Paul and Minneapolis
79      Washington
613     Washington

```

## 2.4 Here with editing

```

[ ]: cathedral_list = pd.read_html('https://en.wikipedia.org/wiki/
    ↪List_of_Catholic_cathedrals_in_the_United_States')[0][[['Diocese', ↪
    ↪'Cathedral']]]

cathedral_list['Diocese'] = cathedral_list['Diocese'].str.replace('Diocese of', ↪
    ↪'').str.replace('Archdiocese of', '').str.strip()

# Adding str.strip() ended up being necessary for the merge to work
cathedral_list['Cathedral_List'] = [[cathedral_list['Cathedral'][i]] for i in ↪
    ↪range(len(cathedral_list))]

```

```

cathedral_list.drop('Cathedral', axis = 1, inplace = True)
cathedral_list['Cathedral_coord_list'] = [[] for i in
    range(len(cathedral_list))]
df_provinces_cathedrals = df_provinces.merge(cathedral_list, on = 'Diocese', u
    ↪how = 'left')
df_provinces_cathedrals.to_csv('diocese_province_cathedral_list.csv', index = u
    ↪False)
df_provinces_cathedrals

```

```
[ ]:      Diocese      Province \
0     Anchorage-Juneau Anchorage-Juneau
1     Anchorage-Juneau Anchorage-Juneau
2          Fairbanks Anchorage-Juneau
3          Atlanta    Atlanta
4        Charleston    Atlanta
..           ...
179         Seattle    Seattle
180        Spokane    Seattle
181        Yakima    Seattle
182      Washington    Washington
183       St. Thomas    Washington
```

	Cathedral_List	Cathedral_coord_list
0	[Our Lady of Guadalupe Cathedral(Anchorage)]	[]
1	[Co-Cathedral of the Nativity of the Blessed V...]	[]
2	[Cathedral of the Sacred Heart]	[]
3	[Cathedral of Christ the King]	[]
4	[Cathedral of Saint John the Baptist]	[]
..	...	...
179	[Saint James Cathedral]	[]
180	[Cathedral of Our Lady of Lourdes]	[]
181	[Saint Paul Cathedral]	[]
182	[Cathedral of Saint Matthew the Apostle]	[]
183	NaN	NaN

[184 rows x 4 columns]

I then went to openstreetmap.org to determine the coordinates of each cathedral. I found these coordinates by searching for each cathedral; right clicking on the cathedral that appeared on the map and selecting ‘show address’; and then copying in and pasting the geographic coordinates that appeared within the ‘Results from Internal’ section. (Alternately, I could have selected ‘Centre Map Here’ and then copied and pasted in the coordinates from the URL box.)

```
[ ]: df_provinces
```

```
[ ]:      Diocese      Province
0     Anchorage-Juneau Anchorage-Juneau
```

```
1      Fairbanks    Anchorage-Juneau
2          Atlanta        Atlanta
3      Charleston        Atlanta
4      Charlotte        Atlanta
...
171         ...        ...
172      Seattle        Seattle
173      Spokane        Seattle
173      Yakima        Seattle
174      Washington     Washington
175      St. Thomas     Washington
```

[176 rows x 2 columns]

```
[ ]: df_dioceses.groupby('Diocese').count().sort_values(['STATEFP'], ascending = False).head(15)[['COUNTYFP']]
```

```
[ ]: Diocese
Richmond                105
Savannah                 90
Little Rock                75
Atlanta                  69
Jackson                  65
Wheeling-Charleston      55
Raleigh                   54
Lexington                  50
Oklahoma City                46
Charleston                  46
Charlotte                  46
Sioux Falls                  44
Boise                      44
Springfield-Cape Girardeau    39
Birmingham                  39
Name: COUNTYFP, dtype: int64
```

```
[ ]: df_dioceses.groupby('Diocese').count().sort_values(['STATEFP']).head(5)[['COUNTYFP']]
```

```
[ ]: Diocese
Bridgeport                  1
San Jose                     1
Worcester                     1
Orange                      1
Rockville Centre                2
Name: COUNTYFP, dtype: int64
```

```
[ ]: df_dioceses.set_index('county_state', drop = False, inplace = True)
df_dioceses['Diocese_Detail'] = df_dioceses['Diocese']
```

```

df_dioceses['Province_Detail'] = df_dioceses['Province']

df_dioceses.at['Plymouth County, Massachusetts', 'Diocese_Detail'] = 'Boston, □
    ↪Fall River'
df_dioceses.at['Fayette County, Texas', 'Diocese_Detail'] = 'Austin, Victoria'

df_dioceses.at['McMullen County, Texas', 'Diocese_Detail'] = 'Corpus Christi, □
    ↪San Antonio'
df_dioceses.at['McMullen County, Texas', 'Province_Detail'] = □
    ↪'Galveston-Houston, San Antonio'

df_dioceses.at['Spencer County, Indiana', 'Diocese_Detail'] = 'Evansville, □
    ↪Indianapolis'
df_dioceses.at['Rio Arriba County, New Mexico', 'Diocese_Detail'] = 'Gallup, □
    ↪Santa Fe'
df_dioceses.at['Sandoval County, New Mexico', 'Diocese_Detail'] = 'Gallup, □
    ↪Santa Fe'
df_dioceses.at['Bernalillo County, New Mexico', 'Diocese_Detail'] = 'Gallup, □
    ↪Santa Fe'
df_dioceses.at['Valencia County, New Mexico', 'Diocese_Detail'] = 'Gallup, □
    ↪Santa Fe'
df_dioceses.at['Pinal County, Arizona', 'Diocese_Detail'] = 'Phoenix, Tucson'
df_dioceses.at['Coconino County, Arizona', 'Diocese_Detail'] = 'Gallup, Phoenix'
df_dioceses.at['Jefferson Parish, Louisiana', 'Diocese_Detail'] = □
    ↪'Houma-Thibodaux, New Orleans'
df_dioceses.at['St. Mary Parish, Louisiana', 'Diocese_Detail'] = □
    ↪'Houma-Thibodaux, Lafayette in Louisiana'

df_dioceses.at['Suffolk County, New York', 'Diocese_Detail'] = 'Norwich, □
    ↪Rockville Centre'
df_dioceses.at['Suffolk County, New York', 'Diocese_Detail'] = 'Hartford, New □
    ↪York'

df_dioceses.at['Herkimer County, New York', 'Diocese_Detail'] = 'Albany, □
    ↪Ogdensburg'
df_dioceses.at['Hamilton County, New York', 'Diocese_Detail'] = 'Albany, □
    ↪Ogdensburg'
df_dioceses.at['Deuel County, Nebraska', 'Diocese_Detail'] = 'Grand Island, □
    ↪Lincoln'
df_dioceses.at['Keith County, Nebraska', 'Diocese_Detail'] = 'Grand Island, □
    ↪Lincoln'
df_dioceses.at['Lincoln County, Nebraska', 'Diocese_Detail'] = 'Grand Island, □
    ↪Lincoln'
df_dioceses.at['Dawson County, Nebraska', 'Diocese_Detail'] = 'Grand Island, □
    ↪Lincoln'

```

```

df_dioceses.at['Hall County, Nebraska', 'Diocese_Detail'] = 'Grand Island,□
↪Lincoln'
df_dioceses.at['Toole County, Montana', 'Diocese_Detail'] = 'Great□
↪Falls-Billings, Helena'
df_dioceses.at['Teton County, Montana', 'Diocese_Detail'] = 'Great□
↪Falls-Billings, Helena'

df_dioceses.at['Fremont County, Idaho', 'Diocese_Detail'] = 'Boise, Cheyenne'
df_dioceses.at['Fremont County, Idaho', 'Province_Detail'] = 'Portland in□
↪Oregon, Denver'
df_dioceses.at['Gallatin County, Montana', 'Diocese_Detail'] = 'Cheyenne,□
↪Helena'
df_dioceses.at['Gallatin County, Montana', 'Province_Detail'] = 'Denver,□
↪Portland in Oregon'
df_dioceses.at['Park County, Montana', 'Diocese_Detail'] = 'Cheyenne, Great□
↪Falls-Billings'
df_dioceses.at['Park County, Montana', 'Province_Detail'] = 'Denver, Portland□
↪in Oregon'

df_dioceses.at['Bottineau County, North Dakota', 'Diocese_Detail'] = 'Bismarck,□
↪Fargo'

df_dioceses.reset_index(drop=True, inplace = True)

```

```
[ ]: if generate_county_list_and_boundaries == True:
    # See https://geopandas.org/en/stable/docs/user_guide/
↪aggregation_with_dissolve.html
    diocese_boundaries = df_dioceses.dissolve(by = 'Diocese')
    diocese_boundaries['geometry'] = diocese_boundaries.simplify(tolerance = 0.
↪005)
    diocese_boundaries['Diocese'] = diocese_boundaries.index
    diocese_boundaries.reset_index(drop=True,inplace=True)
    diocese_boundaries.to_file('diocese_boundaries.geojson', driver = 'GeoJSON')
    diocese_boundaries.head(5)
```

```
[ ]: if generate_county_list_and_boundaries == True:
    # See https://geopandas.org/en/stable/docs/user_guide/
↪aggregation_with_dissolve.html
    province_boundaries = df_dioceses.dissolve(by = 'Province')
    province_boundaries['geometry'] = province_boundaries.simplify(tolerance = 0.
↪0.005)
    province_boundaries.to_file('province_boundaries.geojson', driver = 'GeoJSON')
    province_boundaries.head(5)
```

```
[ ]: df_dioceses['geometry'] = df_dioceses.simplify(tolerance = 0.005)
```

```
[ ]: df_dioceses
```

```
[ ]: STATEFP COUNTYFP COUNTYNS GEOID NAME NAMELSAD LSAD \
0 31 039 00835841 31039 Cuming Cuming County 06
1 53 069 01513275 53069 Wahkiakum Wahkiakum County 06
2 35 011 00933054 35011 De Baca De Baca County 06
3 31 109 00835876 31109 Lancaster Lancaster County 06
4 31 129 00835886 31129 Nuckolls Nuckolls County 06
...
3141 ... ... ... ... ... Gilmer Gilmer County 06
3142 27 135 00659513 27135 Roseau Roseau County 06
3143 28 089 00695768 28089 Madison Madison County 06
3144 48 227 01383899 48227 Howard Howard County 06
3145 54 099 01550056 54099 Wayne Wayne County 06

