

Group Assignment 2

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```
[1]: import pandas as pd
```

0.0.1 Hamzah Yaacob

Group Members: Purva Kapshikar, Hamzah Yaacob, Jackson Zeng

Topic: Real-time bus information for Oakland, CA

In this exercise, I analyze census tracts around AC Transit route 19 that runs through heavily minority areas of Downtown Oakland, Alameda and South Oakland. Census tracts have been analyzed across 3 dimensions: namely demographics, housing profile (i.e. number of renters), transportation choices (i.e. predominant mode of transportation to get to work), and a combination of these factors. The purpose of this exercise is to find areas that could be a suitable candidate for the installation of real-time bus information at bus stops according to the profile of the census tracts along the aforesaid bus route.

```
[2]: import geopandas as gpd
```

```
[3]: dataset = pd.read_csv("Route_19.csv")
```

After downloading the data, I check the first five rows of my dataset.

```
[4]: dataset.head()
```

```
[4]:
```

	Geo_FIPS		Geo_QName	Geo_FILEID	\
0	6001402600	Census Tract 4026, Alameda County, California		ACSSF	
1	6001402700	Census Tract 4027, Alameda County, California		ACSSF	
2	6001402801	Census Tract 4028.01, Alameda County, California		ACSSF	
3	6001402802	Census Tract 4028.02, Alameda County, California		ACSSF	
4	6001402900	Census Tract 4029, Alameda County, California		ACSSF	

	Geo_STUSAB	Geo_SUMLEV	Geo_GEOCOMP	Geo_LOGRECNO	Geo_US	Geo_REGION	\
0	ca	140	0	2839	NaN	NaN	
1	ca	140	0	2840	NaN	NaN	
2	ca	140	0	2841	NaN	NaN	
3	ca	140	0	2842	NaN	NaN	
4	ca	140	0	2843	NaN	NaN	

	Geo_DIVISION	...	SE_A09005_008	PCT_SE_A09005_002	PCT_SE_A09005_009	\
0	NaN	...	66	53.10	44.61	
1	NaN	...	148	44.11	33.33	
2	NaN	...	433	20.51	19.47	
3	NaN	...	95	14.80	8.59	
4	NaN	...	142	16.73	15.21	

	PCT_SE_A09005_010	PCT_SE_A09005_003	PCT_SE_A09005_004	PCT_SE_A09005_005	\
0	8.50	13.73	0.00	0.82	
1	10.77	31.57	0.00	4.12	
2	1.04	38.62	1.75	2.84	
3	6.21	44.87	3.58	2.86	
4	1.52	50.70	0.00	2.41	

	PCT_SE_A09005_006	PCT_SE_A09005_007	PCT_SE_A09005_008
0	14.87	6.70	10.78
1	7.24	0.51	12.46
2	11.71	0.88	23.69
3	7.88	3.34	22.67
4	12.17	0.00	18.00

[5 rows x 100 columns]

Check the characteristics of my data. It has 28 rows and 100 columns.

```
[5]: dataset.shape
```

```
[5]: (28, 100)
```

Override defaults to see the entire table.

```
[6]: pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)
```

```
[7]: dataset.sample()
```

```
[7]:      Geo_FIPS      Geo_QName Geo_FILEID \
8  6001403302  Census Tract 4033.02, Alameda County, California      ACSSF

      Geo_STUSAB  Geo_SUMLEV  Geo_GEOCOMP  Geo_LOGRECNO  Geo_US  Geo_REGION \
8         ca         140         0         2847      NaN      NaN

      Geo_DIVISION  Geo_STATECE  Geo_STATE  Geo_COUNTY  Geo_COUSUB  Geo_PLACE \
8         NaN         NaN         6         1         NaN         NaN

      Geo_TRACT  Geo_BLKGRP  Geo_CONCIT  Geo_AIANHH  Geo_AIANHHFP  Geo_AIHHTLI \
8    403302         NaN         NaN         NaN         NaN         NaN
```

8	Geo_AITSCE	Geo_AITS	Geo_ANRC	Geo_CBSA	Geo_CSA	Geo_METDIV	Geo_MACC	\
	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
8	Geo_MEMI	Geo_NECTA	Geo_CNECTA	Geo_NECTADIV	Geo_UA	Geo_UACP	\	
	NaN	NaN	NaN	NaN	NaN	NaN		
8	Geo_CDCURR	Geo_SLDU	Geo_SLDL	Geo_VTD	Geo_ZCTA3	Geo_ZCTA5	Geo_SUBMCD	\
	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
8	Geo_SDELM	Geo_SDSEC	Geo_SDUNI	Geo_UR	Geo_PCI	Geo_TAZ	Geo_UGA	\
	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
8	Geo_PUMA5	Geo_PUMA1	Geo_GEOID	Geo_NAME	Geo_BTTR	\		
	NaN	NaN	14000US06001403302	Census Tract 4033.02	NaN			
8	Geo_BTBG	Geo_PLACESE	SE_A03001_001	SE_A03001_002	SE_A03001_003	\		
	NaN	NaN	2279	1124	92			
8	SE_A03001_004	SE_A03001_005	SE_A03001_006	SE_A03001_007	SE_A03001_008	\		
	53	593	0	46	371			
8	PCT_SE_A03001_002	PCT_SE_A03001_003	PCT_SE_A03001_004	PCT_SE_A03001_005	\			
	49.32	4.04	2.33	26.02				
8	PCT_SE_A03001_006	PCT_SE_A03001_007	PCT_SE_A03001_008	SE_A10062B_001	\			
	0.0	2.02	16.28	1398				
8	SE_A10062B_002	SE_A10062B_003	SE_A10062B_004	SE_A10062B_005	\			
	73	0	1325	0				
8	SE_A10062B_006	PCT_SE_A10062B_002	PCT_SE_A10062B_003	PCT_SE_A10062B_004	\			
	0	5.22	0.0	94.78				
8	PCT_SE_A10062B_005	PCT_SE_A10062B_006	SE_A09005_001	SE_A09005_002	\			
	0.0	0.0	1870	537				
8	SE_A09005_009	SE_A09005_010	SE_A09005_003	SE_A09005_004	SE_A09005_005	\		
	513	24	631	99	55			
8	SE_A09005_006	SE_A09005_007	SE_A09005_008	PCT_SE_A09005_002	\			
	278	31	239	28.72				
8	PCT_SE_A09005_009	PCT_SE_A09005_010	PCT_SE_A09005_003	PCT_SE_A09005_004	\			
	27.43	1.28	33.74	5.29				
	PCT_SE_A09005_005	PCT_SE_A09005_006	PCT_SE_A09005_007	PCT_SE_A09005_008				

Here I query the data types in the dataset. It gives me each column and the nature of the values in each column.

```
[8]: dataset.info(verbose=True, show_counts=True)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 28 entries, 0 to 27
Data columns (total 100 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Geo_FIPS              28 non-null    int64
1   Geo_QName             28 non-null    object
2   Geo_FILEID            28 non-null    object
3   Geo_STUSAB            28 non-null    object
4   Geo_SUMLEV            28 non-null    int64
5   Geo_GEOCOMP           28 non-null    int64
6   Geo_LOGRECNO          28 non-null    int64
7   Geo_US                0 non-null     float64
8   Geo_REGION            0 non-null     float64
9   Geo_DIVISION          0 non-null     float64
10  Geo_STATECE           0 non-null     float64
11  Geo_STATE             28 non-null    int64
12  Geo_COUNTY            28 non-null    int64
13  Geo_COUSUB            0 non-null     float64
14  Geo_PLACE             0 non-null     float64
15  Geo_TRACT             28 non-null    int64
16  Geo_BLKGRP            0 non-null     float64
17  Geo_CONCIT            0 non-null     float64
18  Geo_AIANHH            0 non-null     float64
19  Geo_AIANHHFP          0 non-null     float64
20  Geo_AIHHTLI           0 non-null     float64
21  Geo_AITSCE            0 non-null     float64
22  Geo_AITS              0 non-null     float64
23  Geo_ANRC              0 non-null     float64
24  Geo_CBSA              0 non-null     float64
25  Geo_CSA               0 non-null     float64
26  Geo_METDIV            0 non-null     float64
27  Geo_MACC              0 non-null     float64
28  Geo_MEMI              0 non-null     float64
29  Geo_NECTA             0 non-null     float64
30  Geo_CNECTA            0 non-null     float64
31  Geo_NECTADIV          0 non-null     float64
32  Geo_UA                0 non-null     float64
33  Geo_UACP              0 non-null     float64
34  Geo_CDCURR            0 non-null     float64
35  Geo_SLDU              0 non-null     float64
```

36	Geo_SLDL	0 non-null	float64
37	Geo_VTD	0 non-null	float64
38	Geo_ZCTA3	0 non-null	float64
39	Geo_ZCTA5	0 non-null	float64
40	Geo_SUBMCD	0 non-null	float64
41	Geo_SDELM	0 non-null	float64
42	Geo_SDSEC	0 non-null	float64
43	Geo_SDUNI	0 non-null	float64
44	Geo_UR	0 non-null	float64
45	Geo_PCI	0 non-null	float64
46	Geo_TAZ	0 non-null	float64
47	Geo_UGA	0 non-null	float64
48	Geo_PUMA5	0 non-null	float64
49	Geo_PUMA1	0 non-null	float64
50	Geo_GEOID	28 non-null	object
51	Geo_NAME	28 non-null	object
52	Geo_BTTR	0 non-null	float64
53	Geo_BTBG	0 non-null	float64
54	Geo_PLACESE	0 non-null	float64
55	SE_A03001_001	28 non-null	int64
56	SE_A03001_002	28 non-null	int64
57	SE_A03001_003	28 non-null	int64
58	SE_A03001_004	28 non-null	int64
59	SE_A03001_005	28 non-null	int64
60	SE_A03001_006	28 non-null	int64
61	SE_A03001_007	28 non-null	int64
62	SE_A03001_008	28 non-null	int64
63	PCT_SE_A03001_002	28 non-null	float64
64	PCT_SE_A03001_003	28 non-null	float64
65	PCT_SE_A03001_004	28 non-null	float64
66	PCT_SE_A03001_005	28 non-null	float64
67	PCT_SE_A03001_006	28 non-null	float64
68	PCT_SE_A03001_007	28 non-null	float64
69	PCT_SE_A03001_008	28 non-null	float64
70	SE_A10062B_001	28 non-null	int64
71	SE_A10062B_002	28 non-null	int64
72	SE_A10062B_003	28 non-null	int64
73	SE_A10062B_004	28 non-null	int64
74	SE_A10062B_005	28 non-null	int64
75	SE_A10062B_006	28 non-null	int64
76	PCT_SE_A10062B_002	28 non-null	float64
77	PCT_SE_A10062B_003	28 non-null	float64
78	PCT_SE_A10062B_004	28 non-null	float64
79	PCT_SE_A10062B_005	28 non-null	float64
80	PCT_SE_A10062B_006	28 non-null	float64
81	SE_A09005_001	28 non-null	int64
82	SE_A09005_002	28 non-null	int64
83	SE_A09005_009	28 non-null	int64

```

84 SE_A09005_010      28 non-null    int64
85 SE_A09005_003      28 non-null    int64
86 SE_A09005_004      28 non-null    int64
87 SE_A09005_005      28 non-null    int64
88 SE_A09005_006      28 non-null    int64
89 SE_A09005_007      28 non-null    int64
90 SE_A09005_008      28 non-null    int64
91 PCT_SE_A09005_002  28 non-null    float64
92 PCT_SE_A09005_009  28 non-null    float64
93 PCT_SE_A09005_010  28 non-null    float64
94 PCT_SE_A09005_003  28 non-null    float64
95 PCT_SE_A09005_004  28 non-null    float64
96 PCT_SE_A09005_005  28 non-null    float64
97 PCT_SE_A09005_006  28 non-null    float64
98 PCT_SE_A09005_007  28 non-null    float64
99 PCT_SE_A09005_008  28 non-null    float64
dtypes: float64(64), int64(31), object(5)
memory usage: 22.0+ KB

```

Next I check the nature of my FIPS, state and county code to make sure they are not an integer, but a string instead.

```
[9]: dataset.Geo_FIPS.head()
```

```

[9]: 0    6001402600
     1    6001402700
     2    6001402801
     3    6001402802
     4    6001402900
     Name: Geo_FIPS, dtype: int64

```

```
[10]: dataset.Geo_STATE.head()
```

```

[10]: 0     6
      1     6
      2     6
      3     6
      4     6
      Name: Geo_STATE, dtype: int64

```

```
[11]: dataset.Geo_COUNTY.head()
```

```

[11]: 0     1
      1     1
      2     1
      3     1
      4     1
      Name: Geo_COUNTY, dtype: int64

```

Here I alter the values in the FIPS, State and County columns to become strings.

```
[12]: dataset = pd.read_csv(
        'Route_19.csv',
        dtype=
        {
            'Geo_FIPS':str,
            'Geo_STATE':str,
            'Geo_COUNTY': str
        }
    )
```

That didn't work so I manually add a 0 in front of my FIPS code.

```
[13]: dataset['Geo_FIPS'] = dataset['Geo_FIPS'].apply(lambda x: x.zfill(11))
```

```
[14]: dataset.head()
```

```
[14]:      Geo_FIPS      Geo_QName Geo_FILEID \
0  06001402600  Census Tract 4026, Alameda County, California  ACSSF
1  06001402700  Census Tract 4027, Alameda County, California  ACSSF
2  06001402801  Census Tract 4028.01, Alameda County, California  ACSSF
3  06001402802  Census Tract 4028.02, Alameda County, California  ACSSF
4  06001402900  Census Tract 4029, Alameda County, California  ACSSF

      Geo_STUSAB  Geo_SUMLEV  Geo_GEOCOMP  Geo_LOGRECNO  Geo_US  Geo_REGION  \
0             ca           140           0           2839   NaN           NaN
1             ca           140           0           2840   NaN           NaN
2             ca           140           0           2841   NaN           NaN
3             ca           140           0           2842   NaN           NaN
4             ca           140           0           2843   NaN           NaN

      Geo_DIVISION  Geo_STATECE  Geo_STATE  Geo_COUNTY  Geo_COUSUB  Geo_PLACE  \
0             NaN           NaN         6           1         NaN         NaN
1             NaN           NaN         6           1         NaN         NaN
2             NaN           NaN         6           1         NaN         NaN
3             NaN           NaN         6           1         NaN         NaN
4             NaN           NaN         6           1         NaN         NaN

      Geo_TRACT  Geo_BLKGRP  Geo_CONCIT  Geo_AIANHH  Geo_AIANHHFP  Geo_AIHHTLI  \
0       402600         NaN         NaN         NaN         NaN         NaN
1       402700         NaN         NaN         NaN         NaN         NaN
2       402801         NaN         NaN         NaN         NaN         NaN
3       402802         NaN         NaN         NaN         NaN         NaN
4       402900         NaN         NaN         NaN         NaN         NaN

      Geo_AITSCE  Geo_AITS  Geo_ANRC  Geo_CBSA  Geo_CSA  Geo_METDIV  Geo_MACC  \
0             NaN         NaN         NaN         NaN         NaN         NaN         NaN
```

1	NaN	NaN	NaN	NaN	NaN	NaN	NaN
2	NaN	NaN	NaN	NaN	NaN	NaN	NaN
3	NaN	NaN	NaN	NaN	NaN	NaN	NaN
4	NaN	NaN	NaN	NaN	NaN	NaN	NaN

	Geo_MEMI	Geo_NECTA	Geo_CNECTA	Geo_NECTADIV	Geo_UA	Geo_UACP	\
0	NaN	NaN	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	NaN	NaN	
2	NaN	NaN	NaN	NaN	NaN	NaN	
3	NaN	NaN	NaN	NaN	NaN	NaN	
4	NaN	NaN	NaN	NaN	NaN	NaN	

	Geo_CDCURR	Geo_SLDU	Geo_SLDL	Geo_VTD	Geo_ZCTA3	Geo_ZCTA5	Geo_SUBMCD	\
0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	

	Geo_SDELM	Geo_SDSEC	Geo_SDUNI	Geo_UR	Geo_PCI	Geo_TAZ	Geo_UGA	\
0	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
1	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
2	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
3	NaN	NaN	NaN	NaN	NaN	NaN	NaN	
4	NaN	NaN	NaN	NaN	NaN	NaN	NaN	

	Geo_PUMA5	Geo_PUMA1	Geo_GEOID	Geo_NAME	Geo_BTTR	\
0	NaN	NaN	14000US06001402600	Census Tract 4026	NaN	
1	NaN	NaN	14000US06001402700	Census Tract 4027	NaN	
2	NaN	NaN	14000US06001402801	Census Tract 4028.01	NaN	
3	NaN	NaN	14000US06001402802	Census Tract 4028.02	NaN	
4	NaN	NaN	14000US06001402900	Census Tract 4029	NaN	

	Geo_BTBG	Geo_PLACESE	SE_A03001_001	SE_A03001_002	SE_A03001_003	\
0	NaN	NaN	1299	197	437	
1	NaN	NaN	1988	616	717	
2	NaN	NaN	3301	990	1230	
3	NaN	NaN	1251	284	583	
4	NaN	NaN	1638	426	291	

	SE_A03001_004	SE_A03001_005	SE_A03001_006	SE_A03001_007	SE_A03001_008	\
0	4	454	0	38	169	
1	0	313	0	252	90	
2	31	582	0	67	401	
3	0	195	0	56	133	
4	3	742	0	100	76	

	PCT_SE_A03001_002	PCT_SE_A03001_003	PCT_SE_A03001_004	PCT_SE_A03001_005	\
0	15.17	33.64	0.31	34.95	
1	30.99	36.07	0.00	15.74	
2	29.99	37.26	0.94	17.63	
3	22.70	46.60	0.00	15.59	
4	26.01	17.77	0.18	45.30	

	PCT_SE_A03001_006	PCT_SE_A03001_007	PCT_SE_A03001_008	SE_A10062B_001	\
0	0.0	2.93	13.01	1140	
1	0.0	12.68	4.53	1160	
2	0.0	2.03	12.15	2799	
3	0.0	4.48	10.63	938	
4	0.0	6.11	4.64	1509	

	SE_A10062B_002	SE_A10062B_003	SE_A10062B_004	SE_A10062B_005	\
0	134	183	817	0	
1	201	461	487	11	
2	105	294	2389	11	
3	0	20	918	0	
4	0	15	1494	0	

	SE_A10062B_006	PCT_SE_A10062B_002	PCT_SE_A10062B_003	PCT_SE_A10062B_004	\
0	6	11.75	16.05	71.67	
1	0	17.33	39.74	41.98	
2	0	3.75	10.50	85.35	
3	0	0.00	2.13	97.87	
4	0	0.00	0.99	99.01	

	PCT_SE_A10062B_005	PCT_SE_A10062B_006	SE_A09005_001	SE_A09005_002	\
0	0.00	0.53	612	325	
1	0.95	0.00	1188	524	
2	0.39	0.00	1828	375	
3	0.00	0.00	419	62	
4	0.00	0.00	789	132	

	SE_A09005_009	SE_A09005_010	SE_A09005_003	SE_A09005_004	SE_A09005_005	\
0	273	52	84	0	5	
1	396	128	375	0	49	
2	356	19	706	32	52	
3	36	26	188	15	12	
4	120	12	400	0	19	

	SE_A09005_006	SE_A09005_007	SE_A09005_008	PCT_SE_A09005_002	\
0	91	41	66	53.10	
1	86	6	148	44.11	
2	214	16	433	20.51	
3	33	14	95	14.80	

4	96	0	142	16.73
---	----	---	-----	-------

	PCT_SE_A09005_009	PCT_SE_A09005_010	PCT_SE_A09005_003	PCT_SE_A09005_004 \
0	44.61	8.50	13.73	0.00
1	33.33	10.77	31.57	0.00
2	19.47	1.04	38.62	1.75
3	8.59	6.21	44.87	3.58
4	15.21	1.52	50.70	0.00

	PCT_SE_A09005_005	PCT_SE_A09005_006	PCT_SE_A09005_007	PCT_SE_A09005_008
0	0.82	14.87	6.70	10.78
1	4.12	7.24	0.51	12.46
2	2.84	11.71	0.88	23.69
3	2.86	7.88	3.34	22.67
4	2.41	12.17	0.00	18.00