State_Name State_Code FIPS county_state \
0 Nebraska NE 31 Cuming County, Nebraska
1 Washington WA 53 Wahkiakum County, Washington
2 New Mexico NM 35 De Baca County, New Mexico
3 Nebraska NE 31 Lancaster County, Nebraska
4 Nebraska NE 31 Nuckolls County, Nebraska
...
3141 Georgia GA 13 Gilmer County, Georgia
3142 Minnesota MN 27 Roseau County, Minnesota
3143 Mississippi MS 28 Madison County, Mississippi
3144 Texas TX 48 Howard County, Texas
3145 West Virginia WV 54 Wayne County, West Virginia

Diocese Diocese_Detail Province_Detail \
0 Omaha Omaha Omaha
1 Seattle Seattle Seattle
2 Santa Fe Santa Fe Santa Fe
3 Lincoln Lincoln Omaha
4 Lincoln Lincoln Omaha
...
3141 Atlanta Atlanta Atlanta
3142 Crookston Crookston St. Paul and Minneapolis
3143 Jackson Jackson Mobile
3144 San Angelo San Angelo San Antonio
3145 Wheeling-Charleston Wheeling-Charleston Baltimore

geometry \
0 POLYGON ((-96.55515 41.91587, -96.55517 41.742...
1 POLYGON ((-123.49077 46.38358, -123.21795 46.3...
2 POLYGON ((-104.38368 34.69213, -104.33973 34.6...
```

```

3      POLYGON ((-96.68140 41.04566, -96.46387 41.045...
4      POLYGON ((-98.04802 40.35066, -97.82082 40.350...
...
3141  POLYGON ((-84.30237 34.57832, -84.32878 34.583...
3142  POLYGON ((-95.25857 48.88666, -95.23104 48.881...
3143  POLYGON ((-90.14883 32.40026, -90.24376 32.400...
3144  POLYGON ((-101.18138 32.21252, -101.18400 32.0...
3145  POLYGON ((-82.30872 38.28106, -82.31149 38.256...

```

	Province
0	Omaha
1	Seattle
2	Santa Fe
3	Omaha
4	Omaha
...	...
3141	Atlanta
3142	St. Paul and Minneapolis
3143	Mobile
3144	San Antonio
3145	Baltimore

[3146 rows x 16 columns]

```
[ ]: df_dioceses.to_file('counties_by_diocese.geojson', driver = 'GeoJSON')
# This raises a ValueError if the index is set to county_state, though I'm not
↪sure why.
```

```
c:\Users\kburc\miniforge3\envs\ga15pyd\lib\site-
packages\geopandas\io\file.py:362: FutureWarning: pandas.Int64Index is
deprecated and will be removed from pandas in a future version. Use pandas.Index
with the appropriate dtype instead.
pd.Int64Index,
```

## 2.5 Inaccurate parts of the map at this point:

1. Fall River/Boston: The Diocese of Fall River includes “the towns of Marion, Mattapoisett, and Wareham along the south coast of Plymouth County in Massachusetts, in the New England region of the United States.” ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Fall\\_River](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Fall_River)) The rest of Plymouth County belongs to the Archdiocese of Boston. [Revised diocese maps]
2. Austin/Victoria in Texas: Only part of Fayette County belongs to the Diocese of Victoria in Texas. “The part of Fayette County north of the Colorado River” is part of the Diocese of Austin. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Austin](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Austin)) [Revised diocese maps]
3. San Antonio/Corpus Christi: The Archdiocese of San Antonio includes only that part of McMullen County north of the Nueces River. The rest belongs to the Diocese of Corpus Christi.

See: [https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Archdiocese\\_of\\_San\\_Antonio](https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_San_Antonio) This also means that McMullen County is part of two different provinces (Galveston-Houston and San Antonio). I believe it is the only county to have this distinction. [Revised diocese and province maps]

4. Evansville/Indianapolis: Wikipedia notes that “Harrison Township in Spencer County, the location of St. Meinrad Archabbey, is part of the Archdiocese of Indianapolis.” ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Evansville](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Evansville)) [Revised diocese and province maps]
5. Gallup/Santa Fe: Wikipedia notes that the Diocese of Gallup also includes “parts of Rio Arriba, Sandoval, Bernalillo, and Valencia Counties west of 106,52’41” meridian [-106.87806 decimal degrees longitude] in New Mexico.” The rest of those counties belong to Santa Fe. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Gallup](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Gallup)) (The Wikipedia page references [https://web.archive.org/web/20120624033053/https://dioceseofgallup.org/about\\_history.php](https://web.archive.org/web/20120624033053/https://dioceseofgallup.org/about_history.php) (Perhaps it’s related to the New Mexico meridian? [https://en.wikipedia.org/wiki/New\\_Mexico\\_meridian](https://en.wikipedia.org/wiki/New_Mexico_meridian) That one is -106.8944 decimal degrees longitude). [Revised diocese maps]
6. Tucson/Phoenix: The parts of Pinal County that lie within “the territorial boundaries of the Gila River Indian Community” are part of the Diocese of Phoenix, not the Diocese of Tucson. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Tucson](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Tucson)) (This map of the Gila River Indian Community was also helpful: [https://en.wikipedia.org/wiki/Gila\\_River\\_Indian\\_Community#/media/File:Pinal\\_County\\_Arizona\\_Inco](https://en.wikipedia.org/wiki/Gila_River_Indian_Community#/media/File:Pinal_County_Arizona_Inco)) [Revised diocese maps]
7. New Orleans/Houma-Thibodaux: The Archdiocese of New Orleans does not include Grand Isle (within Jefferson Parish); that instead belongs to the Diocese of Houma-Thibodaux. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Archdiocese\\_of\\_New\\_Orleans](https://en.wikipedia.org/wiki/Roman_Catholic_Archdiocese_of_New_Orleans)) [Revised diocese maps]
8. Lafayette in Louisiana/Houma-Thibodaux: The eastern portion of St. Mary Parish (including Morgan City) belongs to the Diocese of Houma-Thibodaux; the rest belongs to the Diocese of Lafayette in Louisiana. Based on parish listings for each diocese (<https://htdiocese.org/church-parishes-by-area> and <https://diolaf.org/all-parishes> ), I allocated Berwick and Patterson to the Diocese of Lafayette. I ended up making the Atchafalaya River the dividing point between these two dioceses within St. Mary’s. [Revised diocese maps]
9. Rockville Centre/Norwich: Fisher Island (within Suffolk County, NY) belongs to the Diocese of Norwich and the Province of Hartford, not the Diocese of Rockville Centre and the Province of New York. [Revised diocese and province maps]
10. Albany/Ogdensburg: The northern part of Herkimer County belongs to the Diocese of Ogdensburg; the rest belongs to the Diocese of Albany. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Ogdensburg](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Ogdensburg) (<https://www.rcdony.org/about/history.html> and <https://evangelist.org/Images/Images/2470.jpg> were helpful in revising the diocesan borders.) [Revised diocese maps]
11. Albany/Ogdensburg: The southern part of Hamilton County belongs to the Diocese of Albany; the rest belongs to the Diocese of Ogdensburg. ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Ogdensburg](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Ogdensburg)) [Revised diocese maps]

12. Grand Island/Lincoln: the parts of Deuel, Keith, Lincoln, Dawson, and Hall counties that lie south of the Platte River belong to the Diocese of Lincoln. The northern parts of these counties belong to the Diocese of Grand Island. Although the Archdiocese of Omaha reports that “parts of Hall County” belong to its diocese (<https://archomaha.org/about-us/>), I believe this is incorrect, as the Diocese of Lincoln’s parish map shows the southern portion of Hall County as belonging instead instead to the Diocese of Lincoln: <https://www.lincolndiocese.org/directory/parish-map> For now, I have assigned Lincoln County to the Diocese of Lincoln and Deuel, Keith, Dawson, and Hall counties to the Diocese of Grand Island (based on which diocese has the majority of each’s county’s area). It appears that a small portion of Buffalo County may lie south of the Platte, but I’m keeping all of this county within the Diocese of Grand Island for now, since it’s possible the Platte’s course changed following the diocese’s establishment (and the bottom edge of the county does appear to follow the course of a river). [Revised diocese maps]
13. Helena/Great Falls-Billings: The Diocese of Great Falls-Billings includes parts of 2 counties, given that the Diocese of Helena does also: <https://diocesehelena.org/about/> Based on the Diocese of Helena’s Wikipedia map ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Helena#/media/File:Diocese\\_of\\_Helena.PM](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Helena#/media/File:Diocese_of_Helena.PM)) it looks like the Diocese of Great Falls-Billings includes portions of Toole and Teton counties, the majority of which belong to the Diocese of Helena. However, the Diocese of Great Falls-Billings map doesn’t appear to reflect these modifications: <https://diocesegfb.org/home-page/about/> Meanwhile, the Diocese of Helena’s Wikipedia page reports that the diocese includes “Parts of Meagher, Musselshell, and Toole counties in Montana.” However, Musselshell county is landlocked within the Diocese of Great Falls-Billings, so this is likely a typo. I also don’t see any evidence on the Wikipedia map ([https://en.wikipedia.org/wiki/Roman\\_Catholic\\_Diocese\\_of\\_Helena#/media/File:Diocese\\_of\\_Helena.PM](https://en.wikipedia.org/wiki/Roman_Catholic_Diocese_of_Helena#/media/File:Diocese_of_Helena.PM)) of part of Meagher county belonging to the Diocese of Great Falls-Billings. [Revised diocese maps]
14. Bismarck/Fargo: The western section of Bottineau County belongs to the Diocese of Bismarck; the rest belongs to the Diocese of Fargo. See <https://bismarckdiocese.com/about> and page 3 of <https://d2y1pz2y630308.cloudfront.net/2950/documents/2022/3/DiocesanDirectory.pdf>. This change is not reflected on the current Bismarck and Fargo diocese maps on Wikipedia. [Revised diocese maps]
15. Gallup/Phoenix: The Navajo Nation part of Coconino County belongs to the Diocese of Gallup; the rest of Coconino County belongs to the Diocese of Phoenix. (This is reflected on the Phoenix and Santa Fe Province maps on Wikipedia but not on the Gallup map). [Revised diocese maps]
16. According to the Diocese of Cheyenne’s website (<https://dcwy.org/about-the-diocese-of-cheyenne>), the Diocese of Cheyenne also includes all of Yellowstone National Park (which extends into Montana and Idaho). This means that the Diocese of Cheyenne contains slivers of Fremont County (Idaho), Gallatin County (Montana), and Park County (Montana). This also means that these three counties are in both the Province of Denver and the Province of Portland-Oregon. [Revised diocese and province maps]

```
[ ]: df_dioceses.sort_values('Diocese', inplace = True)
```

```
# Sorts the dioceses alphabetically so that the colors are not determined by
# the order in which the dioceses were added
df_diocese_numbers = pd.DataFrame(list(enumerate(pd.unique(
    df_dioceses['Diocese']))))
df_diocese_numbers.columns = ['Diocese_Color_Code', 'Diocese']
df_diocese_numbers
```

```
[ ]:   Diocese_Color_Code      Diocese
0            0          Albany
1            1        Alexandria
2            2       Allentown
3            3 Altoona-Johnstown
4            4        Amarillo
..
171          ...           ...
172          171      Wilmington
172          172 Winona-Rochester
173          173      Worcester
174          174        Yakima
175          175     Youngstown
```

[176 rows x 2 columns]

```
[ ]: df_dioceses.head(2)
```

```
[ ]:   STATEFP COUNTYFP COUNTYNNS GEOID      NAME      NAMELSAD LSAD \
744      36      039 00974118 36039  Greene  Greene County  06
2878     36      025 00974111 36025 Delaware Delaware County  06

      State_Name State_Code FIPS                  county_state Diocese \
744    New York          NY    36  Greene County, New York  Albany
2878    New York          NY    36 Delaware County, New York  Albany

      Diocese_Detail Province_Detail \
744        Albany        New York
2878        Albany        New York

                                         geometry Province
744  POLYGON ((-74.04239 42.17039, -74.07480 42.096...  New York
2878  POLYGON ((-74.78069 42.01637, -75.15150 41.849...  New York
```

```
[ ]: df_diocese_numbers
```

```
[ ]:   Diocese_Color_Code      Diocese
0            0          Albany
1            1        Alexandria
2            2       Allentown
3            3 Altoona-Johnstown
```

```

4          4      Amarillo
..
..        ...
171      171      Wilmington
172      172  Winona-Rochester
173      173      Worcester
174      174      Yakima
175      175      Youngstown

```

[176 rows x 2 columns]

```

[ ]: if 'Diocese_Color_Code' in df_dioceses:
    df_dioceses.drop('Diocese_Color_Code', axis = 1, inplace = True)
df_dioceses = df_dioceses.merge(df_diocese_numbers, on = 'Diocese',
how = 'left')
df_dioceses

```

	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMESAD	LSAD	\
0	36	039	00974118	36039	Greene	Greene County	06	
1	36	025	00974111	36025	Delaware	Delaware County	06	
2	36	091	00974143	36091	Saratoga	Saratoga County	06	
3	36	001	00974099	36001	Albany	Albany County	06	
4	36	043	00974120	36043	Herkimer	Herkimer County	06	
...	...	...	...	...	...	...	...	
3141	39	099	01074062	39099	Mahoning	Mahoning County	06	
3142	39	133	01074079	39133	Portage	Portage County	06	
3143	39	151	01065576	39151	Stark	Stark County	06	
3144	39	007	01074017	39007	Ashtabula	Ashtabula County	06	
3145	39	029	01074027	39029	Columbiana	Columbiana County	06	
	State_Name	State_Code	FIPS		county_state	Diocese	\	
0	New York		NY	36	Greene County, New York	Albany		
1	New York		NY	36	Delaware County, New York	Albany		
2	New York		NY	36	Saratoga County, New York	Albany		
3	New York		NY	36	Albany County, New York	Albany		
4	New York		NY	36	Herkimer County, New York	Albany		
...	...	...	...	...	...	...	...	
3141	Ohio		OH	39	Mahoning County, Ohio	Youngstown		
3142	Ohio		OH	39	Portage County, Ohio	Youngstown		
3143	Ohio		OH	39	Stark County, Ohio	Youngstown		
3144	Ohio		OH	39	Ashtabula County, Ohio	Youngstown		
3145	Ohio		OH	39	Columbiana County, Ohio	Youngstown		
	Diocese_Detail	Province_Detail	\					
0	Albany	New York						
1	Albany	New York						
2	Albany	New York						
3	Albany	New York						

```

4      Albany, Ogdensburg          New York
...
3141      ...                      ...
3142      Youngstown              Cincinnati
3143      Youngstown              Cincinnati
3144      Youngstown              Cincinnati
3145      Youngstown              Cincinnati

                                geometry   Province \
0      POLYGON ((-74.04239 42.17039, -74.07480 42.096...  New York
1      POLYGON ((-74.78069 42.01637, -75.15150 41.849...  New York
2      POLYGON ((-73.67891 42.91221, -73.68447 42.891...  New York
3      POLYGON ((-73.96379 42.44162, -74.26347 42.407...  New York
4      POLYGON ((-74.74371 42.99941, -74.76330 42.863...  New York
...
3141  ...                      ...
3142  POLYGON ((-80.56910 41.13332, -80.51905 41.133... Cincinnati
3143  POLYGON ((-81.00229 41.13419, -81.00169 40.987... Cincinnati
3144  POLYGON ((-80.51942 41.97752, -80.51923 41.499... Cincinnati
3145  POLYGON ((-80.51899 40.65409, -80.51899 40.638... Cincinnati

    Diocese_Color_Code
0                  0
1                  0
2                  0
3                  0
4                  0
...
3141      ...
3142      175
3143      175
3144      175
3145      175

[3146 rows x 17 columns]

```

### 3 Updating Color Codes:

```
[ ]: # # This use of df.apply() with if/else statements is based on an example
# by Professor Hardeep Johar.

# Green:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 48 if
row['Diocese'] in
['Seattle', 'Dubuque', 'Charleston'] else row['Diocese_Color_Code'], axis = 1)
```

```

# Light blue:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 0 if
    row['Diocese'] in [
        'Santa Rosa', 'Crookston', 'Kansas City-St. Joseph', 'St. Petersburg',
        'Gaylord'] else row['Diocese_Color_Code'], axis = 1)

#Pink:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 64 if
    row['Diocese'] in [
        'Reno', 'San Antonio', 'Cleveland'] else row['Diocese_Color_Code'], axis =
    1)

#Red:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 80 if
    row['Diocese'] in [
        'Cheyenne', 'Sioux Falls', 'Baltimore', 'San Francisco', 'Scranton']
    else row['Diocese_Color_Code'], axis = 1)

# Blue:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 16 if
    row['Diocese'] in [
        'Davenport', 'Tulsa', 'San Diego',
        'Biloxi', 'St. Paul and Minneapolis'
    ] else row['Diocese_Color_Code'], axis = 1)

# Light green:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 32 if
    row['Diocese'] in [
        'Sacramento', 'Washington', 'Palm Beach', 'Birmingham', 'Paterson',
        'Rockville Centre'] else row['Diocese_Color_Code'], axis = 1)

# Yellow (changed to dark red within the mapping code to make the labels
# easier to read):
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 160 if
    row['Diocese'] in [
        'Lubbock'] else row['Diocese_Color_Code'], axis = 1)

# Light orange:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 96 if
    row['Diocese'] in [
        'Youngstown', 'Denver'] else row['Diocese_Color_Code'], axis = 1)

# Orange:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 112 if
    row['Diocese'] in [
        'Alexandria', 'Covington', 'Helena', 'Raleigh']

```

```

    else row['Diocese_Color_Code'], axis = 1)

# Purple:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 144 if
    ↪row['Diocese'] in [
        'Lafayette in Louisiana', 'Lexington', 'Gary', 'New York',
        'St. Louis'] else row['Diocese_Color_Code'], axis = 1)

# Brown:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 174 if
    ↪row['Diocese'] in [
        'Louisville', 'Bridgeport', 'Milwaukee',
        'Colorado Springs'] else row['Diocese_Color_Code'], axis = 1)

# Light purple:
df_dioceses['Diocese_Color_Code'] = df_dioceses.apply(lambda row: 128 if
    ↪row['Diocese'] in [
        'St. Cloud', 'Memphis'] else row['Diocese_Color_Code'], axis = 1)

```

[ ]: df\_dioceses.to\_csv('counties\_by\_diocese.csv', index = False)

### 3.1 Finding mean latitude and longitude points for each diocese (in order to determine where to plot the diocese name)

[ ]: diocese\_boundaries['center'] = diocese\_boundaries['geometry'].representative\_point()  
*# See [https://geopandas.org/en/stable/docs/reference/api/geopandas.GeoSeries.representative\\_point.html](https://geopandas.org/en/stable/docs/reference/api/geopandas.GeoSeries.representative_point.html)*

[ ]: diocese\_boundaries['name\_for\_plotting'] = diocese\_boundaries['Diocese']

[ ]: diocese\_boundaries

	STATEFP	COUNTYFP	COUNTYNS	GEOID	NAME	NAMESAD	LSAD	\
0	36	091	00974143	36091	Saratoga	Saratoga County	06	
1	22	021	00558477	22021	Caldwell	Caldwell Parish	15	
2	42	011	01209172	42011	Berks	Berks County	06	
3	42	057	01213671	42057	Fulton	Fulton County	06	
4	48	011	01383791	48011	Armstrong	Armstrong County	06	
..	..	..	..	..	..	..	..	
171	24	047	01668802	24047	Worcester	Worcester County	06	
172	27	045	00659468	27045	Fillmore	Fillmore County	06	
173	25	027	00606940	25027	Worcester	Worcester County	06	
174	53	037	01531926	53037	Kittitas	Kittitas County	06	
175	39	133	01074079	39133	Portage	Portage County	06	

	State_Name	State_Code	FIPS	county_state	\
0	New York	NY	36	Saratoga County, New York	
1	Louisiana	LA	22	Caldwell Parish, Louisiana	
2	Pennsylvania	PA	42	Berks County, Pennsylvania	
3	Pennsylvania	PA	42	Fulton County, Pennsylvania	
4	Texas	TX	48	Armstrong County, Texas	
..	..	..	..	..	
171	Maryland	MD	24	Worcester County, Maryland	
172	Minnesota	MN	27	Fillmore County, Minnesota	
173	Massachusetts	MA	25	Worcester County, Massachusetts	
174	Washington	WA	53	Kittitas County, Washington	
175	Ohio	OH	39	Portage County, Ohio	
	Province		Diocese_Detail	Province_Detail	\
0	New York		Albany	New York	
1	New Orleans		Alexandria	New Orleans	
2	Philadelphia		Allentown	Philadelphia	
3	Philadelphia		Altoona-Johnstown	Philadelphia	
4	San Antonio		Amarillo	San Antonio	
..	..		..	..	
171	Baltimore		Wilmington	Baltimore	
172	St. Paul and Minneapolis		Winona-Rochester	St. Paul and Minneapolis	
173	Boston		Worcester	Boston	
174	Seattle		Yakima	Seattle	
175	Cincinnati		Youngstown	Cincinnati	
	Diocese			geometry	\
0	Albany	POLYGON	((-74.78339 42.01512, -75.15621 41.848...		
1	Alexandria	POLYGON	((-93.29827 30.88300, -93.42428 30.883...		
2	Allentown	POLYGON	((-75.63903 40.31249, -75.69595 40.242...		
3	Altoona-Johnstown	POLYGON	((-78.17999 39.72240, -79.39246 39.721...		
4	Amarillo	POLYGON	((-102.53886 34.31305, -103.04376 34.3...		
..	..		..	..	
171	Wilmington	POLYGON	((-75.81391 37.91204, -75.95267 37.906...		
172	Winona-Rochester	POLYGON	((-93.65128 43.49967, -96.45326 43.500...		
173	Worcester	POLYGON	((-71.85848 42.63381, -71.77532 42.636...		
174	Yakima	POLYGON	((-120.85541 45.67173, -120.89582 45.6...		
175	Youngstown	POLYGON	((-80.51899 40.65388, -80.51899 40.638...		
	center		name_for_plotting		
0	POINT (-74.24141 42.96657)		Albany		
1	POINT (-92.36865 31.67734)		Alexandria		
2	POINT (-75.92727 40.63692)		Allentown		
3	POINT (-78.33118 40.60243)		Altoona-Johnstown		
4	POINT (-101.52090 35.40638)		Amarillo		
..	..		..	..	
171	POINT (-75.74107 38.86142)		Wilmington		