```
[15]: dataset.info(verbose=True, show_counts=True)
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 28 entries, 0 to 27
Data columns (total 100 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Geo_FIPS              28 non-null    object
1   Geo_QName             28 non-null    object
2   Geo_FILEID            28 non-null    object
3   Geo_STUSAB            28 non-null    object
4   Geo_SUMLEV            28 non-null    int64
5   Geo_GEOCOMP           28 non-null    int64
6   Geo_LOGRECNO          28 non-null    int64
7   Geo_US                0 non-null     float64
8   Geo_REGION            0 non-null     float64
9   Geo_DIVISION          0 non-null     float64
10  Geo_STATECE           0 non-null     float64
11  Geo_STATE             28 non-null    object
12  Geo_COUNTY            28 non-null    object
13  Geo_COUSUB            0 non-null     float64
14  Geo_PLACE             0 non-null     float64
15  Geo_TRACT             28 non-null    int64
16  Geo_BLKGRP            0 non-null     float64
17  Geo_CONCIT            0 non-null     float64
18  Geo_AIANHH            0 non-null     float64
19  Geo_AIANHHFP          0 non-null     float64
20  Geo_AIHHTLI           0 non-null     float64
21  Geo_AITSCE            0 non-null     float64
22  Geo_AITS              0 non-null     float64
23  Geo_ANRC              0 non-null     float64
```

24	Geo_CBSA	0 non-null	float64
25	Geo_CSA	0 non-null	float64
26	Geo_METDIV	0 non-null	float64
27	Geo_MACC	0 non-null	float64
28	Geo_MEMI	0 non-null	float64
29	Geo_NECTA	0 non-null	float64
30	Geo_CNECTA	0 non-null	float64
31	Geo_NECTADIV	0 non-null	float64
32	Geo_UA	0 non-null	float64
33	Geo_UACP	0 non-null	float64
34	Geo_CDCURR	0 non-null	float64
35	Geo_SLDU	0 non-null	float64
36	Geo_SLDL	0 non-null	float64
37	Geo_VTD	0 non-null	float64
38	Geo_ZCTA3	0 non-null	float64
39	Geo_ZCTA5	0 non-null	float64
40	Geo_SUBMCD	0 non-null	float64
41	Geo_SDELM	0 non-null	float64
42	Geo_SDSEC	0 non-null	float64
43	Geo_SDUNI	0 non-null	float64
44	Geo_UR	0 non-null	float64
45	Geo_PCI	0 non-null	float64
46	Geo_TAZ	0 non-null	float64
47	Geo_UGA	0 non-null	float64
48	Geo_PUMA5	0 non-null	float64
49	Geo_PUMA1	0 non-null	float64
50	Geo_GEOID	28 non-null	object
51	Geo_NAME	28 non-null	object
52	Geo_BTTR	0 non-null	float64
53	Geo_BTBG	0 non-null	float64
54	Geo_PLACESE	0 non-null	float64
55	SE_A03001_001	28 non-null	int64
56	SE_A03001_002	28 non-null	int64
57	SE_A03001_003	28 non-null	int64
58	SE_A03001_004	28 non-null	int64
59	SE_A03001_005	28 non-null	int64
60	SE_A03001_006	28 non-null	int64
61	SE_A03001_007	28 non-null	int64
62	SE_A03001_008	28 non-null	int64
63	PCT_SE_A03001_002	28 non-null	float64
64	PCT_SE_A03001_003	28 non-null	float64
65	PCT_SE_A03001_004	28 non-null	float64
66	PCT_SE_A03001_005	28 non-null	float64
67	PCT_SE_A03001_006	28 non-null	float64
68	PCT_SE_A03001_007	28 non-null	float64
69	PCT_SE_A03001_008	28 non-null	float64
70	SE_A10062B_001	28 non-null	int64
71	SE_A10062B_002	28 non-null	int64

72	SE_A10062B_003	28 non-null	int64
73	SE_A10062B_004	28 non-null	int64
74	SE_A10062B_005	28 non-null	int64
75	SE_A10062B_006	28 non-null	int64
76	PCT_SE_A10062B_002	28 non-null	float64
77	PCT_SE_A10062B_003	28 non-null	float64
78	PCT_SE_A10062B_004	28 non-null	float64
79	PCT_SE_A10062B_005	28 non-null	float64
80	PCT_SE_A10062B_006	28 non-null	float64
81	SE_A09005_001	28 non-null	int64
82	SE_A09005_002	28 non-null	int64
83	SE_A09005_009	28 non-null	int64
84	SE_A09005_010	28 non-null	int64
85	SE_A09005_003	28 non-null	int64
86	SE_A09005_004	28 non-null	int64
87	SE_A09005_005	28 non-null	int64
88	SE_A09005_006	28 non-null	int64
89	SE_A09005_007	28 non-null	int64
90	SE_A09005_008	28 non-null	int64
91	PCT_SE_A09005_002	28 non-null	float64
92	PCT_SE_A09005_009	28 non-null	float64
93	PCT_SE_A09005_010	28 non-null	float64
94	PCT_SE_A09005_003	28 non-null	float64
95	PCT_SE_A09005_004	28 non-null	float64
96	PCT_SE_A09005_005	28 non-null	float64
97	PCT_SE_A09005_006	28 non-null	float64
98	PCT_SE_A09005_007	28 non-null	float64
99	PCT_SE_A09005_008	28 non-null	float64

dtypes: float64(64), int64(28), object(8)

memory usage: 22.0+ KB

Next I look up the columns that have null values.

```
[16]: dataset.columns[dataset.isna().all()].tolist()
```

```
[16]: ['Geo_US',
       'Geo_REGION',
       'Geo_DIVISION',
       'Geo_STATECE',
       'Geo_COUSUB',
       'Geo_PLACE',
       'Geo_BLKGRP',
       'Geo_CONCIT',
       'Geo_AIANHH',
       'Geo_AIANHHFP',
       'Geo_AIHHTLI',
       'Geo_AITSCE',
       'Geo_AITS',
```

```

'Geo_ANRC',
'Geo_CBSA',
'Geo_CSA',
'Geo_METDIV',
'Geo_MACC',
'Geo_MEMI',
'Geo_NECTA',
'Geo_CNECTA',
'Geo_NECTADIV',
'Geo_UA',
'Geo_UACP',
'Geo_CDCURR',
'Geo_SLDU',
'Geo_SLDL',
'Geo_VTD',
'Geo_ZCTA3',
'Geo_ZCTA5',
'Geo_SUBMCD',
'Geo_SDELM',
'Geo_SDSEC',
'Geo_SDUNI',
'Geo_UR',
'Geo_PCI',
'Geo_TAZ',
'Geo_UGA',
'Geo_PUMA5',
'Geo_PUMA1',
'Geo_BTTR',
'Geo_BTBG',
'Geo_PLACESE']

```

Then I drop the columns with empty values and check my dataset again.

```
[17]: dataset = dataset.dropna(axis=1,how="all")
```

```
[18]: dataset.head()
```

```
[18]:
```

	Geo_FIPS	Geo_QName	Geo_FILEID	\
0	06001402600	Census Tract 4026, Alameda County, California	ACSSF	
1	06001402700	Census Tract 4027, Alameda County, California	ACSSF	
2	06001402801	Census Tract 4028.01, Alameda County, California	ACSSF	
3	06001402802	Census Tract 4028.02, Alameda County, California	ACSSF	
4	06001402900	Census Tract 4029, Alameda County, California	ACSSF	

	Geo_STUSAB	Geo_SUMLEV	Geo_GEOCOMP	Geo_LOGRECNO	Geo_STATE	Geo_COUNTY	\
0	ca	140	0	2839	6	1	
1	ca	140	0	2840	6	1	

2	ca	140	0	2841	6	1
3	ca	140	0	2842	6	1
4	ca	140	0	2843	6	1

	Geo_TRACT	Geo_GEOID	Geo_NAME	SE_A03001_001	\
0	402600	14000US06001402600	Census Tract 4026	1299	
1	402700	14000US06001402700	Census Tract 4027	1988	
2	402801	14000US06001402801	Census Tract 4028.01	3301	
3	402802	14000US06001402802	Census Tract 4028.02	1251	
4	402900	14000US06001402900	Census Tract 4029	1638	

	SE_A03001_002	SE_A03001_003	SE_A03001_004	SE_A03001_005	SE_A03001_006	\
0	197	437	4	454	0	
1	616	717	0	313	0	
2	990	1230	31	582	0	
3	284	583	0	195	0	
4	426	291	3	742	0	

	SE_A03001_007	SE_A03001_008	PCT_SE_A03001_002	PCT_SE_A03001_003	\
0	38	169	15.17	33.64	
1	252	90	30.99	36.07	
2	67	401	29.99	37.26	
3	56	133	22.70	46.60	
4	100	76	26.01	17.77	

	PCT_SE_A03001_004	PCT_SE_A03001_005	PCT_SE_A03001_006	PCT_SE_A03001_007	\
0	0.31	34.95	0.0	2.93	
1	0.00	15.74	0.0	12.68	
2	0.94	17.63	0.0	2.03	
3	0.00	15.59	0.0	4.48	
4	0.18	45.30	0.0	6.11	

	PCT_SE_A03001_008	SE_A10062B_001	SE_A10062B_002	SE_A10062B_003	\
0	13.01	1140	134	183	
1	4.53	1160	201	461	
2	12.15	2799	105	294	
3	10.63	938	0	20	
4	4.64	1509	0	15	

	SE_A10062B_004	SE_A10062B_005	SE_A10062B_006	PCT_SE_A10062B_002	\
0	817	0	6	11.75	
1	487	11	0	17.33	
2	2389	11	0	3.75	
3	918	0	0	0.00	
4	1494	0	0	0.00	

	PCT_SE_A10062B_003	PCT_SE_A10062B_004	PCT_SE_A10062B_005	\
--	--------------------	--------------------	--------------------	---

0	16.05	71.67	0.00
1	39.74	41.98	0.95
2	10.50	85.35	0.39
3	2.13	97.87	0.00
4	0.99	99.01	0.00

	PCT_SE_A10062B_006	SE_A09005_001	SE_A09005_002	SE_A09005_009	\
0	0.53	612	325	273	
1	0.00	1188	524	396	
2	0.00	1828	375	356	
3	0.00	419	62	36	
4	0.00	789	132	120	

	SE_A09005_010	SE_A09005_003	SE_A09005_004	SE_A09005_005	SE_A09005_006	\
0	52	84	0	5	91	
1	128	375	0	49	86	
2	19	706	32	52	214	
3	26	188	15	12	33	
4	12	400	0	19	96	

	SE_A09005_007	SE_A09005_008	PCT_SE_A09005_002	PCT_SE_A09005_009	\
0	41	66	53.10	44.61	
1	6	148	44.11	33.33	
2	16	433	20.51	19.47	
3	14	95	14.80	8.59	
4	0	142	16.73	15.21	

	PCT_SE_A09005_010	PCT_SE_A09005_003	PCT_SE_A09005_004	PCT_SE_A09005_005	\
0	8.50	13.73	0.00	0.82	
1	10.77	31.57	0.00	4.12	
2	1.04	38.62	1.75	2.84	
3	6.21	44.87	3.58	2.86	
4	1.52	50.70	0.00	2.41	

	PCT_SE_A09005_006	PCT_SE_A09005_007	PCT_SE_A09005_008
0	14.87	6.70	10.78
1	7.24	0.51	12.46
2	11.71	0.88	23.69
3	7.88	3.34	22.67
4	12.17	0.00	18.00

I list all the remaining columns that have a non-null value in them.

```
[19]: dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 28 entries, 0 to 27
Data columns (total 57 columns):
```

#	Column	Non-Null Count	Dtype
----	-----	-----	-----
0	Geo_FIPS	28 non-null	object
1	Geo_QName	28 non-null	object
2	Geo_FILEID	28 non-null	object
3	Geo_STUSAB	28 non-null	object
4	Geo_SUMLEV	28 non-null	int64
5	Geo_GEOCOMP	28 non-null	int64
6	Geo_LOGRECNO	28 non-null	int64
7	Geo_STATE	28 non-null	object
8	Geo_COUNTY	28 non-null	object
9	Geo_TRACT	28 non-null	int64
10	Geo_GEOID	28 non-null	object
11	Geo_NAME	28 non-null	object
12	SE_A03001_001	28 non-null	int64
13	SE_A03001_002	28 non-null	int64
14	SE_A03001_003	28 non-null	int64
15	SE_A03001_004	28 non-null	int64
16	SE_A03001_005	28 non-null	int64
17	SE_A03001_006	28 non-null	int64
18	SE_A03001_007	28 non-null	int64
19	SE_A03001_008	28 non-null	int64
20	PCT_SE_A03001_002	28 non-null	float64
21	PCT_SE_A03001_003	28 non-null	float64
22	PCT_SE_A03001_004	28 non-null	float64
23	PCT_SE_A03001_005	28 non-null	float64
24	PCT_SE_A03001_006	28 non-null	float64
25	PCT_SE_A03001_007	28 non-null	float64
26	PCT_SE_A03001_008	28 non-null	float64
27	SE_A10062B_001	28 non-null	int64
28	SE_A10062B_002	28 non-null	int64
29	SE_A10062B_003	28 non-null	int64
30	SE_A10062B_004	28 non-null	int64
31	SE_A10062B_005	28 non-null	int64
32	SE_A10062B_006	28 non-null	int64
33	PCT_SE_A10062B_002	28 non-null	float64
34	PCT_SE_A10062B_003	28 non-null	float64
35	PCT_SE_A10062B_004	28 non-null	float64
36	PCT_SE_A10062B_005	28 non-null	float64
37	PCT_SE_A10062B_006	28 non-null	float64
38	SE_A09005_001	28 non-null	int64
39	SE_A09005_002	28 non-null	int64
40	SE_A09005_009	28 non-null	int64
41	SE_A09005_010	28 non-null	int64
42	SE_A09005_003	28 non-null	int64
43	SE_A09005_004	28 non-null	int64
44	SE_A09005_005	28 non-null	int64
45	SE_A09005_006	28 non-null	int64


```

46 SE_A09005_007      28 non-null    int64
47 SE_A09005_008      28 non-null    int64
48 PCT_SE_A09005_002  28 non-null    float64
49 PCT_SE_A09005_009  28 non-null    float64
50 PCT_SE_A09005_010  28 non-null    float64
51 PCT_SE_A09005_003  28 non-null    float64
52 PCT_SE_A09005_004  28 non-null    float64
53 PCT_SE_A09005_005  28 non-null    float64
54 PCT_SE_A09005_006  28 non-null    float64
55 PCT_SE_A09005_007  28 non-null    float64
56 PCT_SE_A09005_008  28 non-null    float64
dtypes: float64(21), int64(28), object(8)
memory usage: 12.6+ KB

```

I select the columns of interest that I want to keep.

```

[20]: columns_to_keep = ['Geo_FIPS',
                        'SE_A03001_001',
                        'SE_A03001_002',
                        'SE_A03001_003',
                        'SE_A03001_004',
                        'SE_A03001_005',
                        'SE_A03001_006',
                        'SE_A03001_007',
                        'SE_A03001_008',
                        'SE_A10062B_001',
                        'SE_A09005_001',
                        'SE_A09005_002',
                        'SE_A09005_009',
                        'SE_A09005_010',
                        'SE_A09005_003',
                        'SE_A09005_004',
                        'SE_A09005_005',
                        'SE_A09005_006',
                        'SE_A09005_007',
                        'SE_A09005_008']

dataset3 = dataset[columns_to_keep]

```

```

[21]: columns = list(dataset3)
      columns

```

```

[21]: ['Geo_FIPS',
      'SE_A03001_001',
      'SE_A03001_002',
      'SE_A03001_003',
      'SE_A03001_004',
      'SE_A03001_005',

```

```
'SE_A03001_006',
'SE_A03001_007',
'SE_A03001_008',
'SE_A10062B_001',
'SE_A09005_001',
'SE_A09005_002',
'SE_A09005_009',
'SE_A09005_010',
'SE_A09005_003',
'SE_A09005_004',
'SE_A09005_005',
'SE_A09005_006',
'SE_A09005_007',
'SE_A09005_008']
```

I then rename the columns that I want to keep according to the data they represent.

```
[22]: dataset3.columns = ['FIPS',
    'TotalPop',
    'White Alone',
    'Black or African American Alone',
    'American Indian and Alaska Native Alone',
    'Asian Alone',
    'Native Hawaiian or Other Pacific Islander Alone',
    'Some Other Race Alone',
    'Two or More Races',
    'Total Population in Renter Occupied Housing Units',
    'Workers 16 years and Over',
    'Car, Truck or Van',
    'Drove Alone','Carpooled',
    'Public Transportation [Includes Taxicab]',
    'Motorcycle', 'Bicycle','Walked', 'Other Means', 'Worked At_
↪Home']
```

Check my table again.

```
[23]: dataset3.sample(5)
```

```
[23]:
```

	FIPS	TotalPop	White Alone	Black or African American Alone	\
5	06001403000	2907	239	43	
2	06001402801	3301	990	1230	
19	06001427200	4418	1749	190	
17	06001408800	7688	404	2924	
1	06001402700	1988	616	717	

	American Indian and Alaska Native Alone	Asian Alone	\
5	10	2373	

2		31	582
19		0	1771
17		38	336
1		0	313

	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone	\
5	73	37	
2	0	67	
19	49	218	
17	159	2732	
1	0	252	

	Two or More Races	Total Population in Renter Occupied Housing Units	\
5	132	1808	
2	401	2799	
19	441	2407	
17	1095	4999	
1	90	1160	

	Workers 16 years and Over	Car, Truck or Van	Drove Alone	Carpooled	\
5	1010	398	346	52	
2	1828	375	356	19	
19	2451	1398	1358	40	
17	3028	2229	1864	365	
1	1188	524	396	128	

	Public Transportation [Includes Taxicab]	Motorcycle	Bicycle	Walked	\
5	247	0	0	258	
2	706	32	52	214	
19	294	15	64	166	
17	323	0	123	140	
1	375	0	49	86	

	Other Means	Worked At Home
5	0	107
2	16	433
19	18	496
17	134	79
1	6	148

I then query the values of my total population column, including the first 5 values, the mean, median, and the describe function that gives me a summary statistics of the value.

```
[24]: dataset3['TotalPop'].head()
```

```
[24]: 0    1299
      1    1988
      2    3301
      3    1251
      4    1638
      Name: TotalPop, dtype: int64
```

```
[25]: dataset3['TotalPop'].mean()
```

```
[25]: 3547.464285714286
```

```
[26]: dataset3['TotalPop'].median()
```

```
[26]: 3775.0
```

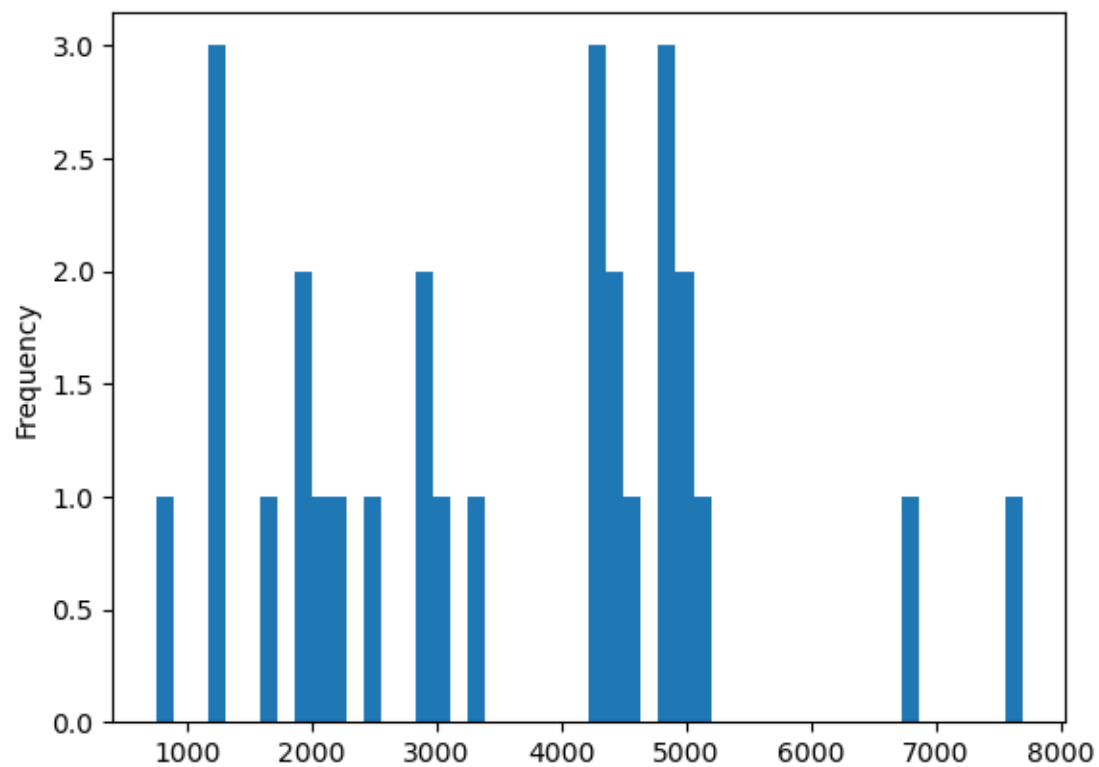
```
[27]: dataset3['TotalPop'].describe()
```

```
[27]: count      28.000000
      mean      3547.464286
      std       1744.557685
      min       755.000000
      25%       2037.500000
      50%       3775.000000
      75%       4824.250000
      max       7688.000000
      Name: TotalPop, dtype: float64
```

I then plot my total population as a histogram and a box plot.

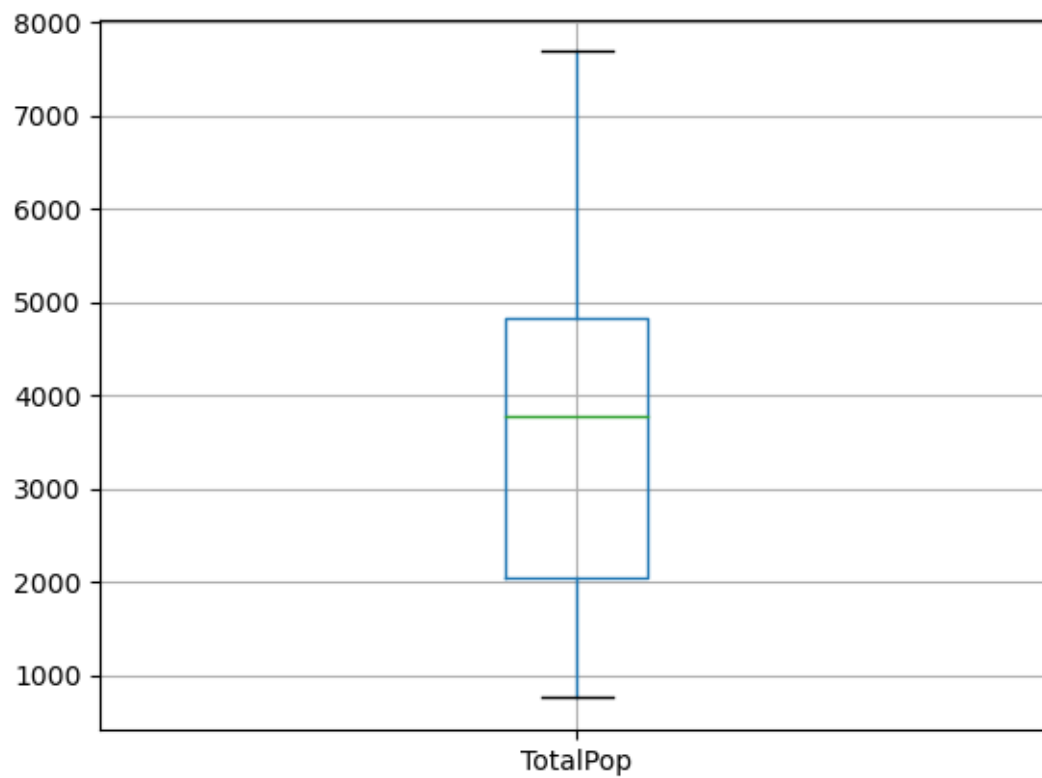
```
[28]: dataset3['TotalPop'].plot.hist(bins=50)
```