```

172 POINT (-93.93778 43.98246)    Winona-Rochester
173 POINT (-71.95780 42.36949)      Worcester
174 POINT (-120.18003 47.07029)     Yakima
175 POINT (-80.76308 41.79994)      Youngstown

```

[176 rows x 18 columns]

```

[ ]: diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Portland in Oregon',_
    ↪'Portland OR')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('San Francisco', 'SF')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('San Jose', 'SJ')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Oakland', 'Oakl.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Orange', 'Or.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Galveston-Houston',_
    ↪'Galv.-Hou.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Victoria in Texas',_
    ↪'Victoria')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('St. Paul and_
    ↪Minneapolis', 'St. Paul-Minn.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Chicago', 'Chi.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Lafayette in Indiana',_
    ↪'Lafayette IN')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Lafayette in_
    ↪Louisiana', 'Lafyt. LA')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Shreveport', 'Shrvpt.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('St. Petersburg', 'St.-
    ↪Prtsbg.')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Springfield in_
    ↪Illinois', 'Springfield IL')
diocese_boundaries['name_for_plotting'] =_
    ↪diocese_boundaries['name_for_plotting'].str.replace('Washington', 'Was.')

```

```

diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Baltimore', 'Balt.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Pittsburgh', 'Pitt.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Greensburg', 'Grnsbg.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Altoona-Johnstown', 'Alt-Jnstn.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Harrisburg', 'Hrsbg.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Allentown', 'Allntn.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Springfield in Massachusetts', 'Springfield MA.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Worcester', 'Wrcstr.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Bridgeport', 'Brgpt.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Providence', 'Prv.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Norwich', 'Nwch.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Brooklyn', 'Brkln.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Rockville Centre', 'Rockvl_Ctr.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Metuchen', 'Mtchn.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Newark', 'Nwrk.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Steubenville', 'Steub.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Philadelphia', 'Phil.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Paterson', 'Ptrsn.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Hartford', 'Htfd.')
diocese_boundaries['name_for_plotting'] = diocese_boundaries['name_for_plotting'].str.replace('Manchester', 'Mnchstr.')

```

```
diocese_boundaries
```

```
C:\Users\kburc\AppData\Local\Temp\ipykernel_28216\3896696021.py:8:  
FutureWarning: The default value of regex will change from True to False in a  
future version.  
    diocese_boundaries['name_for_plotting'] =  
    diocese_boundaries['name_for_plotting'].str.replace('St. Paul and Minneapolis',  
    'St. Paul-Minn.')  
C:\Users\kburc\AppData\Local\Temp\ipykernel_28216\3896696021.py:13:  
FutureWarning: The default value of regex will change from True to False in a  
future version.  
    diocese_boundaries['name_for_plotting'] =  
    diocese_boundaries['name_for_plotting'].str.replace('St. Petersburg', 'St.  
Petersbg.')
```

```
[ ]:   STATEFP COUNTYFP COUNTYNS GEOID      NAME       NAMELSAD LSAD \
0        36     091 00974143 36091 Saratoga Saratoga County 06
1        22     021 00558477 22021 Caldwell Caldwell Parish 15
2        42     011 01209172 42011 Berks    Berks County 06
3        42     057 01213671 42057 Fulton   Fulton County 06
4        48     011 01383791 48011 Armstrong Armstrong County 06
..      ...
171      24     047 01668802 24047 Worcester Worcester County 06
172      27     045 00659468 27045 Fillmore  Fillmore County 06
173      25     027 00606940 25027 Worcester Worcester County 06
174      53     037 01531926 53037 Kittitas Kittitas County 06
175      39     133 01074079 39133 Portage   Portage County 06
```

```
State_Name State_Code FIPS           county_state \
0        New York      NY 36 Saratoga County, New York
1        Louisiana     LA 22 Caldwell Parish, Louisiana
2        Pennsylvania  PA 42 Berks County, Pennsylvania
3        Pennsylvania  PA 42 Fulton County, Pennsylvania
4        Texas         TX 48 Armstrong County, Texas
..      ...
171      Maryland      MD 24 Worcester County, Maryland
172      Minnesota    MN 27 Fillmore County, Minnesota
173  Massachusetts  MA 25 Worcester County, Massachusetts
174      Washington   WA 53 Kittitas County, Washington
175      Ohio          OH 39 Portage County, Ohio
```

```
Province      Diocese_Detail      Province_Detail \
0        New York      Albany      New York
1        New Orleans    Alexandria New Orleans
2        Philadelphia Allentown Philadelphia
```

	Philadelphia	Altoona-Johnstown	Philadelphia
3	San Antonio	Amarillo	San Antonio
4	..	..	..
171	Baltimore	Wilmington	Baltimore
172	St. Paul and Minneapolis	Winona-Rochester	St. Paul and Minneapolis
173	Boston	Worcester	Boston
174	Seattle	Yakima	Seattle
175	Cincinnati	Youngstown	Cincinnati
	Diocese		geometry \
0	Albany	POLYGON ((-74.78339 42.01512, -75.15621 41.848...	
1	Alexandria	POLYGON ((-93.29827 30.88300, -93.42428 30.883...	
2	Allentown	POLYGON ((-75.63903 40.31249, -75.69595 40.242...	
3	Altoona-Johnstown	POLYGON ((-78.17999 39.72240, -79.39246 39.721...	
4	Amarillo	POLYGON ((-102.53886 34.31305, -103.04376 34.3...	
..	..	..	..
171	Wilmington	POLYGON ((-75.81391 37.91204, -75.95267 37.906...	
172	Winona-Rochester	POLYGON ((-93.65128 43.49967, -96.45326 43.500...	
173	Worcester	POLYGON ((-71.85848 42.63381, -71.77532 42.636...	
174	Yakima	POLYGON ((-120.85541 45.67173, -120.89582 45.6...	
175	Youngstown	POLYGON ((-80.51899 40.65388, -80.51899 40.638...	
	center name_for_plotting		
0	POINT (-74.24141 42.96657)	Albany	
1	POINT (-92.36865 31.67734)	Alexandria	
2	POINT (-75.92727 40.63692)	Allntn.	
3	POINT (-78.33118 40.60243)	Alt-Jnstn.	
4	POINT (-101.52090 35.40638)	Amarillo	
..	..	..	..
171	POINT (-75.74107 38.86142)	Wilmington	
172	POINT (-93.93778 43.98246)	Winona-Rochester	
173	POINT (-71.95780 42.36949)	Wrcstr.	
174	POINT (-120.18003 47.07029)	Yakima	
175	POINT (-80.76308 41.79994)	Youngstown	

[176 rows x 18 columns]

```
[ ]: df_provinces.query("Diocese == 'Newark'")
```

[ ]: Diocese Province  
110 Newark Newark

```
[ ]: def create_map_screenshot(absolute_path_to_map_folder, map_name, added_text =  
    ↵'',  
    screenshot_save_path = None):  
  
    """
```

*This function uses the Selenium library to create a screenshot of a map so that it can be shared as a .png file.  
See <https://www.selenium.dev/documentation/> for more information on Selenium.*

*absolute\_path\_to\_map\_folder designates the absolute path where the map is stored. (I wasn't able to get this code to work using just relative paths.)*

*map\_name specifies the name of the map, including its extension.*

*screenshot\_save\_path designates the folder where you wish to save the map screenshot. This can be a relative path.*

*Note that some setup work is required for the Selenium code to run correctly; if you don't have time right now to complete this setup, you can comment out any code that calls this function.*

*'''*

```
ff_driver = webdriver.Firefox()
# See https://www.selenium.dev/documentation/webdriver/getting_started/
→open_browser/
# For more information on using Selenium to get screenshots of .html
# files, see my get_screenshots.ipynb file within my route_maps_builder
# program, available here:
# https://github.com/kburchfiel/route_maps_builder/blob/master/
→get_screenshots.ipynb
window_width = 3000 # This produces a large window that can better
# capture small details (such as zip code shapefiles).
ff_driver.set_window_size(window_width,window_width*(9/16)) # Creates
# a window with an HD/4K/8K aspect ratio
ff_driver.get(f'{absolute_path_to_map_folder}\\{map_name}')
# See https://www.selenium.dev/documentation/webdriver/browser/navigation/
time.sleep(2) # This gives the page sufficient
# time to load the map tiles before the screenshot is taken.
# You can also experiment with longer sleep times.

if screenshot_save_path != None:
    # If specifying a screenshot save path, you must create this path
    # within your directory before the function is run; otherwise,
    # it won't return an image.
    ff_driver.get_screenshot_as_file(
        screenshot_save_path+'\\'+map_name.replace('.html','')+added_text+'.'
→png')
else: # If no save path was specified for the screenshot, the image
    # will be saved within the project's root folder.
    ff_driver.get_screenshot_as_file(
```