```
[28]: <AxesSubplot: ylabel='Frequency'>
```



```
[29]: dataset3.boxplot(column=['TotalPop'])
```

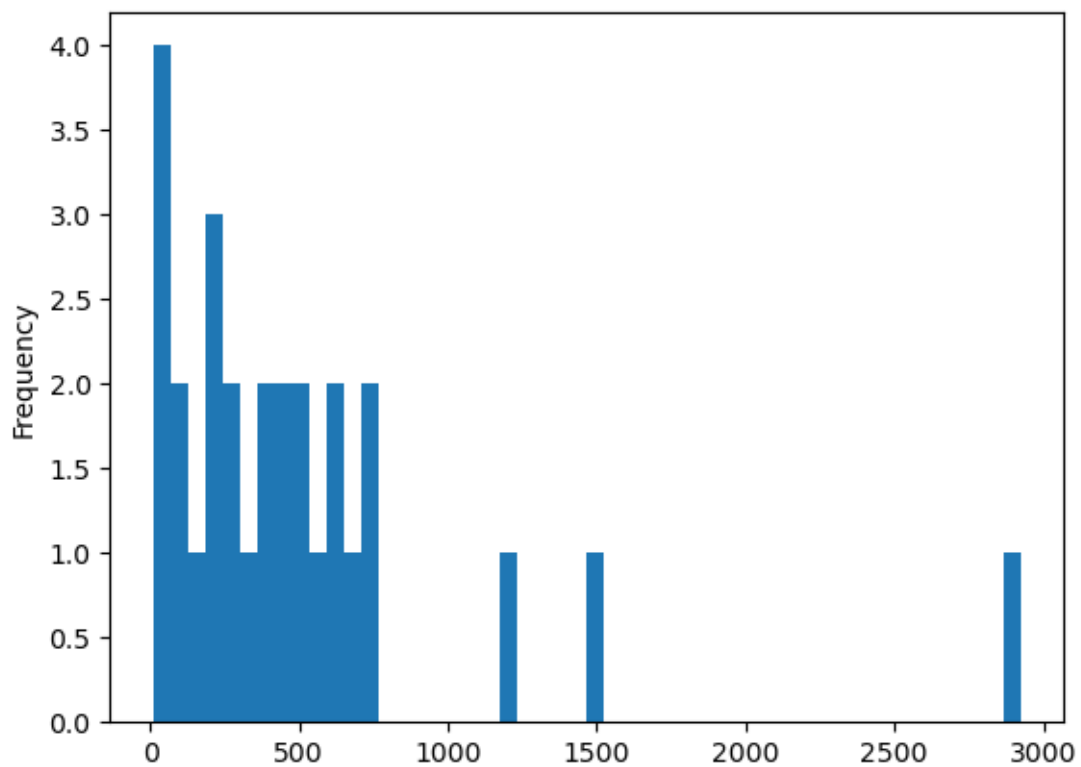
```
[29]: <AxesSubplot: >
```



I then plot the Black, White and Asian populations separately as a histogram.

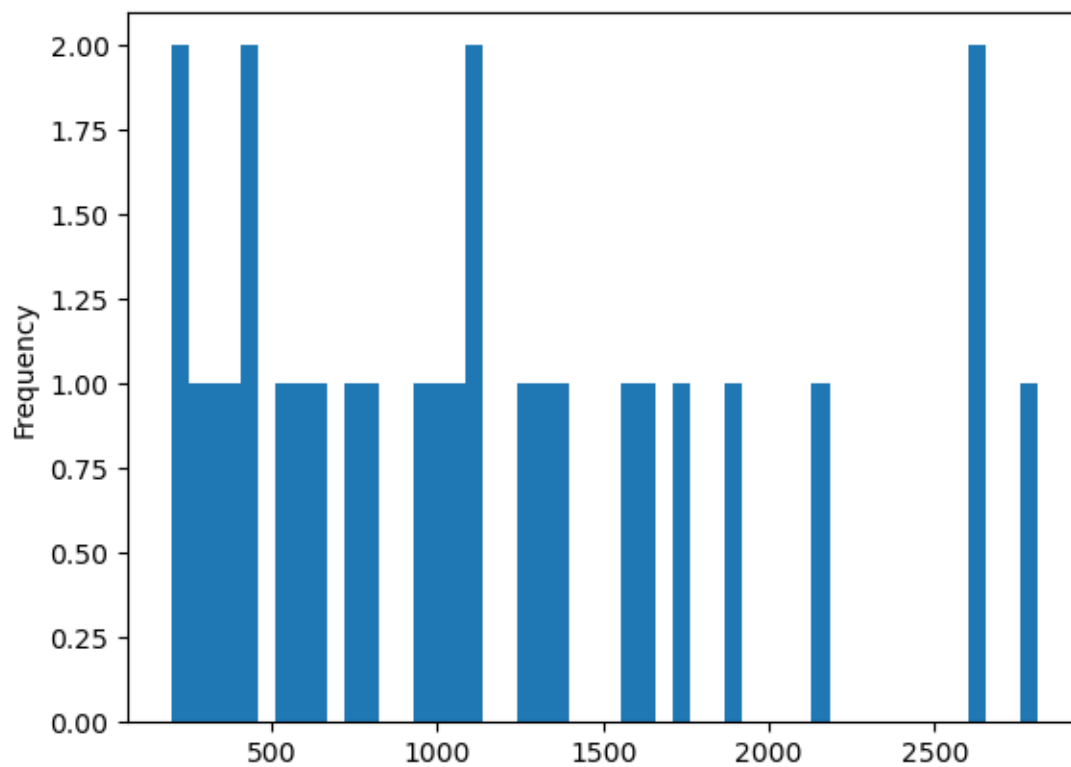
```
[30]: dataset3['Black or African American Alone'].plot.hist(bins=50)
```

```
[30]: <AxesSubplot: ylabel='Frequency'>
```



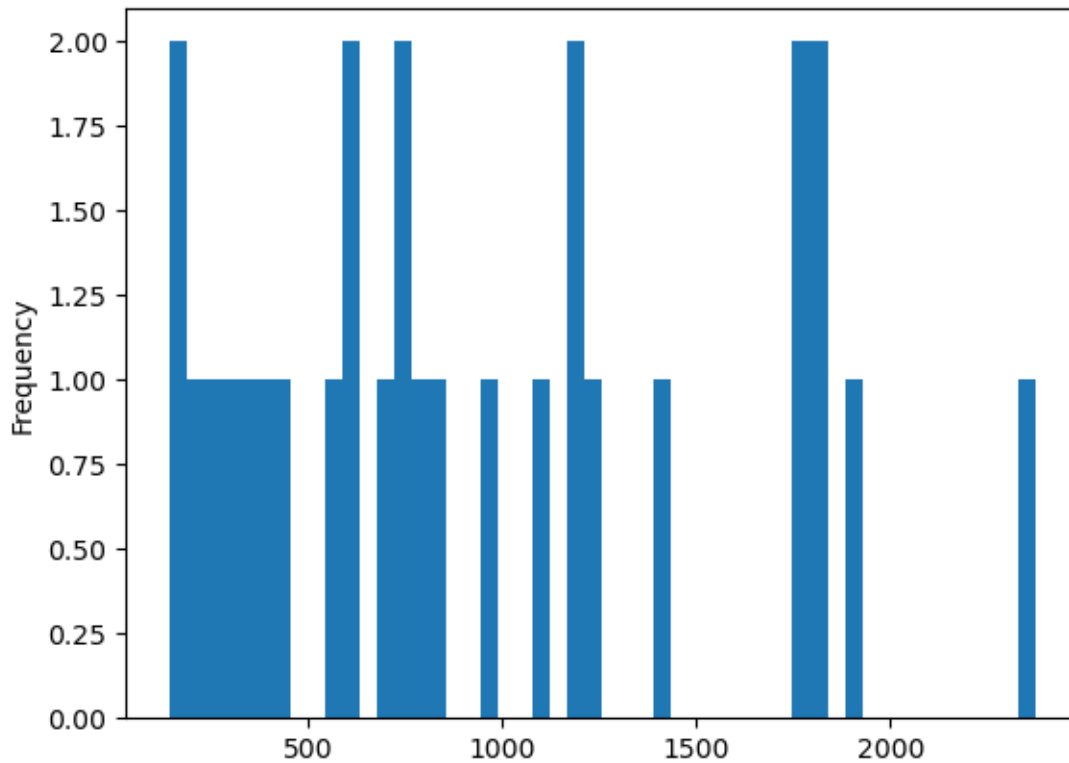
```
[31]: dataset3['White Alone'].plot.hist(bins=50)
```

```
[31]: <AxesSubplot: ylabel='Frequency'>
```



```
[32]: dataset3['Asian Alone'].plot.hist(bins=50)
```

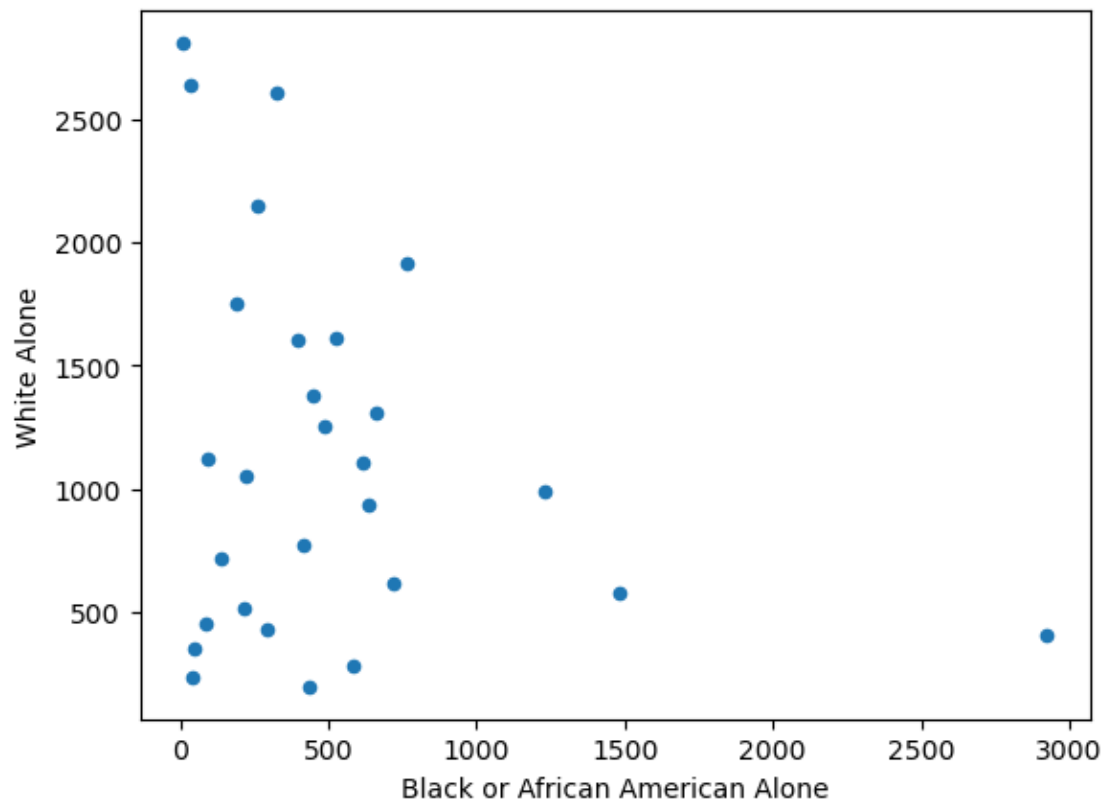
```
[32]: <AxesSubplot: ylabel='Frequency'>
```

I then plot the intersection of the Black and White populations and notice the two rarely overlap.

```
[33]: dataset3.plot.scatter(x='Black or African American Alone',y='White Alone')
```

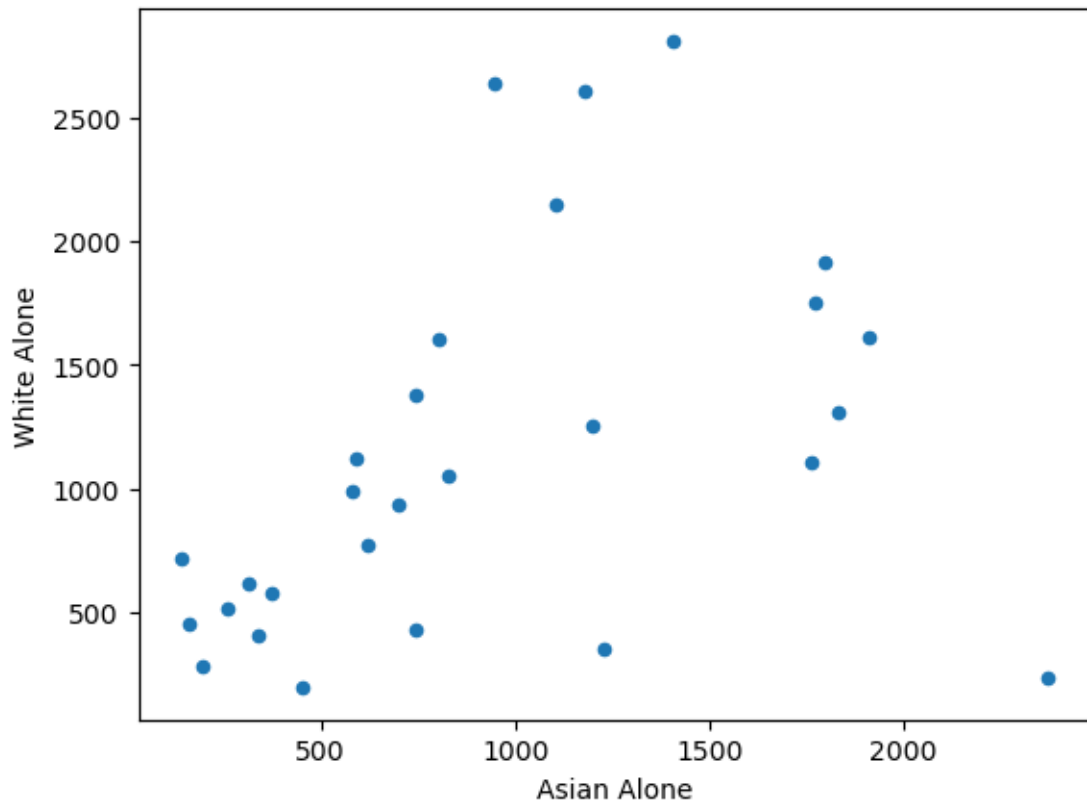
```
[33]: <AxesSubplot: xlabel='Black or African American Alone', ylabel='White Alone'>
```



I then plot the intersection of the Asian and White population and notice more overlap.

```
[34]: dataset3.plot.scatter(x='Asian Alone',y='White Alone')
```

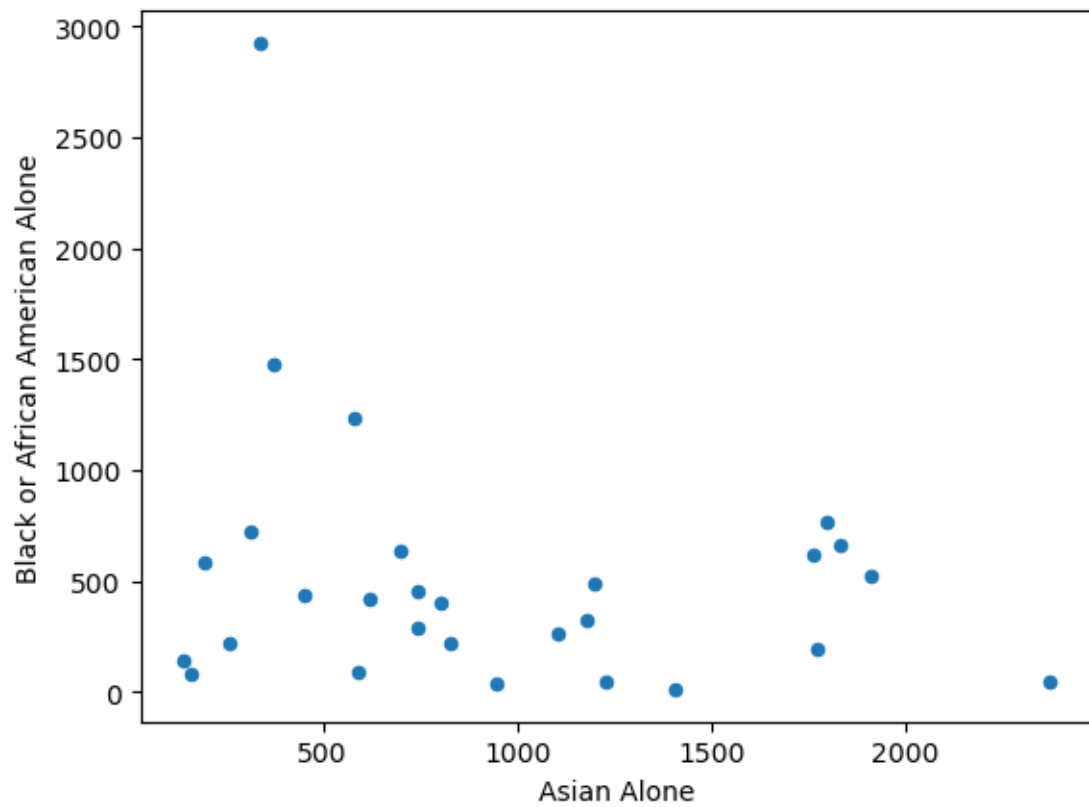
```
[34]: <AxesSubplot: xlabel='Asian Alone', ylabel='White Alone'>
```



I then plot the intersection of the Asian and Black population and find little correlation as well. Note, it seems that my Black population is not very large to begin with.

```
[35]: dataset3.plot.scatter(x='Asian Alone',y='Black or African American Alone')
```

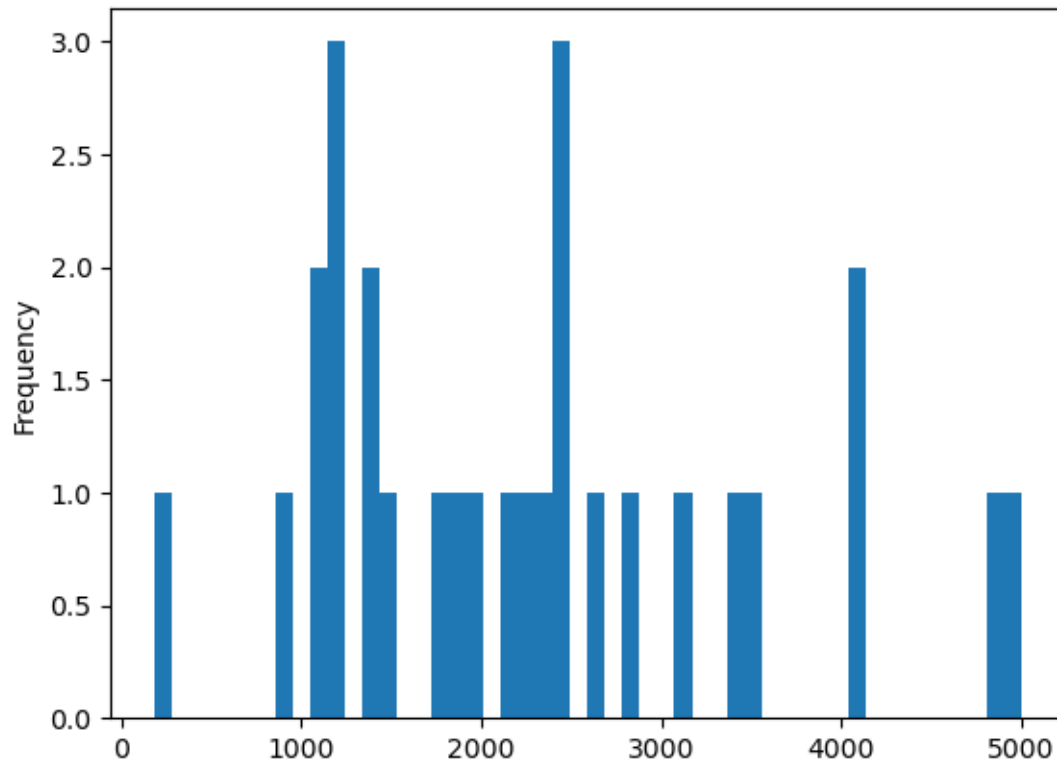
```
[35]: <AxesSubplot: xlabel='Asian Alone', ylabel='Black or African American Alone'>
```



Then I plot total population in renter occupied housing units as a histogram.

```
[36]: dataset3['Total Population in Renter Occupied Housing Units'].plot.hist(bins=50)
```

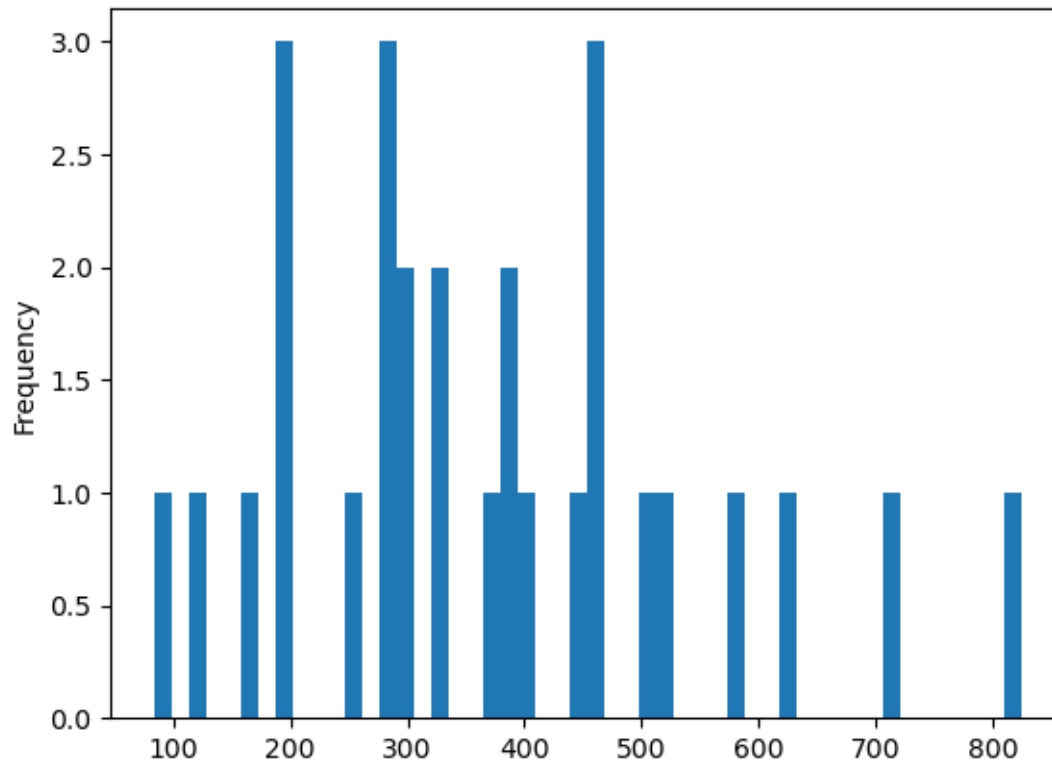
```
[36]: <AxesSubplot: ylabel='Frequency'>
```



I then plot the number of residents (workers above 16) who use public transportation to get to work as a histogram.

```
[37]: dataset3['Public Transportation [Includes Taxicab]'].plot.hist(bins=50)
```

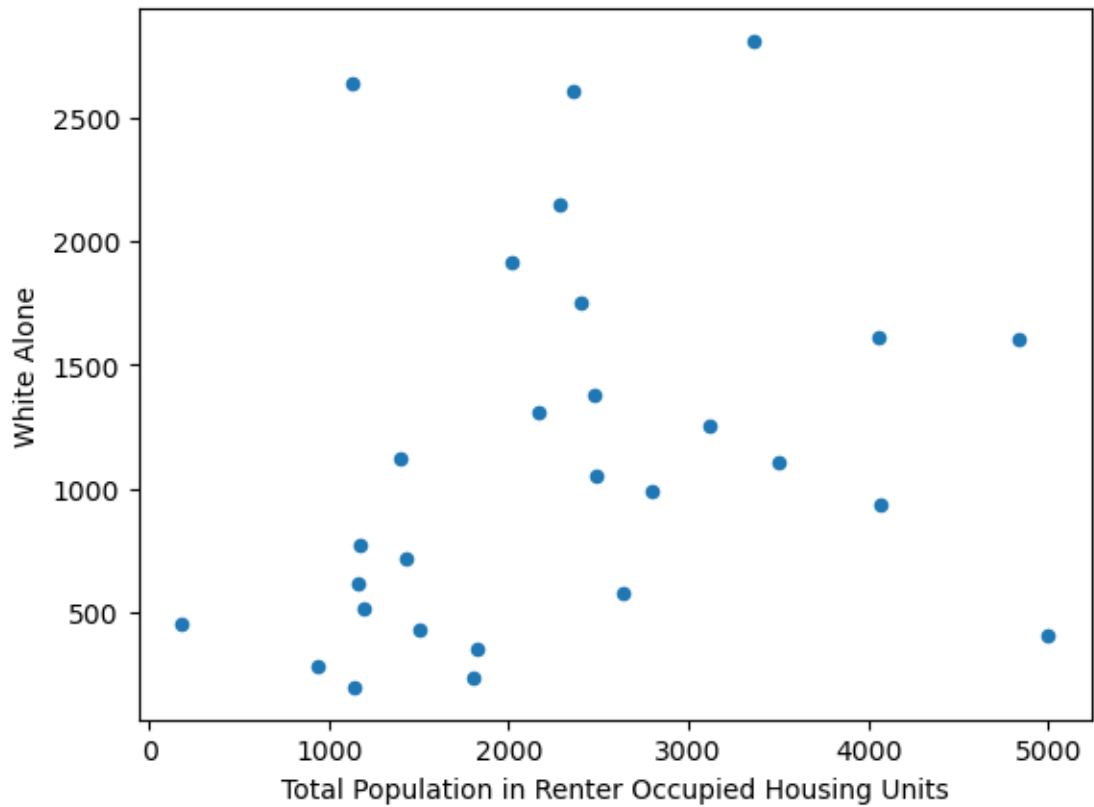
```
[37]: <AxesSubplot: ylabel='Frequency'>
```



I then plot the total renter population against the White population and see there is some spread.

```
[38]: dataset3.plot.scatter(x='Total Population in Renter Occupied Housing Units', y='White Alone')
```

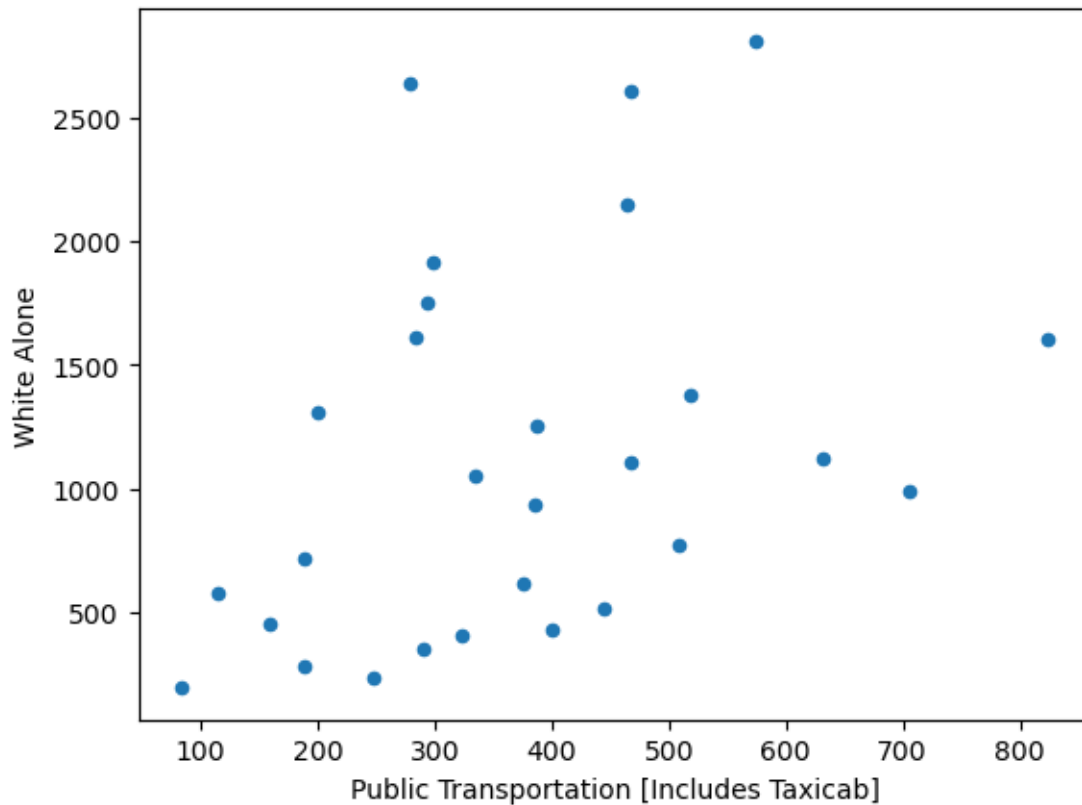
```
[38]: <AxesSubplot: xlabel='Total Population in Renter Occupied Housing Units', ylabel='White Alone'>
```



Next I plot the White population against those who use public transportation to get to work.

```
[39]: dataset3.plot.scatter(x='Public Transportation [Includes Taxicab]',y='White_
    ↪ Alone')
```

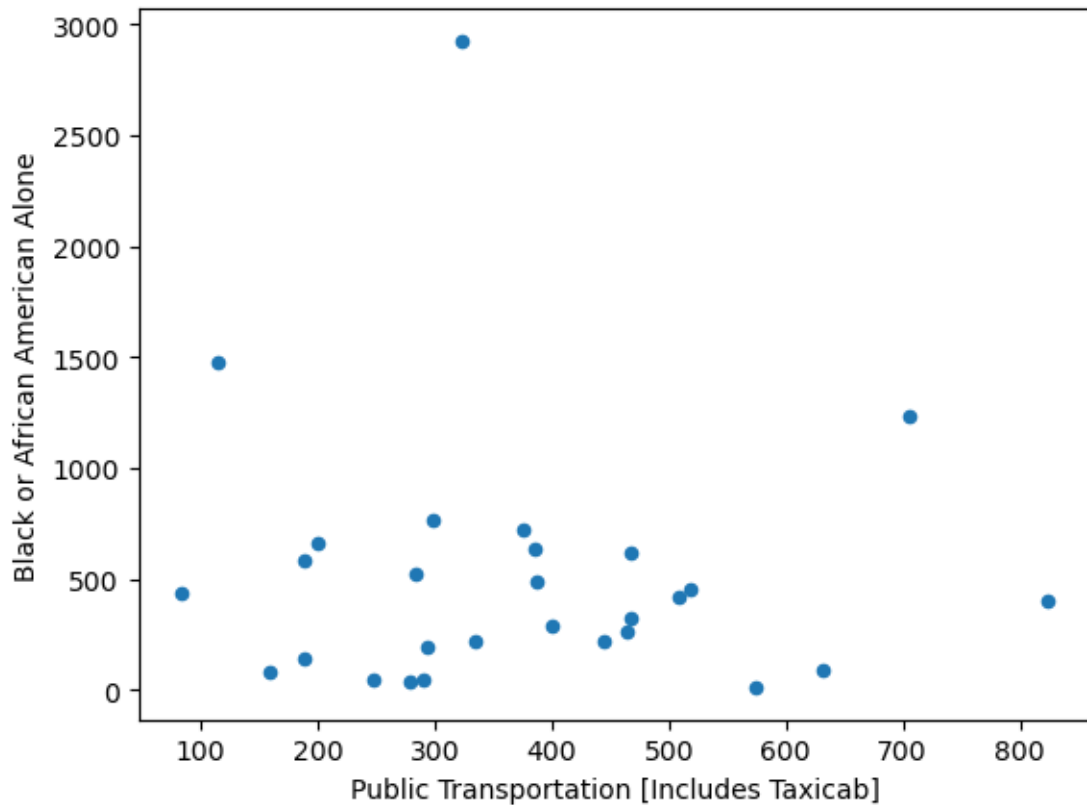
```
[39]: <AxesSubplot: xlabel='Public Transportation [Includes Taxicab]', ylabel='White
    Alone'>
```



Next I plot the Black population against those who use public transportation to get to work. I notice that the Black population is more likely to use public transportation.

```
[40]: dataset3.plot.scatter(x='Public Transportation [Includes Taxicab]',y='Black or African American Alone')
```

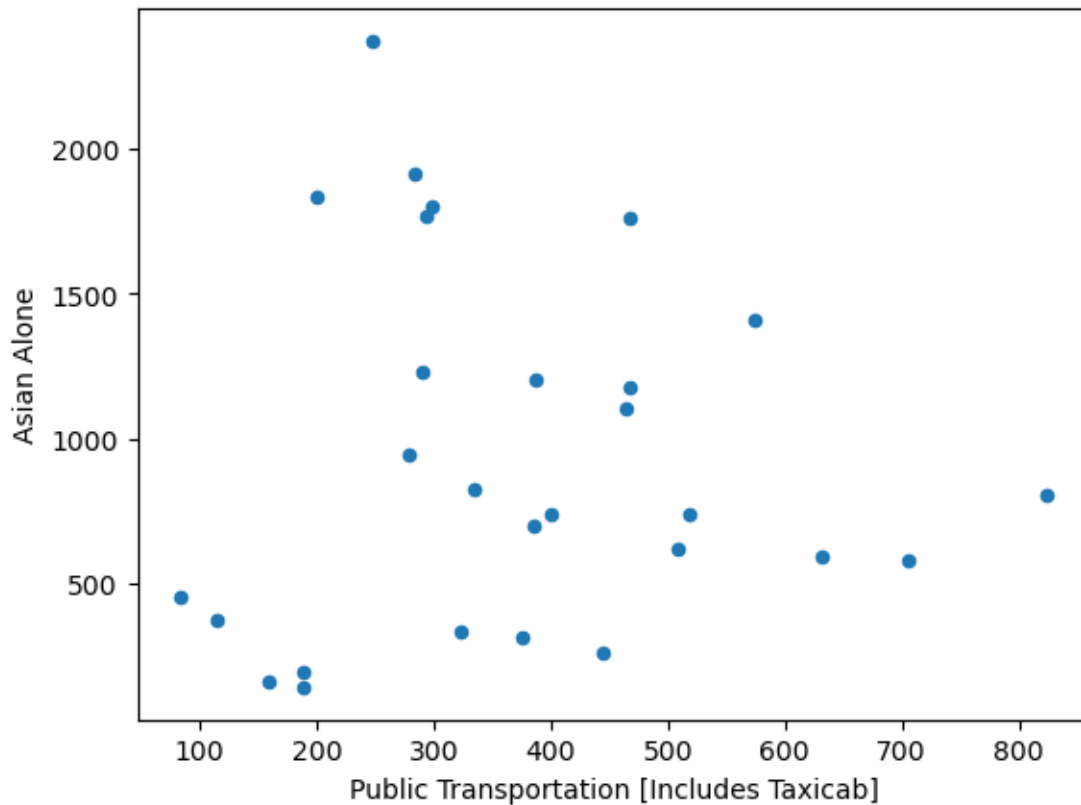
```
[40]: <AxesSubplot: xlabel='Public Transportation [Includes Taxicab]', ylabel='Black or African American Alone'>
```

Next I plot the Asian population against those who use public transportation to get to work. I notice more of a spread than the Black population, indicating that Asians are somewhat less likely to use public transportation.

```
[41]: dataset3.plot.scatter(x='Public Transportation [Includes Taxicab]',y='Asian_
↳Alone')
```

```
[41]: <AxesSubplot: xlabel='Public Transportation [Includes Taxicab]', ylabel='Asian
Alone'>
```



Next I sort my data by descending value. I've done this for my Total Population.

```
[42]: dataset_sorted = dataset3.sort_values(by='TotalPop',ascending = False)
```

```
[43]: dataset_sorted[['FIPS','TotalPop']].head(10)
```

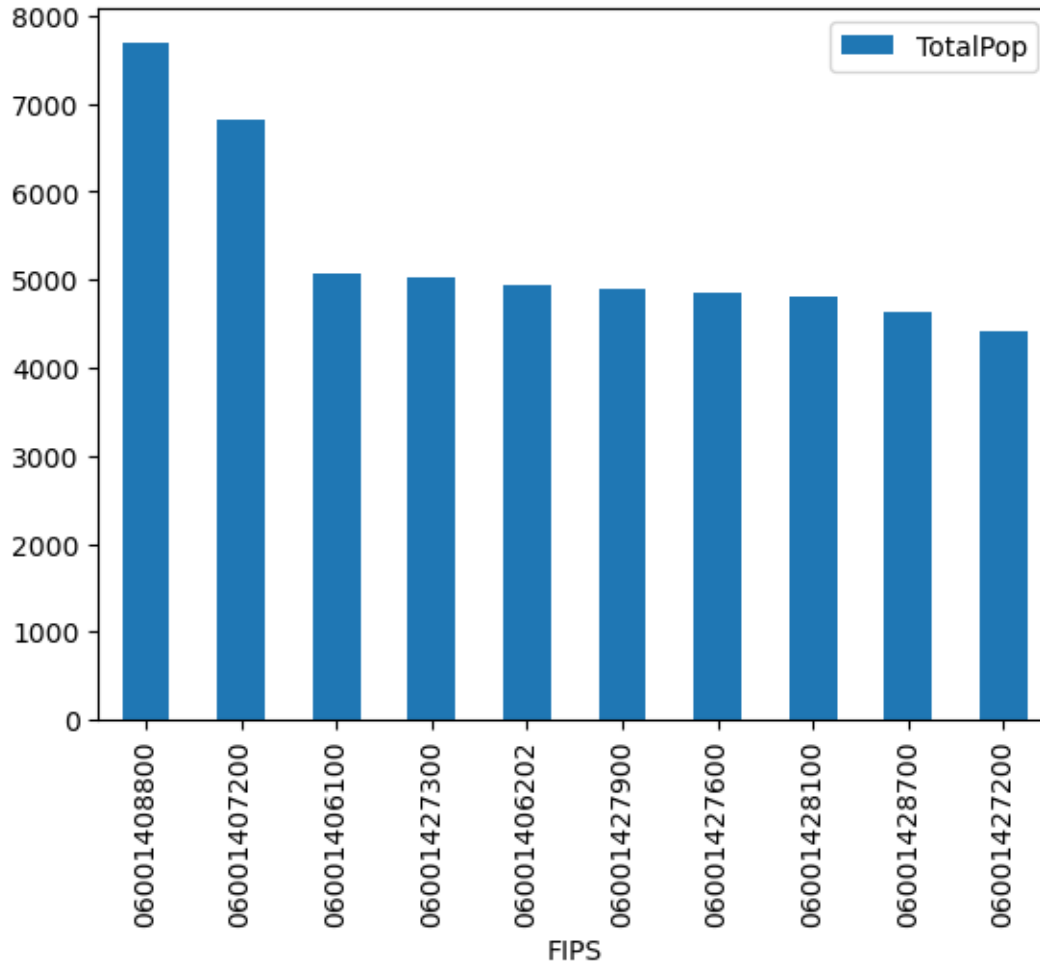
```
[43]:
```

	FIPS	TotalPop
17	06001408800	7688
14	06001407200	6820
12	06001406100	5072
20	06001427300	5036
13	06001406202	4947
23	06001427900	4893
21	06001427600	4861
25	06001428100	4812
26	06001428700	4628
19	06001427200	4418

Next I plot the top 10 most populated census tracts as a bar graph and a horizontal bar graph.

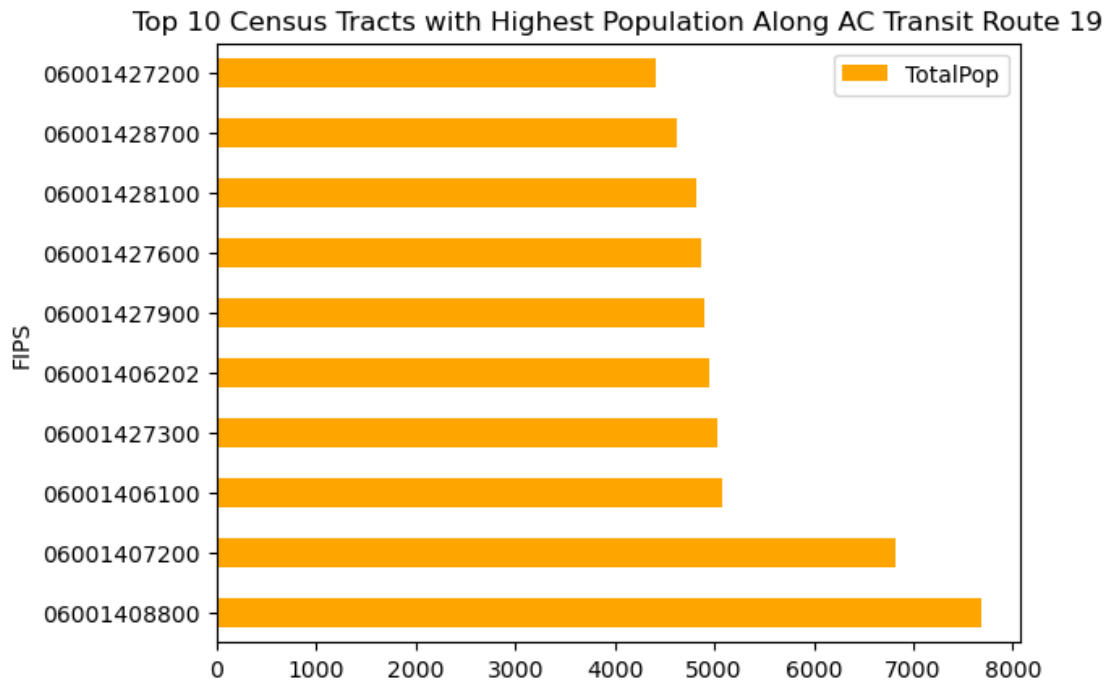
```
[44]: dataset_sorted.head(10).plot.bar(x='FIPS',
                                         y='TotalPop')
```

```
[44]: <AxesSubplot: xlabel='FIPS'>
```



```
[45]: dataset_sorted.head(10).plot.barh(x='FIPS',
                                         y='TotalPop',
                                         title='Top 10 Census Tracts with Highest Population Along AC Transit Route 19',
                                         color='orange')
```

```
[45]: <AxesSubplot: title={'center': 'Top 10 Census Tracts with Highest Population Along AC Transit Route 19'}, ylabel='FIPS'>
```

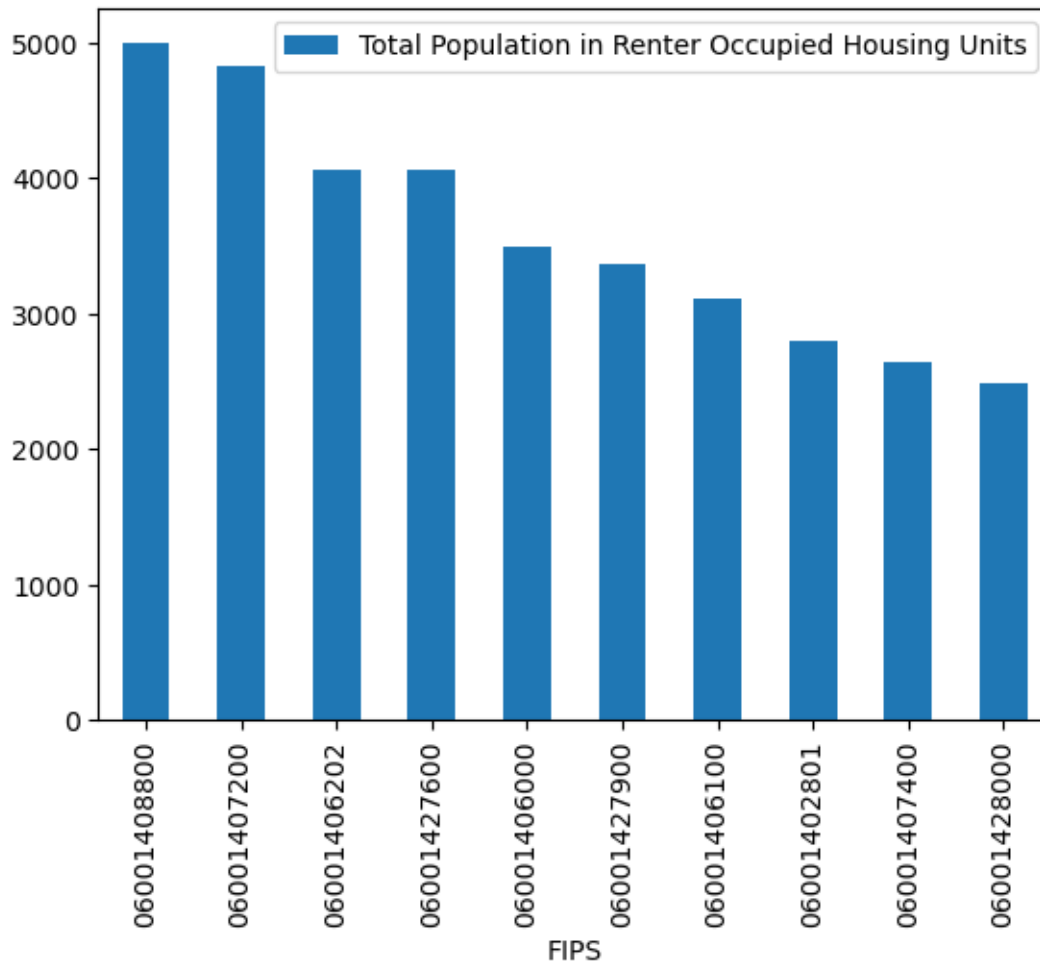


Next I plot the top 10 census tracts by population of renters as a bar graph.