```

    map_name.replace('.html','')+added_text+'.png')
# Based on:
# https://www.selenium.dev/selenium/docs/api/java/org/openqa/selenium/
↪TakesScreenshot.html

ff_driver.quit()
# Based on: https://www.selenium.dev/documentation/webdriver/browser/
↪windows/

def convert_png_to_smaller_jpg(png_folder, png_image_name, jpg_folder,
reduction_factor = 1, quality_factor = 50):
    ''' This function converts a .png image into a smaller .jpg image, which
    helps reduce file sizes and load times when displaying a series of images
    within a notebook or online.
    png_folder and png_image_name specify the location of the original .png
    image.
    jpg folder specifies the location where the .jpg screenshot should be
    saved.
    reduction_factor specifies the amount by which you would like to reduce
    the image's dimensions. For instance, to convert a 4K (3840*2160) image
    to a full HD (1920*1080) one, use a reduction factor of 2. If you do not
    wish to reduce the image's size, use the default reduction factor of 1.
    '''
    with PIL.Image.open(f'{png_folder}/{png_image_name}') as map_image:
        (width, height) = (map_image.width // reduction_factor,
                           map_image.height // reduction_factor)
        jpg_image = map_image.resize((width, height))
        # The above code is based on:
        # https://pillow.readthedocs.io/en/stable/reference/Image.html
        jpg_image = jpg_image.convert('RGB')
        # The above conversion is necessary in order to save .png files as
        # .jpg files. It's based on Patrick Artner's answer at:
        # https://stackoverflow.com/a/48248432/13097194
        jpg_image_name = png_image_name.replace('png', 'jpg')
        jpg_image.save(f'{jpg_folder}/{jpg_image_name}',
                      format = 'JPEG', quality = quality_factor, optimize = True)
        # See https://pillow.readthedocs.io/en/stable/handbook/
↪image-file-formats.html#jpeg

```

```

[ ]: diocese_map = folium.Map(location=[38.7, -95], zoom_start=6, tiles = 'Stamen_
↪Toner')

# Although Folium has a choropleth library, I wasn't able to find a way
# to disable the default legend. Therefore, I am instead using a custom
# choropleth mapping function. Much of this function is based on
# Amodiovalerio Verde's code at:
# https://vverde.github.io/blob/interactivechoropleth.html .

```

```

colormap = branca.colormap.linear.Paired_12.to_step(
    12, data = df_dioceses['Diocese_Color_Code'])
colormap

tooltip = folium.features.GeoJsonTooltip(fields =
['county_state', 'Diocese', 'Province'], aliases =
['County', 'Diocese', 'Province'])
# Based on https://python-visualization.github.io/folium/modules.html#folium.
# features.GeoJsonTooltip

style_function = lambda x: {
    "weight": 0.5,
    'color': '#777777',
    "fillColor": '#770000' if
        colormap(x['properties']['Diocese_Color_Code']) == '#ffff99ff'
    else colormap(x['properties']['Diocese_Color_Code']),
    # Note that 'properties' has to be added before the column name.
    # This can be inferred from the GeoJson definition within Folium:
    # https://python-visualization.github.io/folium/modules.html#folium.
    # features.GeoJson
    # The if/else statement checks whether the color corresponding to the
    # colormap is yellow. (I found this value by printing out each color
    # within the colormap, as shown later in the code.)
    # If so, it changes the fill color to a dark red
    # so that white text labels can be read atop it.
    'fillOpacity': 0.8}

folium.features.GeoJson(df_dioceses,
style_function=style_function).add_to(diocese_map)

diocese_style_function = lambda x: {
    "fillOpacity": 0,
    "weight": 2,
    'color': '#FFFFFF',
    'Fill': False}

folium.features.GeoJson(diocese_boundaries['geometry'],
style_function=diocese_style_function).add_to(diocese_map)
# diocese_boundaries includes both geometry and point values. The point values
# confuse the interpreter, so in order to avoid an error message, I
# entered 'geometry' here to specify that those were the points to be plotted.

```

```

province_style_function = lambda x: {
    'weight': '2',
    'fillOpacity': 0,
    'color':
    '#000000',
    'Fill': False}
# See https://python-visualization.github.io/folium/modules.html#folium.
#<vector_layers.path_options
# for style_function arguments.

folium.GeoJson(province_boundaries, name = "geojson", style_function = province_style_function).add_to(diocese_map)

tooltip_style_function = lambda x: {
    "fillOpacity": 0,
    "weight": 0,
    'color': '#000000',
    'Fill': False}

folium.features.GeoJson(df_dioceses, tooltip = tooltip,
style_function=tooltip_style_function).add_to(diocese_map)

for i in range(len(diocese_boundaries)):
    center_point = [float(diocese_boundaries.iloc[i, diocese_boundaries.columns.get_loc('center')].y),
                    float(diocese_boundaries.iloc[i, diocese_boundaries.columns.get_loc('center')].x)]
    # The use of .y and .x here is based on Francois M.'s response at:
    # https://gis.stackexchange.com/a/255867/195615
    diocese_name = diocese_boundaries.iloc[i, diocese_boundaries.columns.get_loc('Diocese')]
    diocese_name_for_plotting = diocese_boundaries.iloc[i, diocese_boundaries.columns.get_loc('name_for_plotting')]
    split_name = diocese_name_for_plotting.replace('-', ' ').split(' ')
    horizontal_offset = max([len(word) for word in split_name])*3
    vertical_offset = len(split_name)*10
    # print(split_name, horizontal_offset) # For debugging
    style_tag = '<style> p{color:white; line-height: 1} </style>'
    # style_tag = '<style> p{text-align:center} </style>'
    # align_string = 'style = "text-align:center"'
    # align_string = 'style = "color:green"'
    # folium.CircleMarker(center_point, radius = 1).add_to(diocese_map)
    # The above line is very useful for debugging what offsets to use when placing
    # text on the map.

```

```

    if diocese_name == diocese_boundaries.iloc[i, diocese_boundaries.columns.
    ↪get_loc('Province')]: # E.g. if this is an archdiocese (as provinces are
    ↪named after archdioceses)
        folium.Marker(center_point, icon = folium.
    ↪DivIcon(icon_anchor=(horizontal_offset, vertical_offset), ↪
    ↪html=f'{style_tag}<p><b>{diocese_name_for_plotting}</i><b></p>'). ↪
    ↪add_to(diocese_map)
    else:
        folium.Marker(center_point, icon = folium.
    ↪DivIcon(icon_anchor=(horizontal_offset, vertical_offset), ↪
    ↪html=f'{style_tag}<p><b>{diocese_name_for_plotting}</b></p>'). ↪
    ↪add_to(diocese_map)
        # folium.Marker(center_point, icon = folium.
    ↪DivIcon(icon_anchor=(horizontal_offset, 10), ↪
    ↪html=f'{style_tag}<b><p>{diocese_name_for_plotting.replace(' ', '_').
    ↪replace('-', '_')}</p></b>').add_to(diocese_map)

# The strategy of using an invisible folium.Marker object to display text on
# the map via DivIcon elements comes from from Bob Haffner's response at:
# https://stackoverflow.com/a/56878525/13097194 or:
# and https://stackoverflow.com/a/46408144/13097194

# folium.LatLngPopup().add_to(diocese_map) # Useful for debugging

diocese_map.save('diocese_map.html')

# colormap.add_to(m)

```

```

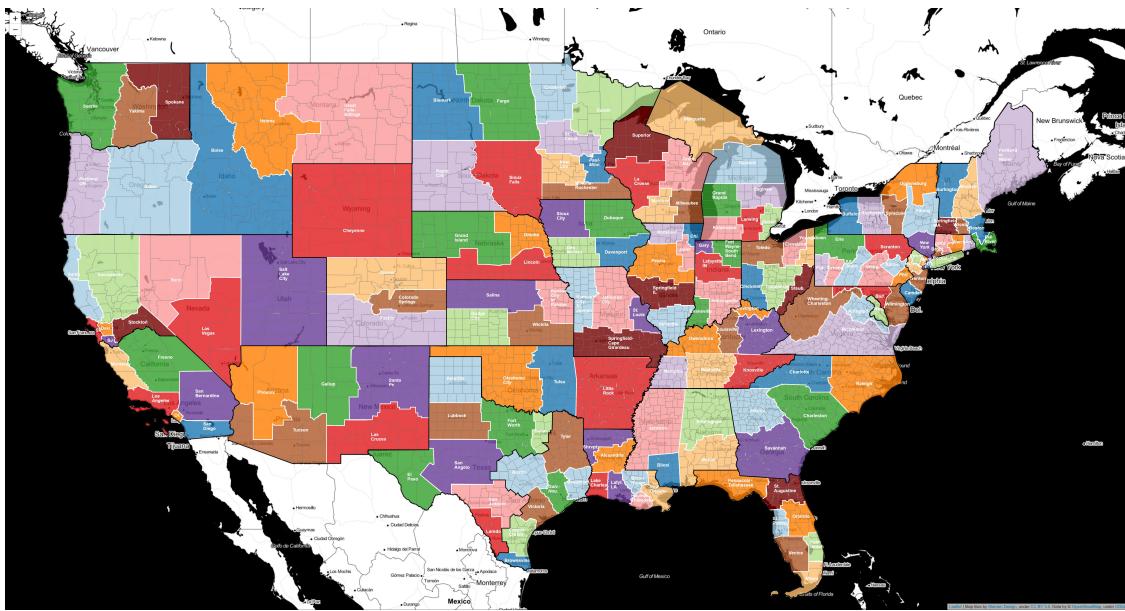
[ ]: create_map_screenshot(
    absolute_path_to_map_folder =
        r'C:\Users\kburc\Documents\!
    ↪Dell164docs\Programming\py\kjb3_programs\us_diocese_mapper',
    map_name = 'diocese_map.html', screenshot_save_path = 'screenshots')

convert_png_to_smaller_jpg(png_folder = 'screenshots',
png_image_name = 'diocese_map.png', jpg_folder = 'smaller_screenshots',
quality_factor = 80)

IPython.display.Image(filename='smaller_screenshots/'+'diocese_map.jpg')
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.
    ↪display.html

```

[ ]:



```
[ ]: colormap
```

```
[ ]: <branca.colormap.StepColormap at 0x245584a84c0>
```

```
[ ]: color_list = list(np.arange(0, 177, 176/12))
[ colormap(color_list[i]) for i in range(len(color_list))]
```

```
[ ]: ['#a6cee3ff',
 '#1f78b4ff',
 '#b2df8aff',
 '#33a02cff',
 '#fb9a99ff',
 '#e31a1cff',
 '#fdbf6fff',
 '#ff7f00ff',
 '#cab2d6ff',
 '#6a3d9aff',
 '#ffff99ff',
 '#b15928ff',
 '#b15928ff']
```

## 4 Generating a map with revised diocesan/provincial boundaries

```
[ ]: revised_diocese_boundaries = geopandas.read_file('diocese_boundaries_revised.
geojson')
revised_diocese_boundaries.sort_values('Diocese', inplace = True)
```

```

revised_diocese_boundaries = revised_diocese_boundaries.
    ↪merge(df_dioceses[['Diocese', 'Diocese_Color_Code']].drop_duplicates(), on = ↪
        ↪'Diocese')
revised_diocese_boundaries = revised_diocese_boundaries.
    ↪merge(diocese_boundaries[['Diocese', 'name_for_plotting']], on = 'Diocese')
revised_diocese_boundaries
revised_diocese_boundaries['center'] = revised_diocese_boundaries['geometry'].
    ↪representative_point()
revised_diocese_boundaries.head(2)

```

```

[ ]:   STATEFP COUNTYFP COUNTYNS GEOID      NAME          NAMELSAD LSAD \
0       36     091 00974143 36091 Saratoga  Saratoga County  06
1       22     021 00558477 22021 Caldwell  Caldwell Parish  15

      Unnamed: 0 State_Name State_Code FIPS           county_state \
0         31 New York          NY   36  Saratoga County, New York
1         17 Louisiana         LA   22  Caldwell Parish, Louisiana

      Province      Diocese           geometry \
0  New York      Albany  POLYGON((-74.78339 42.01512, -74.55360 42.121...
1  New Orleans  Alexandria  POLYGON((-93.29827 30.88300, -93.42428 30.883...

      Diocese_Color_Code name_for_plotting           center
0                      0             Albany  POINT (-74.26500 42.82924)
1                     112            Alexandria  POINT (-92.36865 31.67734)

```

```

[ ]: revised_province_boundaries = geopandas.read_file('province_boundaries_revised.
    ↪geojson')

```

```

[ ]: df_cathedral_locations = pd.read_csv('diocese_province_cathedral_list_revised.
    ↪csv')

```

To obtain the geographic locations of each cathedral, I used multiple tools, including OpenStreetMap, Wikipedia, and GeoHack (which I believe uses the GPL license: <https://bitbucket.org/magnusmanske/geohack/src/master/LICENSE>). GeoHack proved to be the fastest option. I accessed each cathedral's GeoHack page by clicking on the coordinates listed on that cathedral's Wikipedia page. (I used GeoHack instead of the coordinates shown on Wikipedia because the former offered coordinates in decimal degree format.)

```

[ ]: def create_diocese_map(tile_option = 'Stamen Toner', starting_zoom = 6,
    ↪starting_location = [38.7, -95], save_path = 'revised_diocese_map',
    ↪include_cathedrals = True, include_names = True):
    revised_diocese_map = folium.Map(location=starting_location,
    ↪zoom_start=starting_zoom, tiles = tile_option)
    # tiles can be set to 'None' in order to produce a map without any
    ↪background
    # details. This produces a cleaner static image.

```

```

# Although Folium has a choropleth library, I wasn't able to find a way
# to disable the default legend. Therefore, I am instead using a custom
# choropleth mapping function. Much of this function is based on
# Amodiovalerio Verde's code at:
# https://vverde.github.io/blob/interactivechoropleth.html .

colormap = branca.colormap.linear.Paired_12.to_step(
    12, data = revised_diocese_boundaries['Diocese_Color_Code'])
colormap

tooltip = folium.features.GeoJsonTooltip(fields =
    ['county_state', 'Diocese_Detail', 'Province_Detail'], aliases =
    ['County', 'Diocese', 'Province'])
# Based on https://python-visualization.github.io/folium/modules.
↪html#folium.features.GeoJsonTooltip

style_function = lambda x: {
    "weight": 0.5,
    'color': '#000000',
    # Note that 'properties' has to be added before the column name.
    # This can be inferred from the GeoJson definition within Folium:
    # https://python-visualization.github.io/folium/modules.html#folium.
↪features.GeoJson
    'fillOpacity': 0}

folium.features.GeoJson(df_dioceses, name = 'Counties',
    style_function=style_function).add_to(revised_diocese_map)

diocese_style_function = lambda x: {
    "fillOpacity": 0.8,
    "weight": 2,
    'color': '#FFFFFF',
    "fillColor": '#770000' if
        colormap(x['properties']['Diocese_Color_Code']) == '#ffff99ff'
    else colormap(x['properties']['Diocese_Color_Code']),
    'Fill': False}

folium.features.GeoJson(revised_diocese_boundaries[['geometry', ↪
    'Diocese_Color_Code']],
    name = 'Dioceses', style_function=diocese_style_function).
↪add_to(revised_diocese_map)
# revised_diocese_boundaries includes both geometry and point values. The ↪
# point values
# confuse the interpreter, so in order to avoid an error message, I

```

```

# entered 'geometry' here to specify that those were the points to be plotted.

province_style_function = lambda x: {
    'weight': '2',
    'fillOpacity': 0,
    'color':
    '#000000',
    'Fill': False}
# See https://python-visualization.github.io/folium/modules.html#folium.
→vector_layers.path_options
# for style_function arguments.

folium.GeoJson(revised_province_boundaries, name = "Provinces",
→style_function = province_style_function).add_to(revised_diocese_map)

# The tooltips are added after the diocese and province boundaries
# so that they will appear when the user
# hovers over them.

tooltip_style_function = lambda x: {
    "fillOpacity": 0,
    "weight": 0,
    'color': '#000000',
    'Fill': False}

# The following GeoJson function adds tooltips to the map so that users
# can see county, diocese, and province information when they hover over
# a given county.
folium.features.GeoJson(df_dioceses, tooltip = tooltip, name = 'Tooltips',
style_function=tooltip_style_function).add_to(revised_diocese_map)

if include_cathedrals == True:
    icon_width = 10
    icon_height = icon_width/(120/200)
    # The original markers are 120 by 200 pixels, so the icon's width is divided
    →by this ratio to retrieve the height.
    cathedral_counter = 0
    cathedral_feature_group = folium.FeatureGroup(name = 'Cathedrals')
    for i in range(len(df_cathedral_locations)):
        # print(i)
        loc_list = df_cathedral_locations.iloc[i, df_cathedral_locations.
→columns.get_loc('Cathedral_coord_list')].split('[', ']')
        loc_list = [loc.replace('[', '').replace(']', '') for loc in loc_list]

```

```

        loc_list = [loc.split(',', '') for loc in loc_list]
        loc_list = [[float(loc[0]), float(loc[1])] for loc in loc_list]

        cathedral_list = df_cathedral_locations.iloc[i, :]
        df_cathedral_locations.columns.get_loc('Cathedral_List').split(',')
        cathedral_list = [cathedral.replace('[', '').replace(']', '').
        replace("'", '') for cathedral in cathedral_list]
        cathedral_list

        diocese_name = df_cathedral_locations.iloc[i, :]
        df_cathedral_locations.columns.get_loc('Diocese')
        if diocese_name == df_cathedral_locations.iloc[i, :]:
            df_cathedral_locations.columns.get_loc('Province'):
                # print("True")
                marker = 'globus_cruciger_archbishop.png'
        else:
            marker = 'globus_cruciger.png'
        for j in range(len(loc_list)):
            folium.Marker(loc_list[j], icon = folium.CustomIcon(marker, icon_size = (icon_width, icon_height)), tooltip = cathedral_list[j]).add_to(cathedral_feature_group)
            cathedral_counter += 1
        print("Added",cathedral_counter,"cathedrals to the map.")

        cathedral_feature_group.add_to(revised_diocese_map)

if include_names == True:
    name_feature_group = folium.FeatureGroup(name = 'Diocese Names')
    # This method of assigning markers to a FeatureGroup that can then be
    toggled
    # on and off comes from Bob Haffner at
    # https://stackoverflow.com/a/61283334/13097194 .

    for i in range(len(revised_diocese_boundaries)):
        center_point = [float(revised_diocese_boundaries.iloc[i, :].get_loc('center')).y,
        revised_diocese_boundaries.columns.get_loc('center')).y],
        float(revised_diocese_boundaries.iloc[i, revised_diocese_boundaries.columns.get_loc('center')].x)]
        # The use of .y and .x here is based on Francois M.'s response at:
        # https://gis.stackexchange.com/a/255867/195615
        diocese_name = revised_diocese_boundaries.iloc[i, :].get_loc('Diocese')]
        diocese_name_for_plotting = revised_diocese_boundaries.iloc[i, revised_diocese_boundaries.columns.get_loc('name_for_plotting')]
```

```

        split_name = diocese_name_for_plotting.replace('-', ' ').split(' ')
        horizontal_offset = max([len(word) for word in split_name])*3
        vertical_offset = len(split_name)*10
        style_tag = '<style> p{color:white; line-height: 1} </style>'
        #     print(split_name, horizontal_offset) # For debugging
        # The following version of style_tag produces text with a thin
        ↵black border, although this ended up hurting readability compared to
        # a solid white text box.
        # style_tag = '<style> p{color:white; -webkit-text-stroke: 0.5px
        ↵black; line-height: 1} </style>'
        # Source for the text stroke effect: https://stackoverflow.com/a/
        ↵4269821/13097194
        #     style_tag = '<style> p{text-align:center} </style>'
        #     align_string = 'style = "text-align:center"'
        #     align_string = 'style = "color:green"'
        #     folium.CircleMarker(center_point, radius = 1).
        ↵add_to(revised_diocese_map)
        # The above line is very useful for debugging what offsets to use when
        ↵placing
        # text on the map.
        if diocese_name == revised_diocese_boundaries.iloc[i,
        ↵revised_diocese_boundaries.columns.get_loc('Province')]: # E.g. if this is
        ↵an archdiocese (as provinces are named after archdioceses)
            folium.Marker(center_point, icon = folium.
        ↵DivIcon(icon_anchor=(horizontal_offset, vertical_offset),
        ↵html=f'{style_tag}<p><b><i>{diocese_name_for_plotting}</i><b></p>').add_to(name_feature_group)
        else:
            folium.Marker(center_point, icon = folium.
        ↵DivIcon(icon_anchor=(horizontal_offset, vertical_offset),
        ↵html=f'{style_tag}<p><b>{diocese_name_for_plotting}</b></p>').add_to(name_feature_group)
            # folium.Marker(center_point, icon = folium.
        ↵DivIcon(icon_anchor=(horizontal_offset, 10),
        ↵html=f'{style_tag}<b><p>{diocese_name_for_plotting.replace(' ', '_').
        ↵replace('-', '_')}</p></b>').add_to(revised_diocese_map)

        name_feature_group.add_to(revised_diocese_map)