```
[46]: dataset_sorted1 = dataset3.sort_values(by='Total Population in Renter Occupied_
↳Housing Units',ascending = False)
```

```
[47]: dataset_sorted1.head(10).plot.bar(x='FIPS',
                                          y='Total Population in Renter Occupied Housing_
↳Units')
```

```
[47]: <AxesSubplot: xlabel='FIPS'>
```

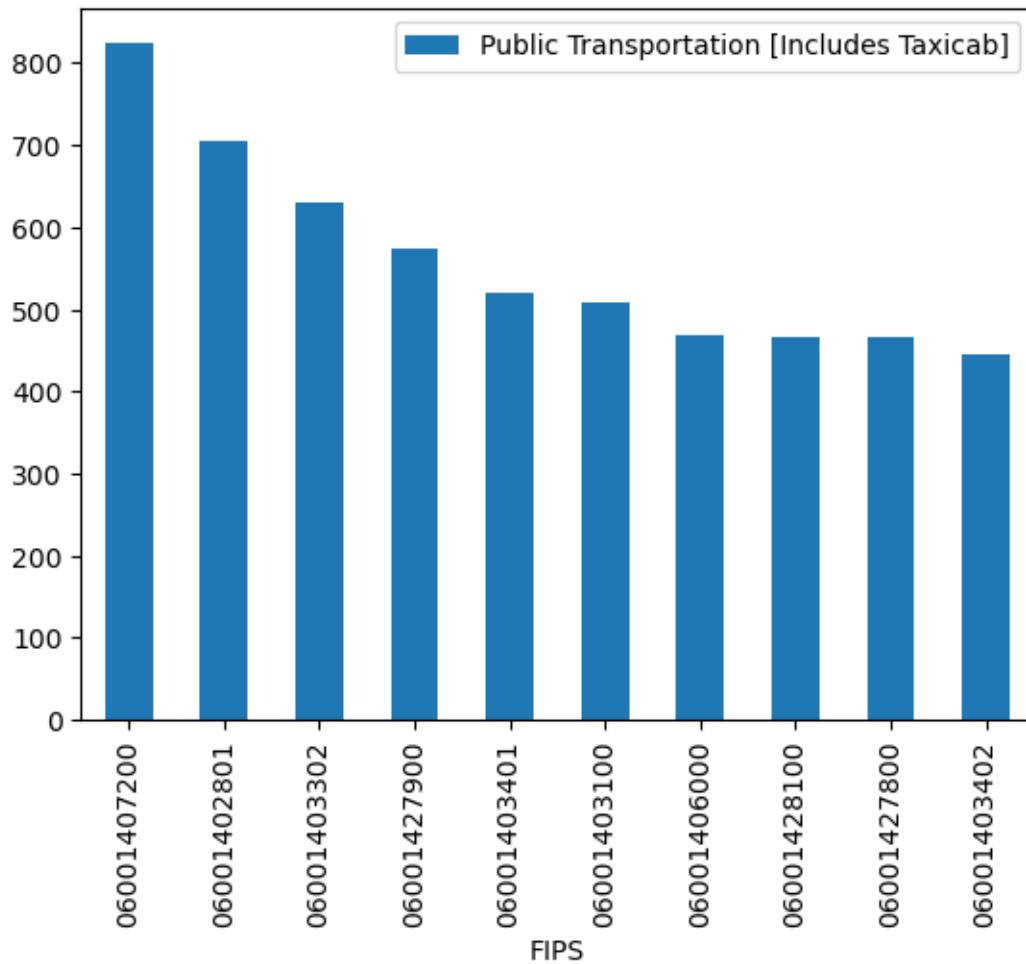


Next I plot the top 10 census tracts by population that uses public transportation as a bar graph and horizontal bar graph.

```
[48]: dataset_sorted2 = dataset3.sort_values(by='Public Transportation [Includes_↪Taxicab]', ascending = False)
```

```
[49]: dataset_sorted2.head(10).plot.bar(x='FIPS',
                                         y='Public Transportation [Includes Taxicab]')
```

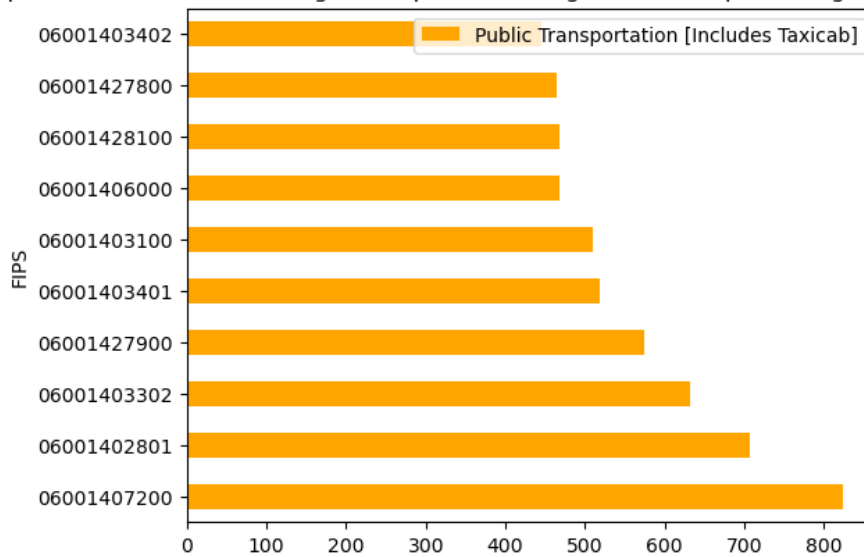
```
[49]: <AxesSubplot: xlabel='FIPS'>
```



```
[50]: dataset_sorted2.head(10).plot.barh(x='FIPS',
      y='Public Transportation [Includes Taxicab]',
      title='Top 10 Census Tracts with Highest Population Using Public Transport Along AC Transit Route 19',
      color='orange')
```

```
[50]: <AxesSubplot: title={'center': 'Top 10 Census Tracts with Highest Population Using Public Transport Along AC Transit Route 19'}, ylabel='FIPS'>
```

Top 10 Census Tracts with Highest Population Using Public Transport Along AC Transit Route 19



Next I query the census tracts with a white population of less than 500 people.

```
[51]: dataset3[dataset3['White Alone'] <= 500]
```

```
[51]:
```

	FIPS	TotalPop	White Alone	Black or African American Alone	\
0	06001402600	1299	197	437	
3	06001402802	1251	284	583	
4	06001402900	1638	426	291	
5	06001403000	2907	239	43	
7	06001403301	1950	353	47	
17	06001408800	7688	404	2924	
27	06001983200	755	455	84	

	American Indian and Alaska Native Alone	Asian Alone	\
0	4	454	
3	0	195	
4	3	742	
5	10	2373	
7	91	1230	
17	38	336	
27	0	161	

	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone	\
0	0	38	
3	0	56	
4	0	100	
5	73	37	
7	0	79	

17	159	2732
27	2	32

	Two or More Races	Total Population in Renter Occupied Housing Units \
0	169	1140
3	133	938
4	76	1509
5	132	1808
7	150	1830
17	1095	4999
27	21	184

	Workers 16 years and Over	Car, Truck or Van	Drove Alone	Carpooled \
0	612	325	273	52
3	419	62	36	26
4	789	132	120	12
5	1010	398	346	52
7	1057	520	376	144
17	3028	2229	1864	365
27	596	148	123	25

	Public Transportation [Includes Taxicab]	Motorcycle	Bicycle	Walked \
0	84	0	5	91
3	188	15	12	33
4	400	0	19	96
5	247	0	0	258
7	291	0	0	164
17	323	0	123	140
27	159	0	0	23

	Other Means	Worked At Home
0	41	66
3	14	95
4	0	142
5	0	107
7	0	82
17	134	79
27	11	255

Next I create a separate dataframe for all census tracts with less than 500 White people corresponding to their FIPS code.

```
[119]: dataset_white_alone = dataset3[dataset3['White Alone']<=500]
```

```
[120]: dataset_white_alone[['FIPS','White Alone']]
```



```
[120]:
```

	FIPS	White Alone
0	06001402600	197
3	06001402802	284
4	06001402900	426
5	06001403000	239
7	06001403301	353
17	06001408800	404
27	06001983200	455

Next we move to map making. First I query my data.

```
[54]: import geopandas as gpd
```

```
[55]: tracts=gpd.read_file('Census_Tract_Boundaries.geojson')
tracts.head()
```

ERROR 1: PROJ: proj_create_from_database: Open of /opt/conda/share/proj failed

```
[55]:
```

	OBJECTID	DIST_NAME	DISTRICT_ID	SHAPE_Length	SHAPE_Area	\
0	1	CENSUS TRACT #4001	184	0.142571	0.000712	
1	2	CENSUS TRACT #4002	185	0.043622	0.000065	
2	3	CENSUS TRACT #4003	186	0.052941	0.000106	
3	4	CENSUS TRACT #4004	187	0.037446	0.000074	
4	5	CENSUS TRACT #4005	188	0.033270	0.000061	


```

                                geometry
0  MULTIPOLYGON (((-122.24466 37.88364, -122.2425...
1  MULTIPOLYGON (((-122.24478 37.85173, -122.2447...
2  MULTIPOLYGON (((-122.24939 37.83924, -122.2501...
3  MULTIPOLYGON (((-122.25313 37.85154, -122.2530...
4  MULTIPOLYGON (((-122.26017 37.85262, -122.2602...

```

I isolate only the census tracts where the route 19 runs.

```
[56]: tracts = tracts.loc[(tracts['DIST_NAME'] == 'CENSUS TRACT #4026') |
↪(tracts['DIST_NAME'] == 'CENSUS TRACT #4027') |
      (tracts['DIST_NAME'] == 'CENSUS TRACT #4028.
↪01')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4028.02')|
      (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4029')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4030')|
      (tracts['DIST_NAME'] == 'CENSUS TRACT #4031')|
↪(tracts['DIST_NAME'] == 'CENSUS TRACT #4033.01') |
      (tracts['DIST_NAME'] == 'CENSUS TRACT #4033.02')|
↪(tracts['DIST_NAME'] == 'CENSUS TRACT #4034.01')|
      (tracts['DIST_NAME'] == 'CENSUS TRACT #4034.
↪02')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4060')|
```

```

        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4061')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4062.02')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4072')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4073')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4074')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4088')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4271')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4272')
        |(tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4273')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4276')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4278')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4279')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4280')|(tracts['DIST_NAME'] == 'CENSUS TRACT #4281')|
        (tracts['DIST_NAME'] == 'CENSUS TRACT_
↪#4287')|(tracts['DIST_NAME'] == 'CENSUS TRACT #9832')]
tracts

```

```

[56]:
      OBJECTID      DIST_NAME  DISTRICT_ID  SHAPE_Length  SHAPE_Area  \
21          22  CENSUS TRACT #4026          209      0.023062    0.000032
22          23  CENSUS TRACT #4027          210      0.024864    0.000039
23          24  CENSUS TRACT #4029          212      0.029851    0.000041
24          25  CENSUS TRACT #4030          213      0.024316    0.000035
25          26  CENSUS TRACT #4031          214      0.024119    0.000036
44          45  CENSUS TRACT #4060          243      0.100612    0.000266
45          46  CENSUS TRACT #4061          244      0.067388    0.000196
54          55  CENSUS TRACT #4072          255      0.037570    0.000073
55          56  CENSUS TRACT #4073          256      0.084682    0.000261
56          57  CENSUS TRACT #4074          257      0.034683    0.000053
70          71  CENSUS TRACT #4088          271      0.050142    0.000120
121         122  CENSUS TRACT #4271          327      0.050782    0.000119
122         123  CENSUS TRACT #4272          328      0.081200    0.000207
123         124  CENSUS TRACT #4273          329      0.073741    0.000273
124         125  CENSUS TRACT #4276          332      0.037284    0.000058
126         127  CENSUS TRACT #4278          334      0.044543    0.000086
127         128  CENSUS TRACT #4279          335      0.036980    0.000085
128         129  CENSUS TRACT #4280          336      0.032117    0.000053
129         130  CENSUS TRACT #4281          337      0.056751    0.000109
243         244  CENSUS TRACT #4062.02          551      0.026645    0.000040
337         338  CENSUS TRACT #9832           763      0.036880    0.000068
340         341  CENSUS TRACT #4287           767      0.180773    0.000967
342         343  CENSUS TRACT #4028.01          813      0.024772    0.000029
343         344  CENSUS TRACT #4028.02          814      0.016330    0.000013
344         345  CENSUS TRACT #4033.01          815      0.018463    0.000020
345         346  CENSUS TRACT #4033.02          816      0.041871    0.000087
346         347  CENSUS TRACT #4034.01          817      0.054530    0.000118

```

347	348 CENSUS TRACT #4034.02	818	0.017165	0.000010
-----	---------------------------	-----	----------	----------

```

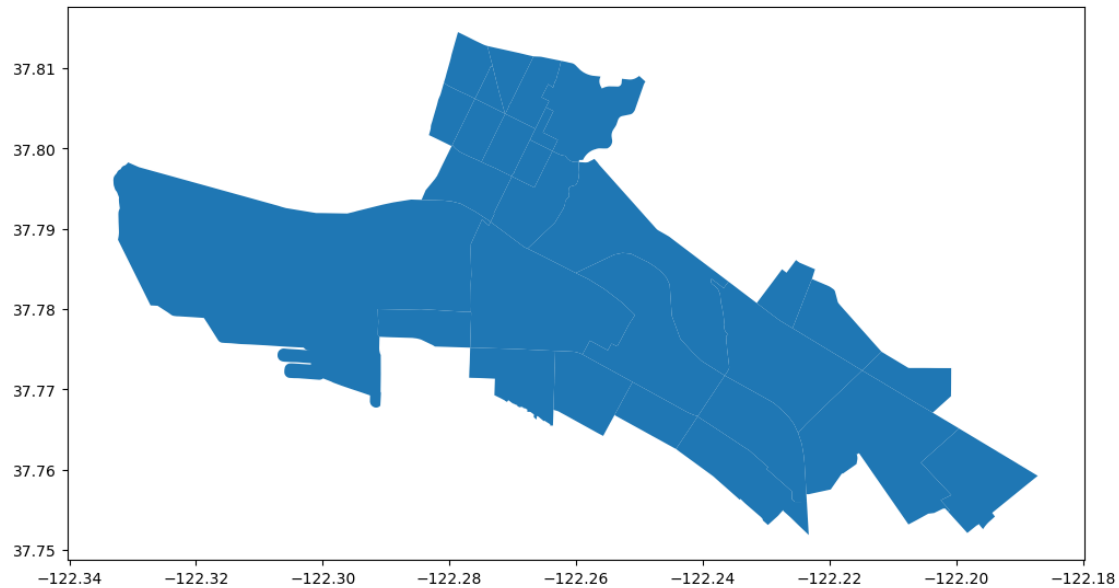
                                geometry
21  MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22  MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23  MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24  MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25  MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44  MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45  MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54  MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55  MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56  MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70  MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

I plot the census tracts where the 19 runs.

```
[57]: tracts.plot(figsize=(12,10))
```

```
[57]: <AxesSubplot: >
```



I query my dataframe for its components.

```
[58]: tracts.info(verbose=True, show_counts=True)
```

```
<class 'geopandas.geodataframe.GeoDataFrame'>
Int64Index: 28 entries, 21 to 347
Data columns (total 6 columns):
#   Column          Non-Null Count  Dtype
---  -
0   OBJECTID        28 non-null    int64
1   DIST_NAME       28 non-null    object
2   DISTRICT_ID     28 non-null    int64
3   SHAPE_Length    28 non-null    float64
4   SHAPE_Area      28 non-null    float64
5   geometry        28 non-null    geometry
dtypes: float64(2), geometry(1), int64(2), object(1)
memory usage: 1.5+ KB
```

I keep only the two columns that I need, namely census tract and geometry.

```
[59]: tracts = tracts[['DIST_NAME', 'geometry']]
tracts.head()
```

```
[59]:
```

	DIST_NAME	geometry
21	CENSUS TRACT #4026	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	CENSUS TRACT #4027	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	CENSUS TRACT #4029	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	CENSUS TRACT #4030	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...

```
25 CENSUS TRACT #4031 MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
```

Unfortunately, this dataframe does not contain FIPS codes, so I replace each Census Tract with a FIPS code 28 times (yawn!).

```
[60]: tracts1=tracts.replace({'DIST_NAME':{'CENSUS TRACT #4026': '402600'}})
      tracts1
```

```
[60]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	CENSUS TRACT #4027	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	CENSUS TRACT #4029	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	CENSUS TRACT #4030	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	CENSUS TRACT #4031	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	CENSUS TRACT #4060	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	CENSUS TRACT #4061	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	CENSUS TRACT #4072	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	CENSUS TRACT #4073	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	CENSUS TRACT #4074	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	CENSUS TRACT #4088	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	CENSUS TRACT #4271	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	CENSUS TRACT #4273	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[61]: tracts2=tracts1.replace({'DIST_NAME':{'CENSUS TRACT #4027': '402700'}})
      tracts2
```

```
[61]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	CENSUS TRACT #4029	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	CENSUS TRACT #4030	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	CENSUS TRACT #4031	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...

```

44 CENSUS TRACT #4060 MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45 CENSUS TRACT #4061 MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54 CENSUS TRACT #4072 MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55 CENSUS TRACT #4073 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56 CENSUS TRACT #4074 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70 CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```

[62]: tracts3=tracts2.replace({'DIST_NAME':{'CENSUS TRACT #4029': '402900'}})
      tracts3

```

```

[62]:          DIST_NAME          geometry
21          402600 MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22          402700 MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23          402900 MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24 CENSUS TRACT #4030 MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25 CENSUS TRACT #4031 MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44 CENSUS TRACT #4060 MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45 CENSUS TRACT #4061 MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54 CENSUS TRACT #4072 MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55 CENSUS TRACT #4073 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56 CENSUS TRACT #4074 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70 CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...

```

```

243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[63]: tracts4=tracts3.replace({'DIST_NAME':{'CENSUS TRACT #4030': '403000'}})
tracts4
```

```

[63]:          DIST_NAME          geometry
21          402600 MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22          402700 MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23          402900 MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24          403000 MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25 CENSUS TRACT #4031 MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44 CENSUS TRACT #4060 MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45 CENSUS TRACT #4061 MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54 CENSUS TRACT #4072 MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55 CENSUS TRACT #4073 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56 CENSUS TRACT #4074 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70 CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[64]: tracts5=tracts4.replace({'DIST_NAME':{'CENSUS TRACT #4031': '403100'}})
tracts5
```



```
[64]:
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON	(((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON	(((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON	(((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON	(((-122.27487 37.79843, -122.2749...
44	CENSUS TRACT #4060	MULTIPOLYGON	(((-122.25670 37.79833, -122.2566...
45	CENSUS TRACT #4061	MULTIPOLYGON	(((-122.23701 37.78279, -122.2367...
54	CENSUS TRACT #4072	MULTIPOLYGON	(((-122.21391 37.77306, -122.2148...
55	CENSUS TRACT #4073	MULTIPOLYGON	(((-122.20317 37.76255, -122.2041...
56	CENSUS TRACT #4074	MULTIPOLYGON	(((-122.20338 37.76731, -122.2037...
70	CENSUS TRACT #4088	MULTIPOLYGON	(((-122.19512 37.75323, -122.1951...
121	CENSUS TRACT #4271	MULTIPOLYGON	(((-122.22365 37.75693, -122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON	(((-122.24483 37.77906, -122.2435...
123	CENSUS TRACT #4273	MULTIPOLYGON	(((-122.27486 37.79114, -122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON	(((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON	(((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON	(((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON	(((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON	(((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON	(((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((-122.26333 37.80033, -122.2637...

```
[65]: tracts6=tracts5.replace({'DIST_NAME':{'CENSUS TRACT #4060': '406000'}})
tracts6
```

```
[65]:
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON	(((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON	(((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON	(((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON	(((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON	(((-122.25670 37.79833, -122.2566...
45	CENSUS TRACT #4061	MULTIPOLYGON	(((-122.23701 37.78279, -122.2367...
54	CENSUS TRACT #4072	MULTIPOLYGON	(((-122.21391 37.77306, -122.2148...
55	CENSUS TRACT #4073	MULTIPOLYGON	(((-122.20317 37.76255, -122.2041...
56	CENSUS TRACT #4074	MULTIPOLYGON	(((-122.20338 37.76731, -122.2037...
70	CENSUS TRACT #4088	MULTIPOLYGON	(((-122.19512 37.75323, -122.1951...
121	CENSUS TRACT #4271	MULTIPOLYGON	(((-122.22365 37.75693, -122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON	(((-122.24483 37.77906, -122.2435...


```

123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```

[66]: tracts7=tracts6.replace({'DIST_NAME':{'CENSUS TRACT #4061': '406100'}})
      tracts7

```

```

[66]:          DIST_NAME          geometry
21          402600 MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22          402700 MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23          402900 MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24          403000 MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25          403100 MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44          406000 MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45          406100 MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54 CENSUS TRACT #4072 MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55 CENSUS TRACT #4073 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56 CENSUS TRACT #4074 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70 CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...

```

```
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...
```

```
[67]: tracts8=tracts7.replace({'DIST_NAME':{'CENSUS TRACT #4072': '407200'}})
tracts8
```

```
[67]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	CENSUS TRACT #4073	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	CENSUS TRACT #4074	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	CENSUS TRACT #4088	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	CENSUS TRACT #4271	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	CENSUS TRACT #4273	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[68]: tracts9=tracts8.replace({'DIST_NAME':{'CENSUS TRACT #4073': '407300'}})
tracts9
```

```
[68]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...

```

55          407300 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56  CENSUS TRACT #4074 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70  CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[69]: tracts10=tracts9.replace({'DIST_NAME':{'CENSUS TRACT #4074': '407400'}})
      tracts10
```

```

[69]:          DIST_NAME          geometry
21          402600 MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22          402700 MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23          402900 MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24          403000 MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25          403100 MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44          406000 MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45          406100 MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54          407200 MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55          407300 MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56          407400 MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70  CENSUS TRACT #4088 MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121 CENSUS TRACT #4271 MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122 CENSUS TRACT #4272 MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123 CENSUS TRACT #4273 MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124 CENSUS TRACT #4276 MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126 CENSUS TRACT #4278 MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127 CENSUS TRACT #4279 MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128 CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129 CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243 CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337 CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340 CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...

```

```

342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[70]: tracts11=tracts10.replace({'DIST_NAME':{'CENSUS TRACT #4088': '408800'}})
      tracts11
```

```
[70]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	CENSUS TRACT #4271	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	CENSUS TRACT #4273	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[71]: tracts12=tracts11.replace({'DIST_NAME':{'CENSUS TRACT #4271': '427100'}})
      tracts12
```

```
[71]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...

24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	CENSUS TRACT #4272	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	CENSUS TRACT #4273	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[72]: tracts13=tracts12.replace({'DIST_NAME':{'CENSUS TRACT #4272': '427200'}})
      tracts13
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON
22	402700	MULTIPOLYGON
23	402900	MULTIPOLYGON
24	403000	MULTIPOLYGON
25	403100	MULTIPOLYGON
44	406000	MULTIPOLYGON
45	406100	MULTIPOLYGON
54	407200	MULTIPOLYGON
55	407300	MULTIPOLYGON
56	407400	MULTIPOLYGON
70	408800	MULTIPOLYGON
121	427100	MULTIPOLYGON
122	427200	MULTIPOLYGON
123	CENSUS TRACT #4273	MULTIPOLYGON
124	CENSUS TRACT #4276	MULTIPOLYGON
126	CENSUS TRACT #4278	MULTIPOLYGON
127	CENSUS TRACT #4279	MULTIPOLYGON


```

128     CENSUS TRACT #4280 MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129     CENSUS TRACT #4281 MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243  CENSUS TRACT #4062.02 MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337     CENSUS TRACT #9832 MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340     CENSUS TRACT #4287 MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342  CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343  CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344  CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345  CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346  CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347  CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[73]: tracts14=tracts13.replace({'DIST_NAME':{'CENSUS TRACT #4273': '427300'}})
      tracts14
```

```
[73]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	CENSUS TRACT #4276	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[74]: tracts15=tracts14.replace({'DIST_NAME':{'CENSUS TRACT #4276': '427600'}})
      tracts15
```

```
[74]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	CENSUS TRACT #4278	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[75]: tracts16=tracts15.replace({'DIST_NAME':{'CENSUS TRACT #4278': '427800'}})
tracts16
```

```
[75]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...

123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	CENSUS TRACT #4279	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[76]: tracts17=tracts16.replace({'DIST_NAME':{'CENSUS TRACT #4279': '427900'}})
tracts17
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((−122.27957 37.80041, −122.2796...
22	402700	MULTIPOLYGON	(((−122.27329 37.81061, −122.2731...
23	402900	MULTIPOLYGON	(((−122.26343 37.80810, −122.2634...
24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	427200	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	CENSUS TRACT #4280	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...


```
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...
```

```
[77]: tracts18=tracts17.replace({'DIST_NAME':{'CENSUS TRACT #4280': '428000'}})
tracts18
```

```
[77]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	CENSUS TRACT #4281	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[78]: tracts19=tracts18.replace({'DIST_NAME':{'CENSUS TRACT #4281': '428100'}})
tracts19
```

```
[78]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...

55	407300	MULTIPOLYGON	(((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON	(((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON	(((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON	(((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON	(((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON	(((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON	(((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON	(((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON	(((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON	(((-122.24353 37.76338, -122.2442...
129	428100	MULTIPOLYGON	(((-122.22591 37.75665, -122.2259...
243	CENSUS TRACT #4062.02	MULTIPOLYGON	(((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((-122.26333 37.80033, -122.2637...

```
[79]: tracts20=tracts19.replace({'DIST_NAME':{'CENSUS TRACT #4062.02': '406202'}})
      tracts20
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON	(((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON	(((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON	(((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON	(((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON	(((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON	(((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON	(((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON	(((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON	(((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON	(((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON	(((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON	(((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON	(((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON	(((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON	(((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON	(((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON	(((-122.24353 37.76338, -122.2442...
129	428100	MULTIPOLYGON	(((-122.22591 37.75665, -122.2259...
243	406202	MULTIPOLYGON	(((-122.22228 37.78495, -122.2227...
337	CENSUS TRACT #9832	MULTIPOLYGON	(((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((-122.30015 37.79195, -122.2961...

```

342 CENSUS TRACT #4028.01 MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343 CENSUS TRACT #4028.02 MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344 CENSUS TRACT #4033.01 MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345 CENSUS TRACT #4033.02 MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346 CENSUS TRACT #4034.01 MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```

```
[80]: tracts21=tracts20.replace({'DIST_NAME':{'CENSUS TRACT #9832': '983200'}})
      tracts21
```

```
[80]:
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON	(((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON	(((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON	(((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON	(((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON	(((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON	(((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON	(((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON	(((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON	(((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON	(((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON	(((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON	(((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON	(((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON	(((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON	(((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON	(((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON	(((-122.24353 37.76338, -122.2442...
129	428100	MULTIPOLYGON	(((-122.22591 37.75665, -122.2259...
243	406202	MULTIPOLYGON	(((-122.22228 37.78495, -122.2227...
337	983200	MULTIPOLYGON	(((-122.27131 37.79698, -122.2702...
340	CENSUS TRACT #4287	MULTIPOLYGON	(((-122.30015 37.79195, -122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((-122.27065 37.80514, -122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((-122.27125 37.80442, -122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((-122.26333 37.80033, -122.2637...

```
[81]: tracts22=tracts21.replace({'DIST_NAME':{'CENSUS TRACT #4287': '428700'}})
      tracts22
```

```
[81]:
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON	(((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON	(((-122.26343 37.80810, -122.2634...

24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	427200	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	428000	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	428100	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	406202	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	983200	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	428700	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	CENSUS TRACT #4028.01	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[82]: tracts23=tracts22.replace({'DIST_NAME':{'CENSUS TRACT #4028.01': '402801'}})
tracts23
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((−122.27957 37.80041, −122.2796...
22	402700	MULTIPOLYGON	(((−122.27329 37.81061, −122.2731...
23	402900	MULTIPOLYGON	(((−122.26343 37.80810, −122.2634...
24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	427200	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...

128	428000	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	428100	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	406202	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	983200	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	428700	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	402801	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	CENSUS TRACT #4028.02	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[83]: tracts24=tracts23.replace({'DIST_NAME':{'CENSUS TRACT #4028.02': '402802'}})
tracts24
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((−122.27957 37.80041, −122.2796...
22	402700	MULTIPOLYGON	(((−122.27329 37.81061, −122.2731...
23	402900	MULTIPOLYGON	(((−122.26343 37.80810, −122.2634...
24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	427200	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	428000	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	428100	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	406202	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	983200	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	428700	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	402801	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	402802	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	CENSUS TRACT #4033.01	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[84]: tracts25=tracts24.replace({'DIST_NAME':{'CENSUS TRACT #4033.01': '403301'}})
tracts25
```

```
[84]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	428100	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	406202	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	983200	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	428700	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	402801	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	402802	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	403301	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	CENSUS TRACT #4033.02	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

```
[85]: tracts26=tracts25.replace({'DIST_NAME':{'CENSUS TRACT #4033.02': '403302'}})
tracts26
```

```
[85]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...

123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	428000	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	428100	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	406202	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	983200	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	428700	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	402801	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	402802	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	403301	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	403302	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	CENSUS TRACT #4034.01	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...
347	CENSUS TRACT #4034.02	MULTIPOLYGON	(((−122.26333 37.80033, −122.2637...

```
[86]: tracts27=tracts26.replace({'DIST_NAME':{'CENSUS TRACT #4034.01': '403401'}})
tracts27
```

	DIST_NAME		geometry
21	402600	MULTIPOLYGON	(((−122.27957 37.80041, −122.2796...
22	402700	MULTIPOLYGON	(((−122.27329 37.81061, −122.2731...
23	402900	MULTIPOLYGON	(((−122.26343 37.80810, −122.2634...
24	403000	MULTIPOLYGON	(((−122.27009 37.79669, −122.2701...
25	403100	MULTIPOLYGON	(((−122.27487 37.79843, −122.2749...
44	406000	MULTIPOLYGON	(((−122.25670 37.79833, −122.2566...
45	406100	MULTIPOLYGON	(((−122.23701 37.78279, −122.2367...
54	407200	MULTIPOLYGON	(((−122.21391 37.77306, −122.2148...
55	407300	MULTIPOLYGON	(((−122.20317 37.76255, −122.2041...
56	407400	MULTIPOLYGON	(((−122.20338 37.76731, −122.2037...
70	408800	MULTIPOLYGON	(((−122.19512 37.75323, −122.1951...
121	427100	MULTIPOLYGON	(((−122.22365 37.75693, −122.2235...
122	427200	MULTIPOLYGON	(((−122.24483 37.77906, −122.2435...
123	427300	MULTIPOLYGON	(((−122.27486 37.79114, −122.2737...
124	427600	MULTIPOLYGON	(((−122.28787 37.77994, −122.2863...
126	427800	MULTIPOLYGON	(((−122.26351 37.76924, −122.2635...
127	427900	MULTIPOLYGON	(((−122.25569 37.76423, −122.2557...
128	428000	MULTIPOLYGON	(((−122.24353 37.76338, −122.2442...
129	428100	MULTIPOLYGON	(((−122.22591 37.75665, −122.2259...
243	406202	MULTIPOLYGON	(((−122.22228 37.78495, −122.2227...
337	983200	MULTIPOLYGON	(((−122.27131 37.79698, −122.2702...
340	428700	MULTIPOLYGON	(((−122.30015 37.79195, −122.2961...
342	402801	MULTIPOLYGON	(((−122.27065 37.80514, −122.2711...
343	402802	MULTIPOLYGON	(((−122.27125 37.80442, −122.2712...
344	403301	MULTIPOLYGON	(((−122.26654 37.79520, −122.2665...
345	403302	MULTIPOLYGON	(((−122.26086 37.79525, −122.2611...
346	403401	MULTIPOLYGON	(((−122.25616 37.80782, −122.2559...

```
347 CENSUS TRACT #4034.02 MULTIPOLYGON (((-122.26333 37.80033, -122.2637...
```

```
[87]: tracts28=tracts27.replace({'DIST_NAME':{'CENSUS TRACT #4034.02': '403402'}})
tracts28
```

```
[87]:
```

	DIST_NAME	geometry
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...
44	406000	MULTIPOLYGON (((-122.25670 37.79833, -122.2566...
45	406100	MULTIPOLYGON (((-122.23701 37.78279, -122.2367...
54	407200	MULTIPOLYGON (((-122.21391 37.77306, -122.2148...
55	407300	MULTIPOLYGON (((-122.20317 37.76255, -122.2041...
56	407400	MULTIPOLYGON (((-122.20338 37.76731, -122.2037...
70	408800	MULTIPOLYGON (((-122.19512 37.75323, -122.1951...
121	427100	MULTIPOLYGON (((-122.22365 37.75693, -122.2235...
122	427200	MULTIPOLYGON (((-122.24483 37.77906, -122.2435...
123	427300	MULTIPOLYGON (((-122.27486 37.79114, -122.2737...
124	427600	MULTIPOLYGON (((-122.28787 37.77994, -122.2863...
126	427800	MULTIPOLYGON (((-122.26351 37.76924, -122.2635...
127	427900	MULTIPOLYGON (((-122.25569 37.76423, -122.2557...
128	428000	MULTIPOLYGON (((-122.24353 37.76338, -122.2442...
129	428100	MULTIPOLYGON (((-122.22591 37.75665, -122.2259...
243	406202	MULTIPOLYGON (((-122.22228 37.78495, -122.2227...
337	983200	MULTIPOLYGON (((-122.27131 37.79698, -122.2702...
340	428700	MULTIPOLYGON (((-122.30015 37.79195, -122.2961...
342	402801	MULTIPOLYGON (((-122.27065 37.80514, -122.2711...
343	402802	MULTIPOLYGON (((-122.27125 37.80442, -122.2712...
344	403301	MULTIPOLYGON (((-122.26654 37.79520, -122.2665...
345	403302	MULTIPOLYGON (((-122.26086 37.79525, -122.2611...
346	403401	MULTIPOLYGON (((-122.25616 37.80782, -122.2559...
347	403402	MULTIPOLYGON (((-122.26333 37.80033, -122.2637...

Next I add a new column called FIPS and add the state and county codes.

```
[88]: tracts28['FIPS'] = '06' + '001' + tracts28['DIST_NAME']
```

```
[89]: tracts28.head()
```

```
[89]:
```

	DIST_NAME	geometry	FIPS
21	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...	06001402600
22	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...	06001402700
23	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...	06001402900
24	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...	06001403000
25	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...	06001403100

I then merge my two datasets together along the common column FIPS

```
[90]: tracts_merge=tracts28.merge(dataset3,on="FIPS")
```

```
[91]: tracts_merge.head()
```

```
[91]:
```

	DIST_NAME	geometry	FIPS \
0	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...	06001402600
1	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...	06001402700
2	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...	06001402900
3	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...	06001403000
4	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...	06001403100

	TotalPop	White Alone	Black or African American Alone \
0	1299	197	437
1	1988	616	717
2	1638	426	291
3	2907	239	43
4	2054	774	416

	American Indian and Alaska Native Alone	Asian Alone \
0	4	454
1	0	313
2	3	742
3	10	2373
4	0	620

	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone \
0	0	38
1	0	252
2	0	100
3	73	37
4	13	116

	Two or More Races	Total Population in Renter Occupied Housing Units \
0	169	1140
1	90	1160
2	76	1509
3	132	1808
4	115	1178

	Workers 16 years and Over	Car, Truck or Van Drove Alone	Carpooled \
0	612	325	52
1	1188	524	128
2	789	132	12
3	1010	398	52
4	1106	325	16

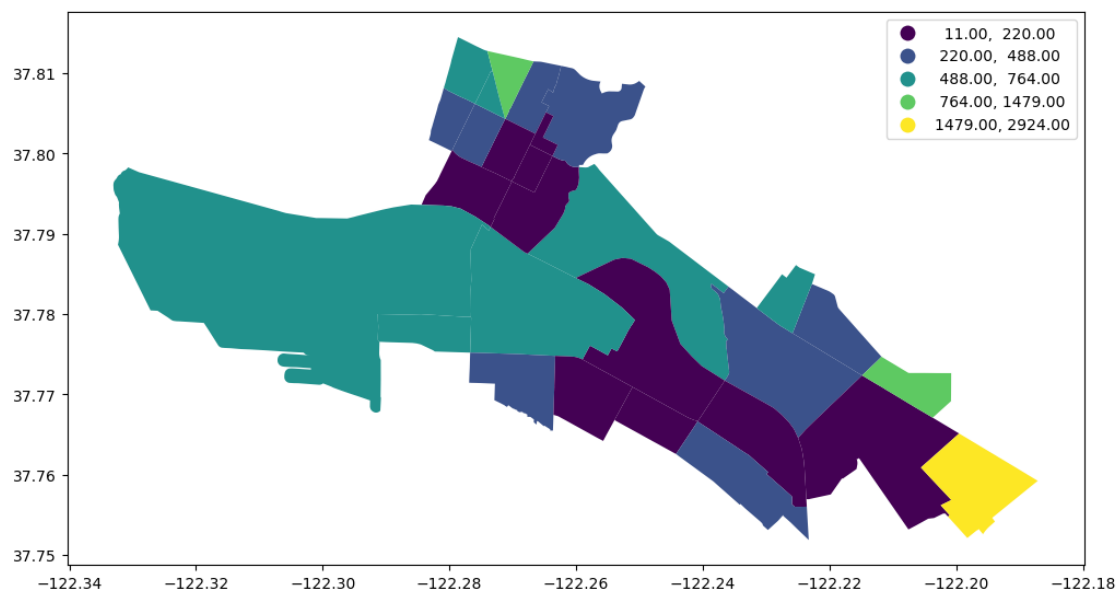
	Public Transportation [Includes Taxicab]	Motorcycle	Bicycle	Walked \
0	84	0	5	91
1	375	0	49	86
2	400	0	19	96
3	247	0	0	258
4	509	0	0	55

	Other Means	Worked At Home
0	41	66
1	6	148
2	0	142
3	0	107
4	10	207

Then I map out the Black population.

```
[92]: tracts_merge.plot(figsize=(12,10),
                        column='Black or African American Alone',
                        legend=True,
                        scheme='NaturalBreaks')
```

[92]: <AxesSubplot: >

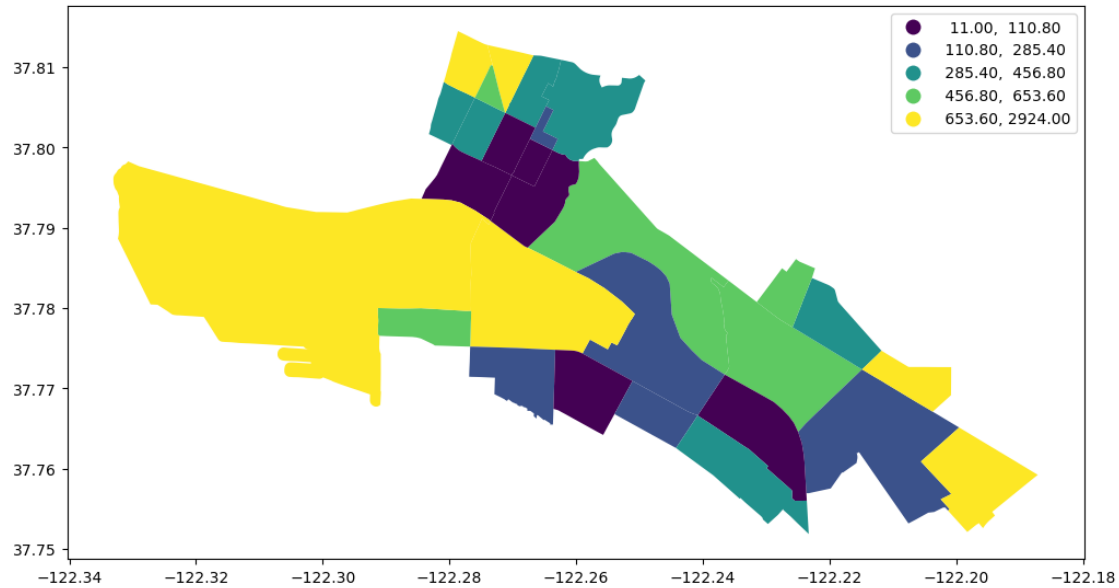


I do the same but this time using quantiles to gain a more proportional understanding of the population.

```
[93]: tracts_merge.plot(figsize=(12,10),
                        column='Black or African American Alone',
```

```
legend=True,  
scheme='quantiles')
```