        # The strategy of using an invisible folium.Marker object to display text
        ↵on
        # the map via DivIcon elements comes from from Bob Haffner's response at:
        # https://stackoverflow.com/a/56878525/13097194 or:
        # and https://stackoverflow.com/a/46408144/13097194

        # for i in range(2):

```

```

#     loc_list = df_cathedral_locations.iloc[i, df_cathedral_locations.
˓→columns.get_loc('Cathedral_coord_list')].split('], ')
#     loc_list = [loc.replace('[', '').replace(']', '') for loc in loc_list]
#     loc_list = [loc.split(', ') for loc in loc_list]
#     loc_list = [[float(loc[0]), float(loc[1])] for loc in loc_list]
#     for loc in loc_list:
#         folium.Marker(loc, icon = folium.Icon(icon = 'plane')).add_to(revised_diocese_map)

# folium.CircleMarker(loc).add_to(test_map)

# Learn how to use Folium's FeatureGroup feature to toggle name and
˓→cathedral markers

folium.LatLngPopup().add_to(revised_diocese_map) # Useful for editing
˓→diocese
# boundaries

folium.LayerControl().add_to(revised_diocese_map)

revised_diocese_map.save(save_path+'.html')

# colormap.add_to(m)

return revised_diocese_map

```

[ ]: create\_diocese\_map(tile\_option = 'Stamen Toner')

Added 194 cathedrals to the map.

[ ]: <folium.folium.Map at 0x2455c7b84f0>

```

[ ]: create_map_screenshot(
    absolute_path_to_map_folder =
        r'C:\Users\kburc\Documents\!
˓→Dell164docs\Programming\py\kjb3_programs\us_diocese_mapper',
    map_name = 'revised_diocese_map.html', screenshot_save_path = 'screenshots')
convert_png_to_smaller_jpg(png_folder = 'screenshots',
png_image_name = 'revised_diocese_map.png', jpg_folder = 'smaller_screenshots',
quality_factor = 80)

```

```

[ ]: def add_alaska_and_hawaii(starting_map_name, tile_option = 'Stamen Toner',
include_cathedrals = True, include_names = True):
    # This function creates a static version of the map defined by
    # starting_map_name.html that includes Alaska and Hawaii at the bottom left.
    # starting_map_name should not include the .html at the end. E.g. pass

```

```

# revised_diocese_map as an argument rather than revised_diocese_map.html.
create_diocese_map(tile_option = tile_option, starting_zoom = 4,
↪starting_location = [65, -150], save_path = starting_map_name+'_alaska',
↪include_cathedrals = include_cathedrals, include_names = include_names)
create_map_screenshot(absolute_path_to_map_folder =
    r'C:\Users\kburc\Documents\'!
↪Dell64docs\Programming\py\kjb3_programs\us_diocese_mapper',
    map_name = starting_map_name+'_alaska.html', screenshot_save_path =
↪'screenshots')
with PIL.Image.open('screenshots/'+starting_map_name+'_alaska.png') as
↪map_image:
    print("Opened")
    cropped_image = map_image.crop((2200, 1100, 3500, 2300)) # Left, upper,
↪right,
    # and lower points: https://pillow.readthedocs.io/en/stable/reference/
↪Image.html#PIL.Image.Image.crop
    # display(cropped_image) # https://stackoverflow.com/a/26649884/13097194
    cropped_image.save('screenshots/'+starting_map_name+'_alaska_cropped.
↪png')

create_diocese_map(tile_option = tile_option, starting_zoom = 6,
↪starting_location = [21, -156], save_path = starting_map_name+'_hawaii',
↪include_cathedrals = include_cathedrals, include_names = include_names)
create_map_screenshot(absolute_path_to_map_folder =
    r'C:\Users\kburc\Documents\'!
↪Dell64docs\Programming\py\kjb3_programs\us_diocese_mapper',
    map_name = starting_map_name+'_hawaii.html', screenshot_save_path =
↪'screenshots')
with PIL.Image.open('screenshots/'+starting_map_name+'_hawaii.png') as
↪map_image:
    print("Opened")
    cropped_image = map_image.crop((2500, 1400, 3300, 1900)) # Left, upper,
↪right,
    # # and lower points: https://pillow.readthedocs.io/en/stable/reference/
↪Image.html#PIL.Image.Image.crop
    cropped_image.save('screenshots/'+starting_map_name+'_hawaii_cropped.
↪png')

with PIL.Image.open('screenshots/'+starting_map_name+'.png') as map_image:
    alaska = PIL.Image.open('screenshots/
↪'+starting_map_name+'_alaska_cropped.png')
    alaska = alaska.resize((int(alaska.width/1.25), int(alaska.height/1.
↪25)))
    hawaii = PIL.Image.open('screenshots/
↪'+starting_map_name+'_hawaii_cropped.png')
    map_image.paste(im = alaska, box = (0, 2300))

```

```
map_image.paste(im = hawaii, box = (1200, 2600))
map_image.save('screenshots/' + starting_map_name + '_50_states.png')
```

```
[ ]: add_alaska_and_hawaii('revised_diocese_map')
```

Added 194 cathedrals to the map.

Opened

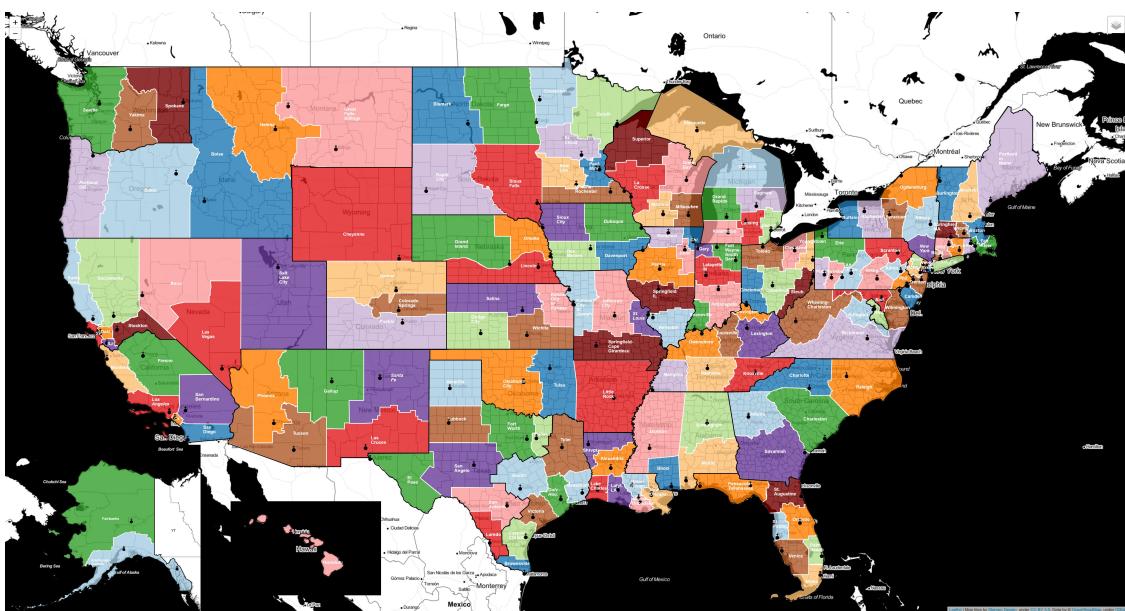
Added 194 cathedrals to the map.

Opened

```
[ ]: # The above line produces a screenshot of the final map,
# so create_map_screenshot doesn't need to be called there.
convert_png_to_smaller_jpg(png_folder = 'screenshots',
png_image_name = 'revised_diocese_map_50_states.png', jpg_folder = 'smaller_screenshots',
quality_factor = 80)

IPython.display.Image(filename='smaller_screenshots/
+' + 'revised_diocese_map_50_states.jpg')
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.
display.html
```

```
[ ]:
```



```
[ ]: create_diocese_map(tile_option = None, save_path =
+'revised_diocese_map_tileless')
```

```
create_map_screenshot(
    absolute_path_to_map_folder =
```

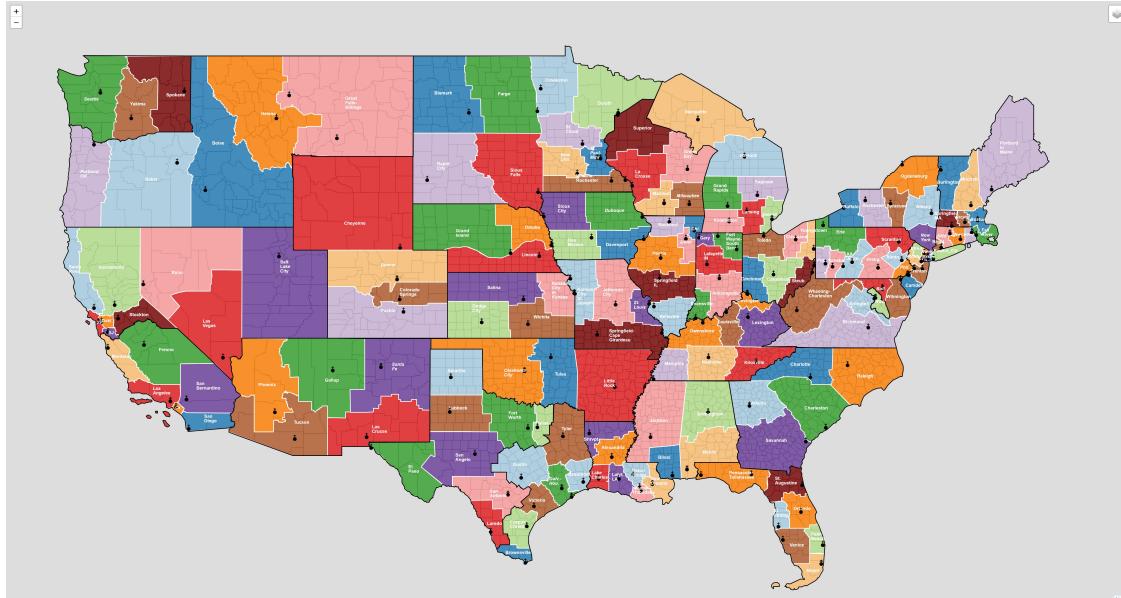
```
r'C:\Users\kburc\Documents\'!  
↳Dell64docs\Programming\py\kjb3_programs\us_diocese_mapper',  
    map_name = 'revised_diocese_map_tileless.html', screenshot_save_path =  
    ↳'screenshots')
```

Added 194 cathedrals to the map.

[ ]:

```
[ ]: convert_png_to_smaller_jpg(png_folder = 'screenshots',  
png_image_name = 'revised_diocese_map_tileless.png', jpg_folder =  
    ↳'smaller_screenshots',  
quality_factor = 80)  
  
IPython.display.Image(filename='smaller_screenshots/  
    ↳'+'revised_diocese_map_tileless.jpg')  
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.display.html
```

[ ]:



```
[ ]: add_alaska_and_hawaii(tile_option = None, starting_map_name =  
    ↳'revised_diocese_map_tileless')  
  
convert_png_to_smaller_jpg(png_folder = 'screenshots',  
png_image_name = 'revised_diocese_map_tileless_50_states.png', jpg_folder =  
    ↳'smaller_screenshots',  
quality_factor = 80)
```

```

IPython.display.Image(filename='smaller_screenshots/
˓→'+'revised_diocese_map_tileless_50_states.jpg')
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.
˓→display.html

```

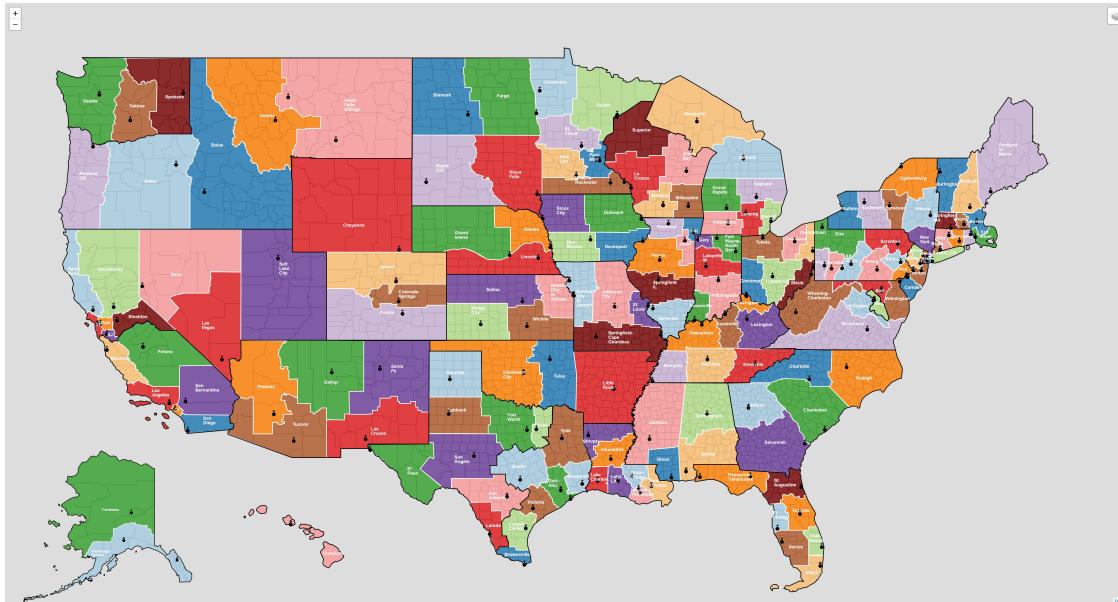
Added 194 cathedrals to the map.

Opened

Added 194 cathedrals to the map.

Opened

[ ]:



```

[ ]: create_diocese_map(tile_option = None, include_cathedrals = False, save_path =_
˓→'revised_diocese_map_no_cathedrals_tileless')
create_map_snapshot(absolute_path_to_map_folder =
    r'C:\Users\kburc\Documents\!
˓→Dell64docs\Programming\py\kjb3_programs\us_diocese_mapper',
    map_name = 'revised_diocese_map_no_cathedrals_tileless.html',_
˓→screenshot_save_path = 'screenshots')

```

```

[ ]: add_alaska_and_hawaii(tile_option = None, starting_map_name =_
˓→'revised_diocese_map_no_cathedrals_tileless', include_cathedrals = False)

convert_png_to_smaller_jpg(png_folder = 'screenshots',
png_image_name = 'revised_diocese_map_no_cathedrals_tileless_50_states.png',_
˓→jpg_folder = 'smaller_screenshots',
quality_factor = 80)

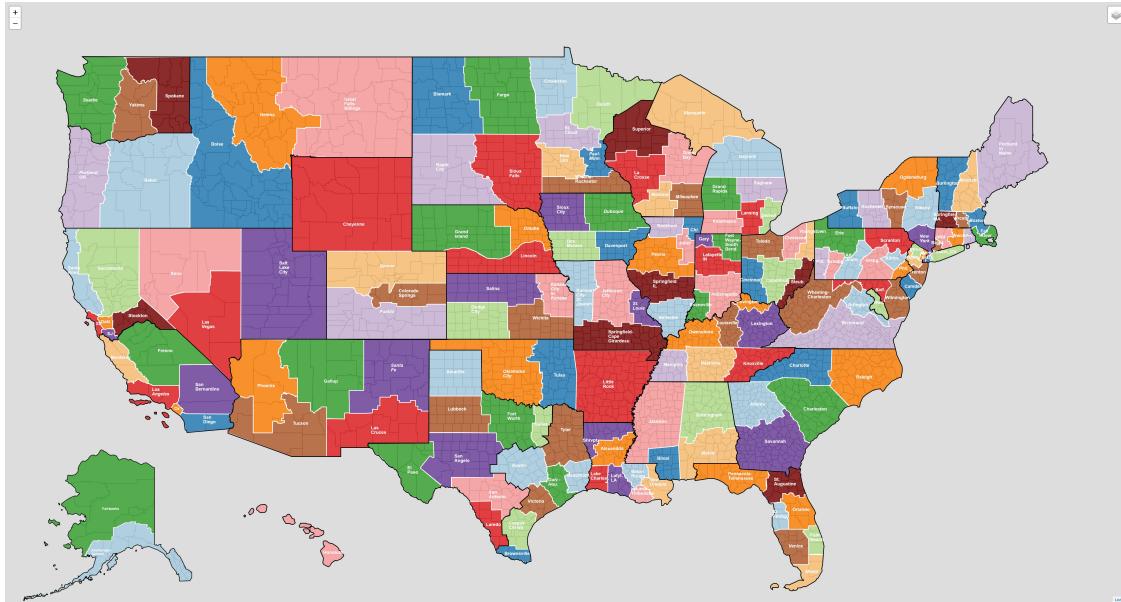
```

```
IPython.display.Image(filename='smaller_screenshots/  
↪+'revised_diocese_map_no_cathedrals_tileless_50_states.jpg')  
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.  
↪display.html
```

Opened

Opened

[ ] :



```
[ ]: create_diocese_map(tile_option = None, include_names = False, save_path = u
    u'\\revised_diocese_map_no_names_tileless')
create_map_screenshot(absolute_path_to_map_folder =
    r'C:\\Users\\kburc\\D1V1\\Documents\\!
    u'Dell64docs\\Programming\\py\\kjb3_programs\\us_diocese_mapper',
    map_name = 'revised_diocese_map_no_names_tileless.html', u
    u'screenshot_save_path = 'screenshots')
```

Added 194 cathedrals to the map.

```
[ ]: add_alaska_and_hawaii(tile_option = None, starting_map_name =  
    ↴'revised diocese map no names tileless', include_names = False)
```

Added 194 cathedrals to the map.

## Opened

Added 194 cathedrals to the map.

## Opened

```
[ ]: convert png_to_smaller_jpg(png_folder = 'screenshots',
```

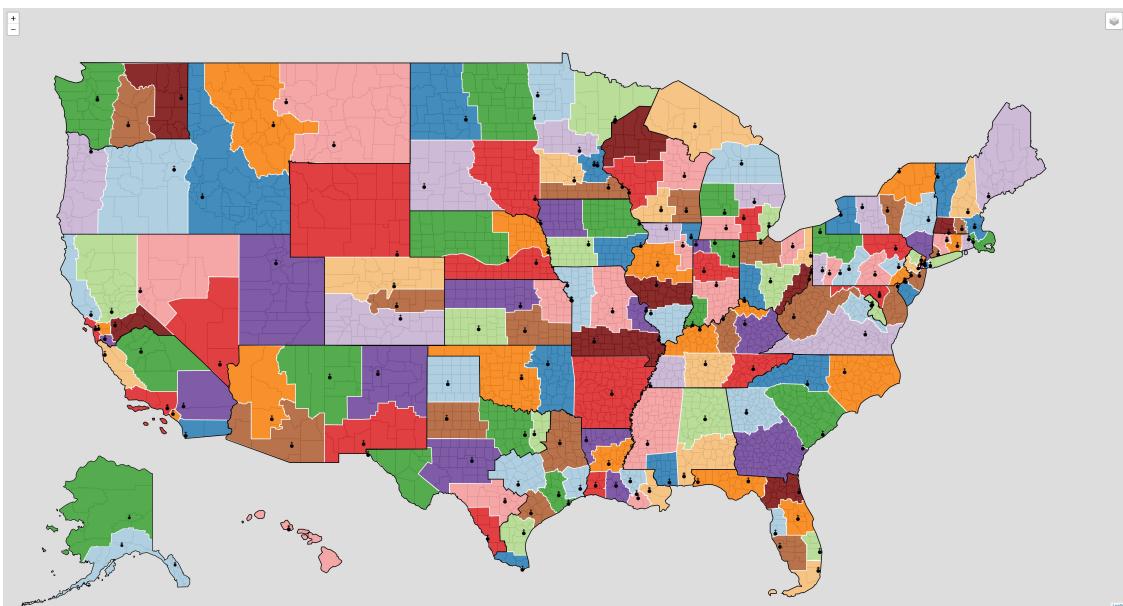
```

png_image_name = 'revised_diocese_map_no_names_tileless_50_states.png',
    ↪jpg_folder = 'smaller_screenshots',
quality_factor = 80)

IPython.display.Image(filename='smaller_screenshots/
    ↪+'revised_diocese_map_no_names_tileless_50_states.jpg')
# Based on https://ipython.readthedocs.io/en/stable/api/generated/IPython.
    ↪display.html

```

[ ]:



[ ]:

```

end_time = time.time()
run_time = end_time - start_time
run_minutes = run_time // 60
run_seconds = run_time % 60
print("Completed run at",time.ctime(end_time),"(local time)")
print("Total run time:",'{:.2f}'.format(run_time),
"second(s) ("+str(run_minutes),"minute(s) and",' {:.2f}'.format(run_seconds),
"second(s))")
# Only meaningful when the program is run nonstop from start to finish

```

Completed run at Thu May 26 02:26:11 2022 (local time)

Total run time: 231.47 second(s) (3.0 minute(s) and 51.47 second(s))