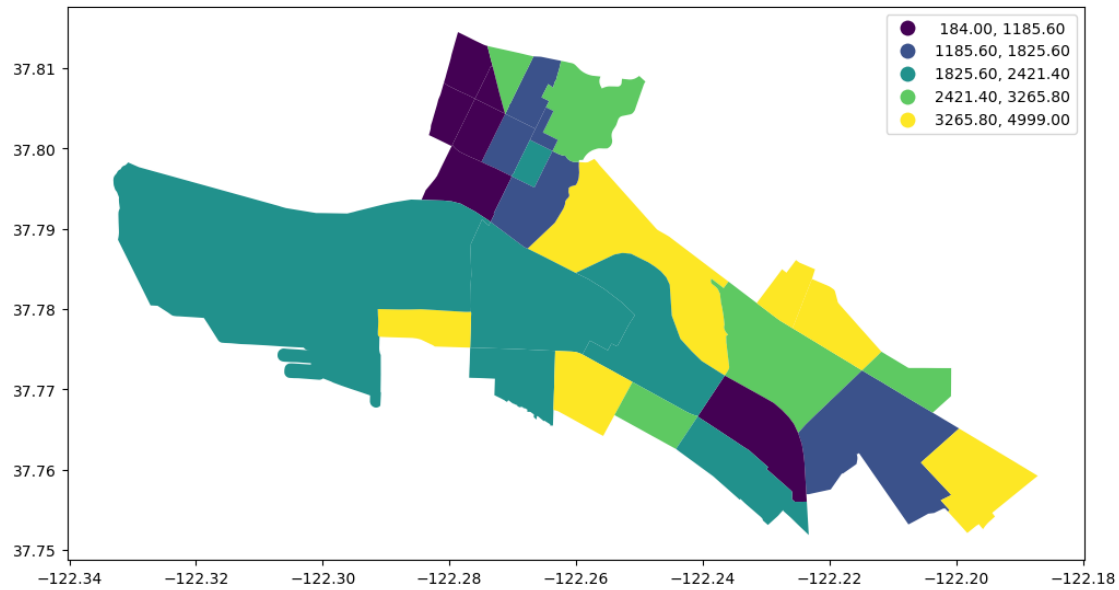
[93]: <AxesSubplot: >



I do the same for the renter population.

```
[94]: tracts_merge.plot(figsize=(12,10),  
        column='Total Population in Renter Occupied Housing Units',  
        legend=True,  
        scheme='quantiles')
```

[94]: <AxesSubplot: >



Here I create a new column, namely the percentages of each racial group.

```
[95]: tracts_merge['PCT_Black'] = tracts_merge['Black or African American Alone']/
      ↪tracts_merge['TotalPop']*100
tracts_merge['PCT_White'] = tracts_merge['White Alone']/
      ↪tracts_merge['TotalPop']*100
tracts_merge['PCT_Asian'] = tracts_merge['Asian Alone']/
      ↪tracts_merge['TotalPop']*100

tracts_merge.head()
```

```
[95]:  DIST_NAME      geometry  FIPS \
0    402600  MULTIPOLYGON (((-122.27957 37.80041, -122.2796... 06001402600
1    402700  MULTIPOLYGON (((-122.27329 37.81061, -122.2731... 06001402700
2    402900  MULTIPOLYGON (((-122.26343 37.80810, -122.2634... 06001402900
3    403000  MULTIPOLYGON (((-122.27009 37.79669, -122.2701... 06001403000
4    403100  MULTIPOLYGON (((-122.27487 37.79843, -122.2749... 06001403100

      TotalPop  White Alone  Black or African American Alone \
0         1299         197                437
1         1988         616                717
2         1638         426                291
3         2907         239                 43
4         2054         774                416

      American Indian and Alaska Native Alone  Asian Alone \
0                                         4          454
```

1		0	313
2		3	742
3		10	2373
4		0	620

	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone	\
0	0	38	
1	0	252	
2	0	100	
3	73	37	
4	13	116	

	Two or More Races	Total Population in Renter Occupied Housing Units	\
0	169	1140	
1	90	1160	
2	76	1509	
3	132	1808	
4	115	1178	

	Workers 16 years and Over	Car, Truck or Van Drove Alone	Carpooled	\
0	612	325	273	52
1	1188	524	396	128
2	789	132	120	12
3	1010	398	346	52
4	1106	325	309	16

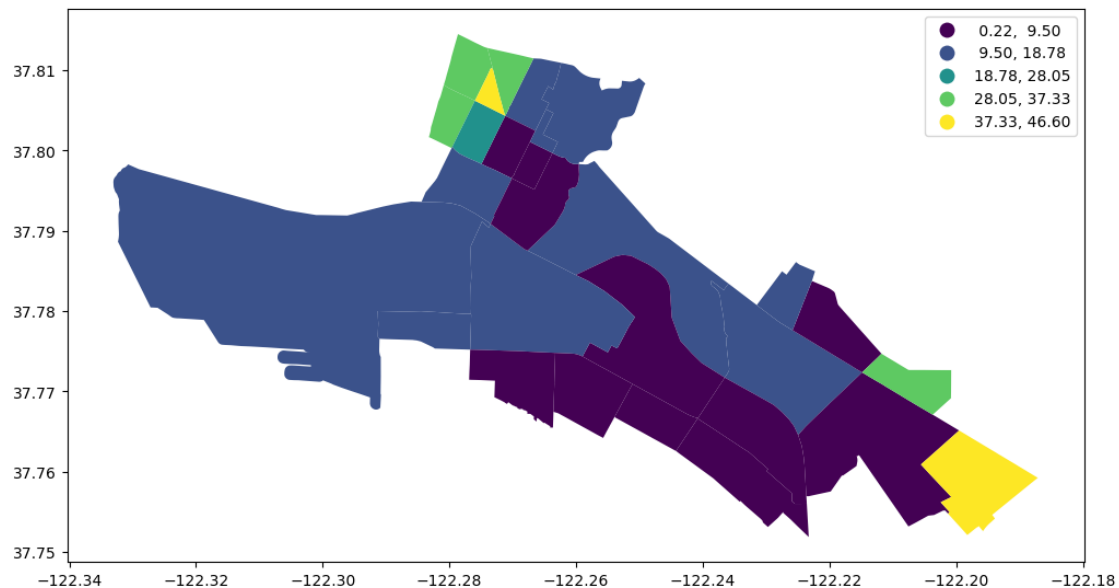
	Public Transportation [Includes Taxicab]	Motorcycle	Bicycle	Walked	\
0	84	0	5	91	
1	375	0	49	86	
2	400	0	19	96	
3	247	0	0	258	
4	509	0	0	55	

	Other Means	Worked At Home	PCT_Black	PCT_White	PCT_Asian
0	41	66	33.641263	15.165512	34.949962
1	6	148	36.066398	30.985915	15.744467
2	0	142	17.765568	26.007326	45.299145
3	0	107	1.479188	8.221534	81.630547
4	10	207	20.253165	37.682571	30.185005

I plot the population percentage of Blacks, Whites and Asians.

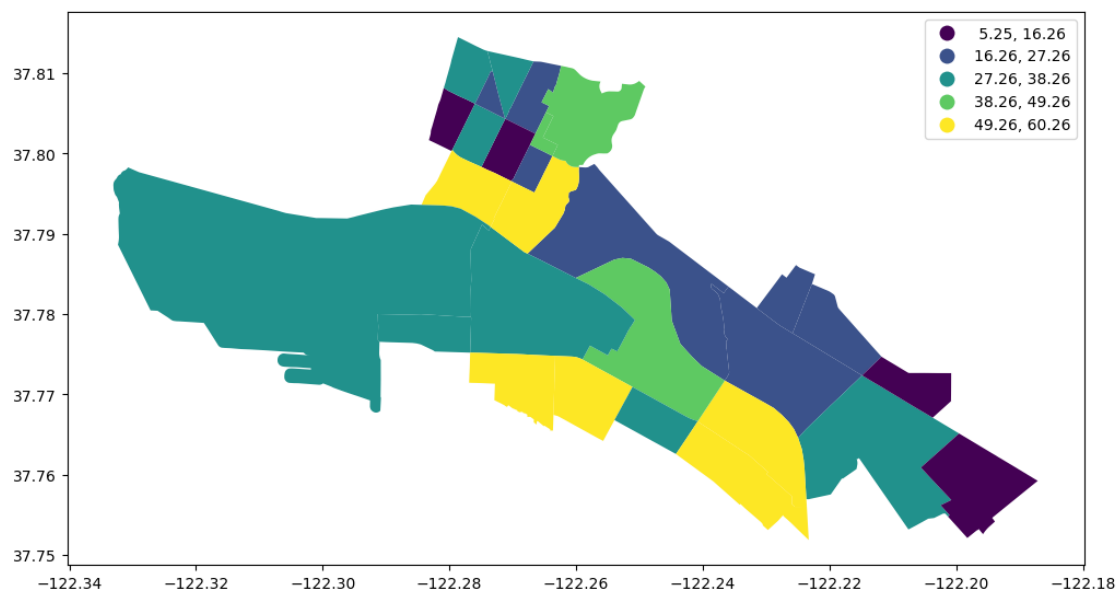
```
[96]: tracts_merge.plot(figsize=(12,10),
        column='PCT_Black',
        legend=True,
        scheme='equal_interval')
```

[96]: <AxesSubplot: >



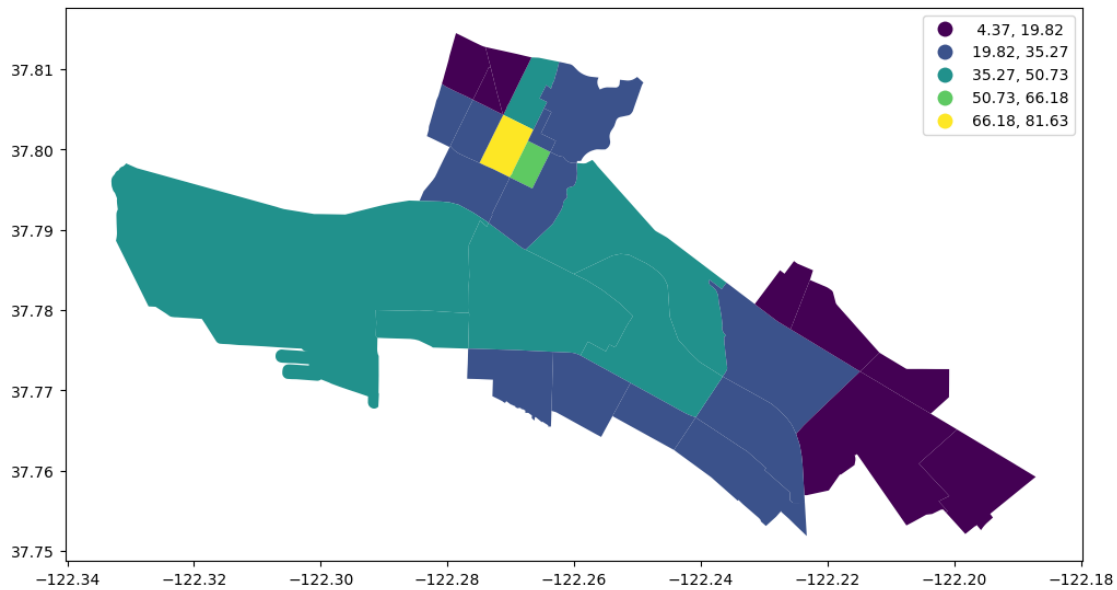
```
[97]: tracts_merge.plot(figsize=(12,10),  
                        column='PCT_White',  
                        legend=True,  
                        scheme='equal_interval')
```

[97]: <AxesSubplot: >



```
[98]: tracts_merge.plot(figsize=(12,10),
        column='PCT_Asian',
        legend=True,
        scheme='equal_interval')
```

[98]: <AxesSubplot: >



Then I create a new column, percentage non-white.

```
[102]: tracts_merge['NonWhite'] = tracts_merge['TotalPop']-tracts_merge['White Alone']
        tracts_merge['PCT_NonWhite'] = tracts_merge['NonWhite']/
        ↪tracts_merge['TotalPop']*100
```

```
[103]: tracts_merge.head()
```

```
[103]:
```

	DIST_NAME	geometry	FIPS \
0	402600	MULTIPOLYGON (((-122.27957 37.80041, -122.2796...	06001402600
1	402700	MULTIPOLYGON (((-122.27329 37.81061, -122.2731...	06001402700
2	402900	MULTIPOLYGON (((-122.26343 37.80810, -122.2634...	06001402900
3	403000	MULTIPOLYGON (((-122.27009 37.79669, -122.2701...	06001403000
4	403100	MULTIPOLYGON (((-122.27487 37.79843, -122.2749...	06001403100

	TotalPop	White Alone	Black or African American Alone \
0	1299	197	437
1	1988	616	717
2	1638	426	291
3	2907	239	43
4	2054	774	416

	American Indian and Alaska Native Alone	Asian Alone \
0	4	454
1	0	313
2	3	742
3	10	2373
4	0	620

	Native Hawaiian or Other Pacific Islander Alone	Some Other Race Alone \
0	0	38
1	0	252
2	0	100
3	73	37
4	13	116

	Two or More Races	Total Population in Renter Occupied Housing Units \
0	169	1140
1	90	1160
2	76	1509
3	132	1808
4	115	1178

	Workers 16 years and Over	Car, Truck or Van	Drove Alone	Carpooled \
0	612	325	273	52
1	1188	524	396	128
2	789	132	120	12
3	1010	398	346	52
4	1106	325	309	16

	Public Transportation [Includes Taxicab]	Motorcycle	Bicycle	Walked \
0	84	0	5	91
1	375	0	49	86
2	400	0	19	96
3	247	0	0	258
4	509	0	0	55

	Other Means	Worked At Home	PCT_Black	PCT_White	PCT_Asian	NonWhite \
0	41	66	33.641263	15.165512	34.949962	1102
1	6	148	36.066398	30.985915	15.744467	1372
2	0	142	17.765568	26.007326	45.299145	1212
3	0	107	1.479188	8.221534	81.630547	2668
4	10	207	20.253165	37.682571	30.185005	1280

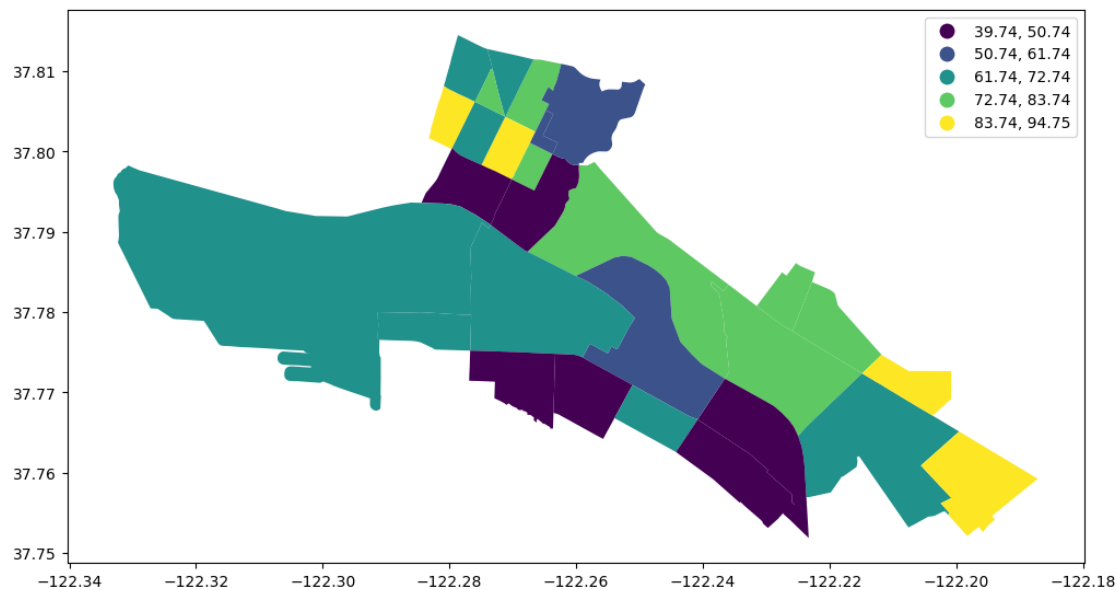
	PCT_NonWhite
0	84.834488
1	69.014085
2	73.992674


```
3      91.778466
4      62.317429
```

I map out non-white percentage.

```
[105]: tracts_merge.plot(figsize=(12,10),
        column='PCT_NonWhite',
        legend=True,
        scheme='equal_interval')
```

```
[105]: <AxesSubplot: >
```



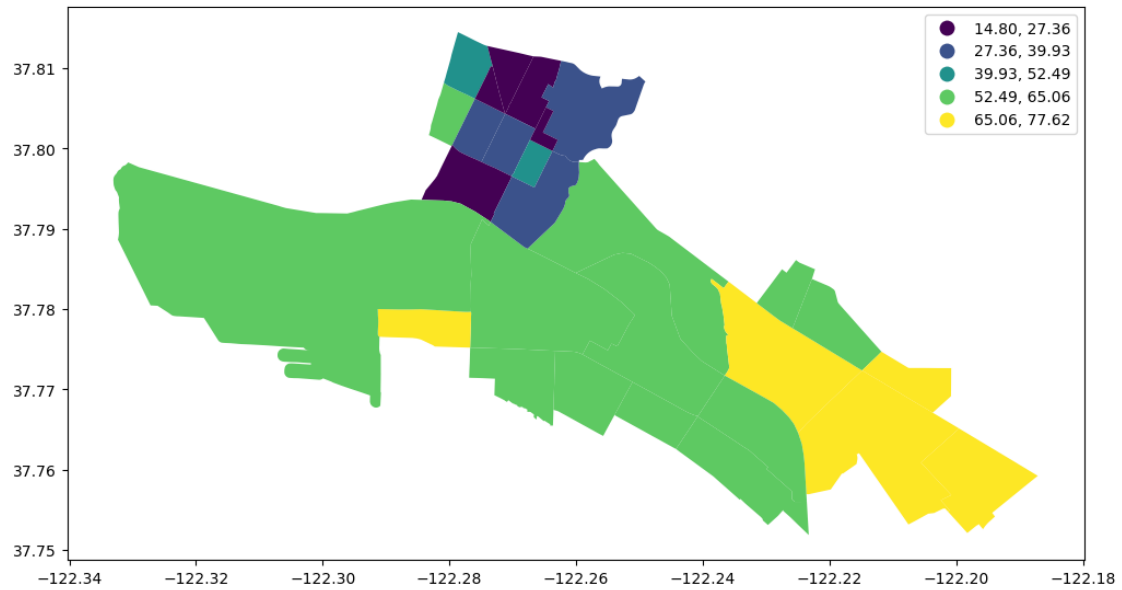
I create new column of percentages of the population that use a car, public transportation and walking to get to work.

```
[106]: tracts_merge['PCT_Car'] = tracts_merge['Car, Truck or Van']/
        ↪tracts_merge['Workers 16 years and Over']*100
tracts_merge['PCT_PublicTransportation'] = tracts_merge['Public Transportation_
        ↪[Includes Taxicab]']/tracts_merge['Workers 16 years and Over']*100
tracts_merge['PCT_Walk'] = tracts_merge['Walked']/tracts_merge['Workers 16_
        ↪years and Over']*100
```

Map out percentages that use a car, take public transportation and walk.

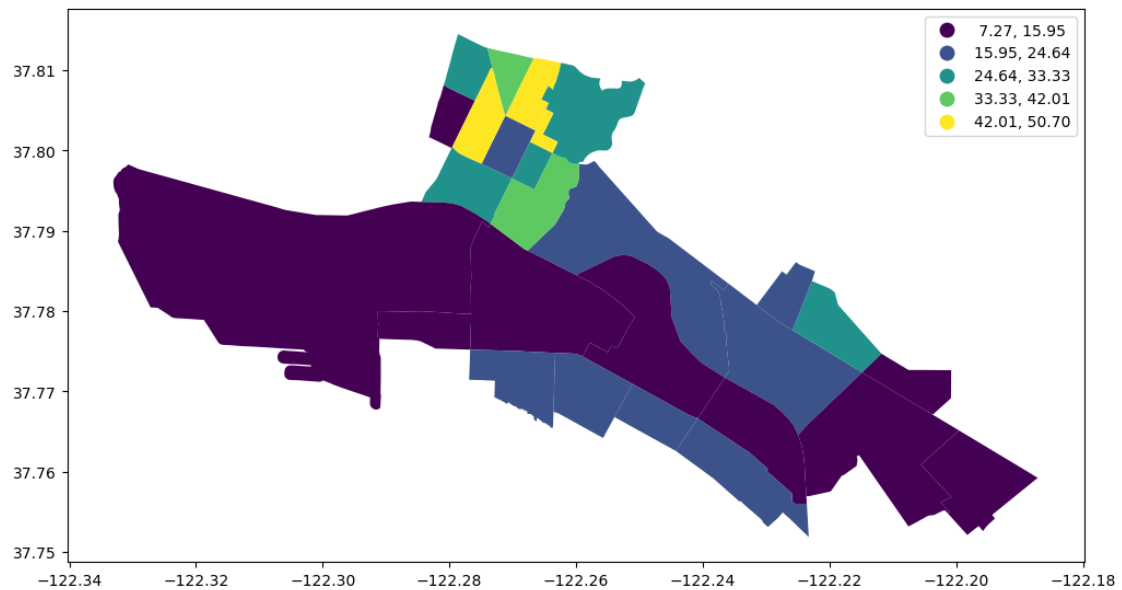
```
[107]: tracts_merge.plot(figsize=(12,10),
        column='PCT_Car',
        legend=True,
        scheme='equal_interval')
```

[107]: <AxesSubplot: >



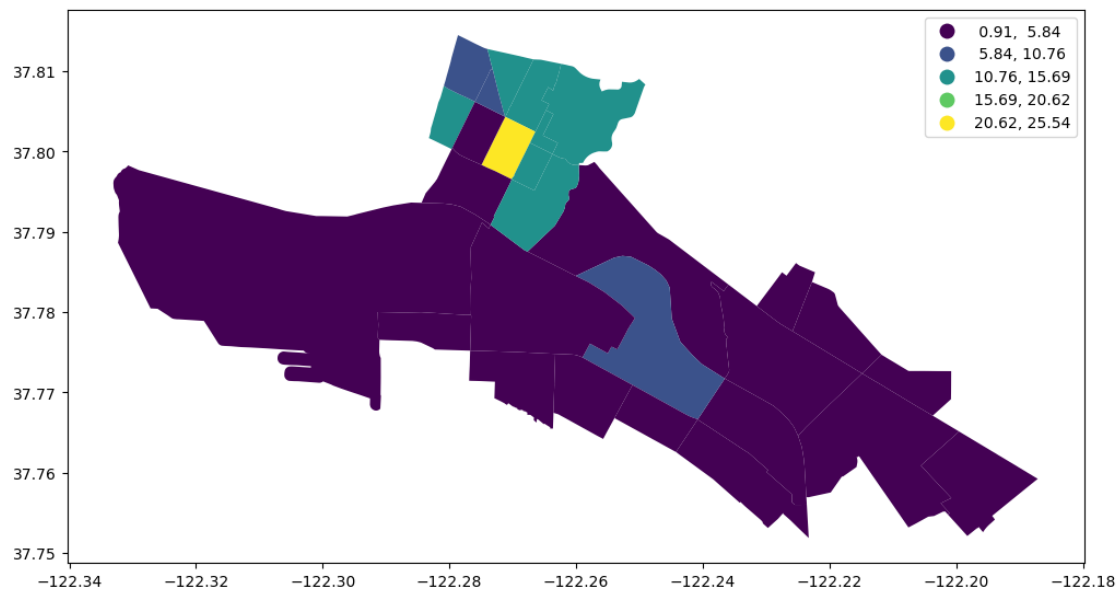
```
[108]: tracts_merge.plot(figsize=(12,10),  
                        column='PCT_PublicTransportation',  
                        legend=True,  
                        scheme='equal_interval')
```

[108]: <AxesSubplot: >



```
[109]: tracts_merge.plot(figsize=(12,10),  
        column='PCT_Walk',  
        legend=True,  
        scheme='equal_interval')
```

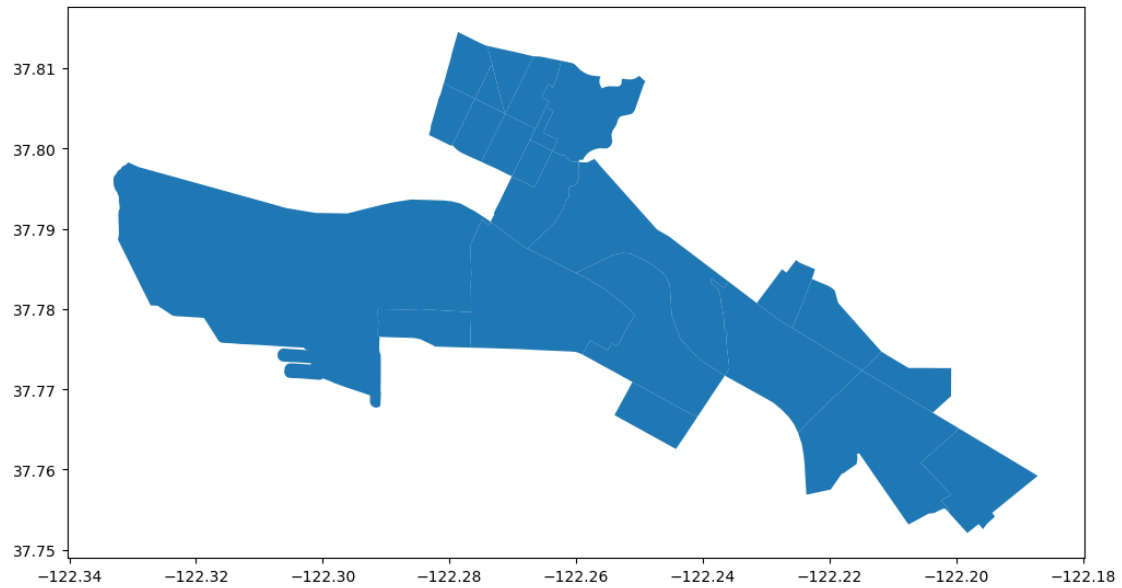
[109]: <AxesSubplot: >



Next I am interested in the census tracts as they correspond to each dimension. First I plot out the census tracts with a non-white population above 50%. Unsurprisingly, it is the vast majority of census tracts.

```
[110]: tracts_merge[tracts_merge.PCT_NonWhite > 50].plot(figsize=(12,10))
```

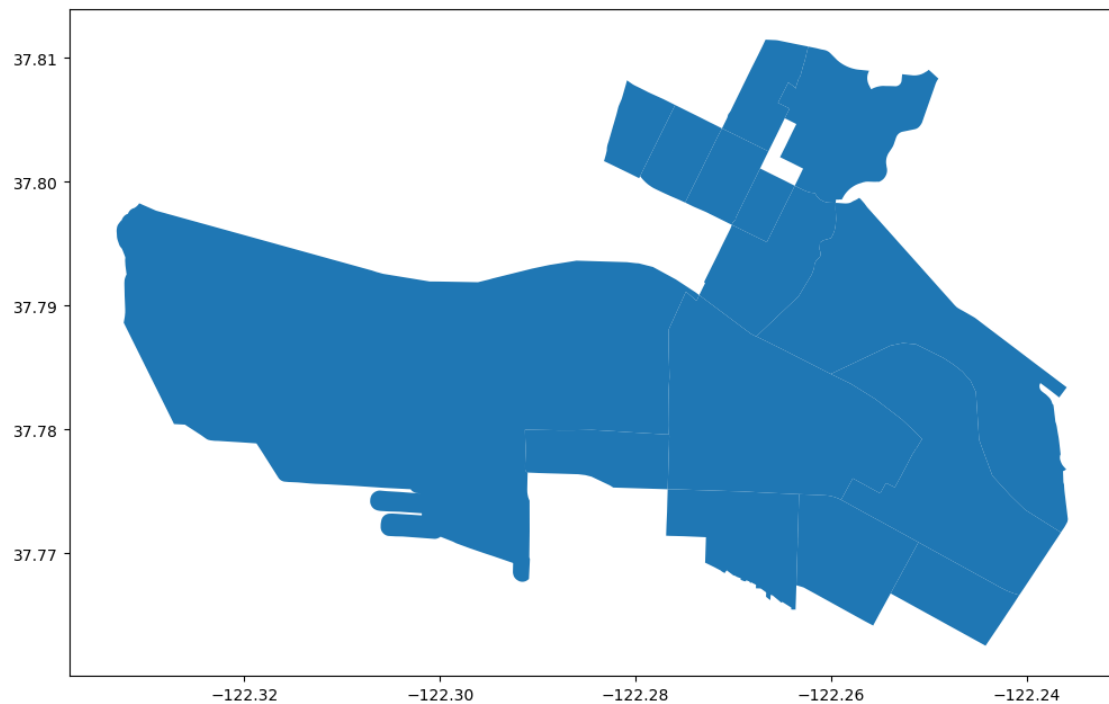
[110]: <AxesSubplot: >



Next I zoom in on census tracts with an Asian population greater than 25%. Tracts in the western half of the route show up.

```
[111]: tracts_merge[tracts_merge.PCT_Asian > 25].plot(figsize=(12,10))
```

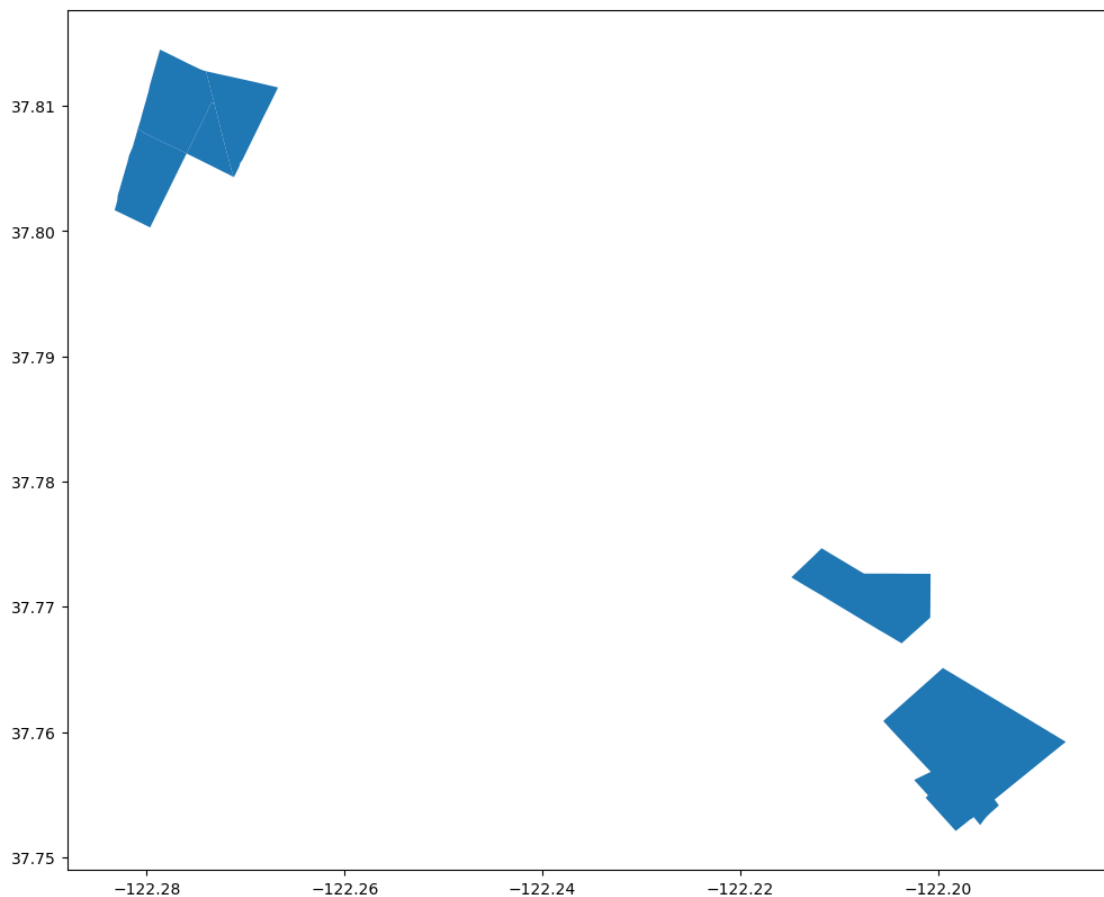
```
[111]: <AxesSubplot: >
```



Next I want to see where the Black population is more than 25%, and find that this is the case in a few census tracts.

```
[121]: tracts_merge[tracts_merge.PCT_Black > 25].plot(figsize=(12,10))
```

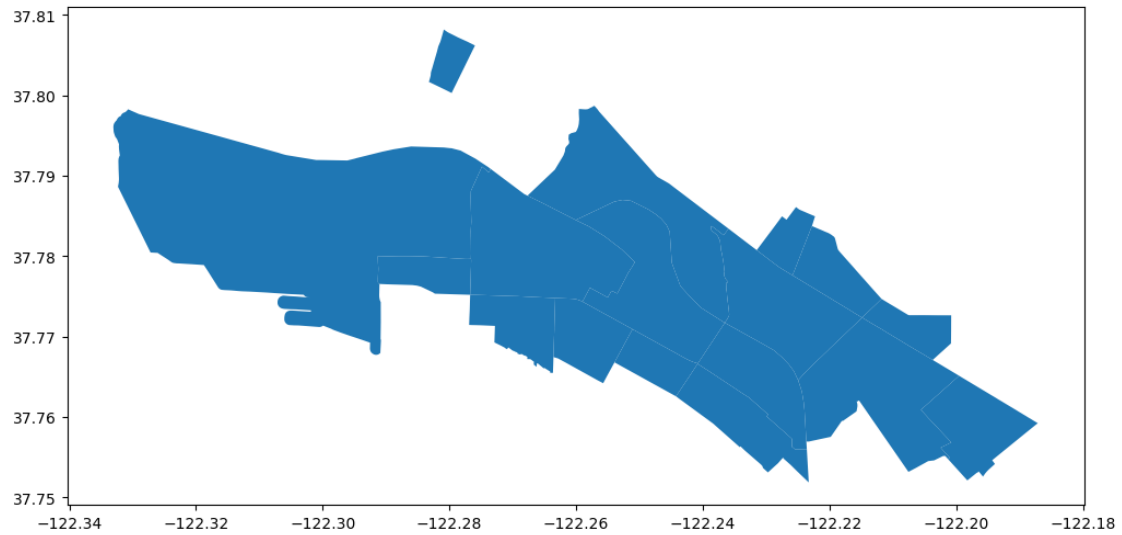
```
[121]: <AxesSubplot: >
```



Next I analyze census tracts where more than 50% use a car to get to work. This is the majority of the southern census tracts.

```
[112]: tracts_merge[tracts_merge.PCT_Car > 50].plot(figsize=(12,10))
```

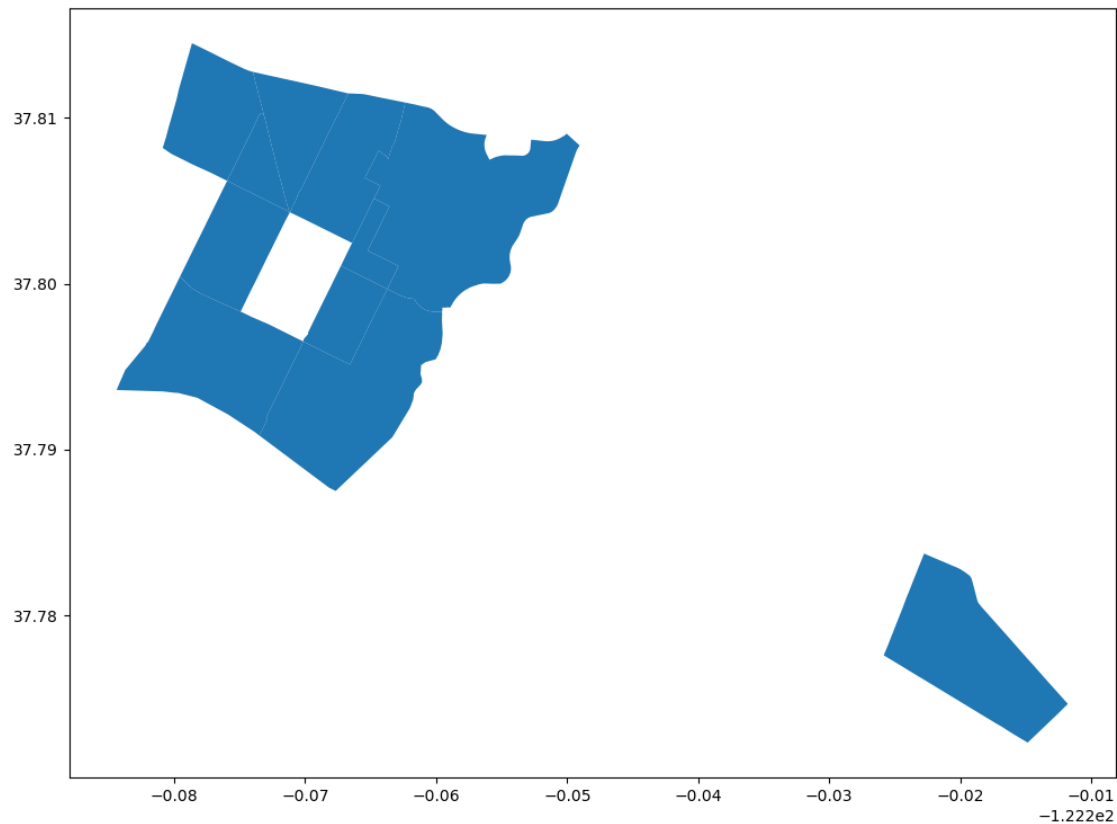
```
[112]: <AxesSubplot: >
```



Then I analyze tracts where more than 25% use public transportation to get to work. This shows up tracts in the northwest corner of the route and one in the southwestern corner.

```
[113]: tracts_merge[tracts_merge.PCT_PublicTransportation > 25].plot(figsize=(12,10))
```

```
[113]: <AxesSubplot: >
```

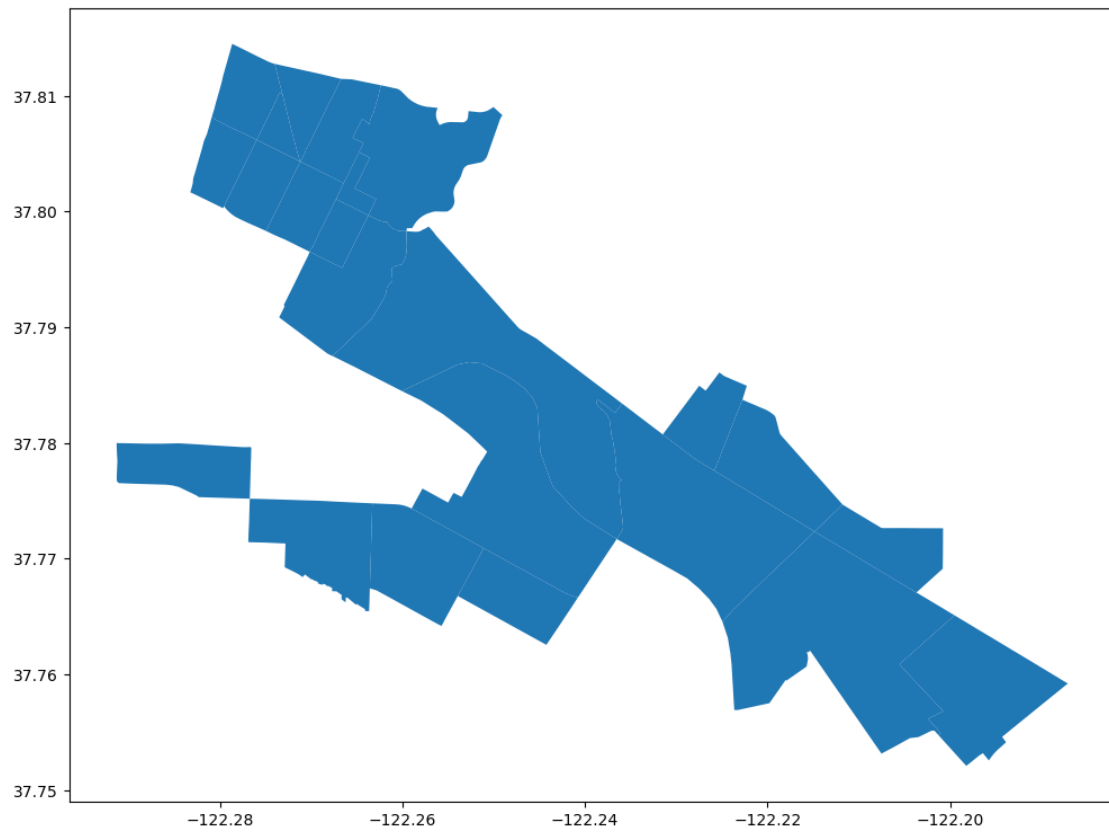


Next I create a new column, percent renters. I plot the census tracts where percent renters is above 50% and this brings up the majority of census tracts. In the next map, I also plot out the percentages for all census tracts.

```
[114]: tracts_merge['PCT_Renters'] = tracts_merge['Total Population in Renter Occupied_
↪Housing Units']/tracts_merge['TotalPop']*100
```

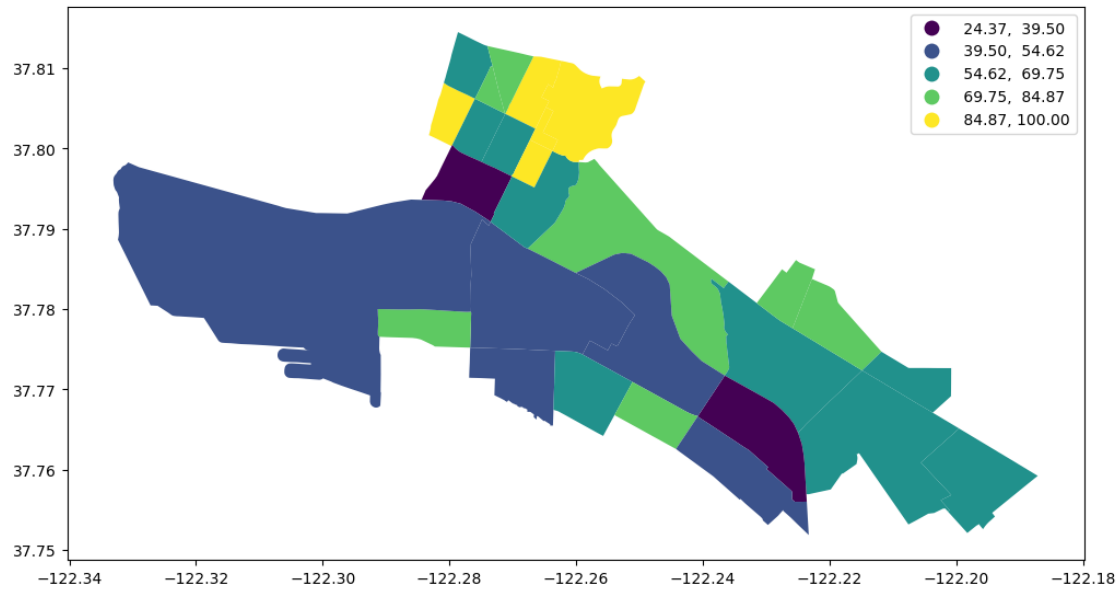
```
[115]: tracts_merge[tracts_merge.PCT_Renters > 50].plot(figsize=(12,10))
```

```
[115]: <AxesSubplot: >
```



```
[116]: tracts_merge.plot(figsize=(12,10),  
                        column='PCT_Renters',  
                        legend=True,  
                        scheme='equal_interval')
```

```
[116]: <AxesSubplot: >
```

Finally, I want to show the non-white population against the total population. I create a Folium map to do so.

```
[117]: import folium
```

```
[118]: m = folium.Map(location=[37.8,-122.2],
                        zoom_start = 9,
                        tiles='CartoDB positron',
                        attribution='CartoDB')

folium.Choropleth(
    geo_data=tracts_merge,
    data=tracts_merge,
    key_on='feature.properties.FIPS',
    columns=['FIPS', 'PCT_NonWhite'],
    fill_color='BuPu',
    line_weight=0.1,
    fill_opacity=0.8,
    line_opacity=0.2,
    legend_name='Population NonWhite along AC Transit 19').
    ↪add_to(m)
```

```
[118]: <folium.features.Choropleth at 0x7f2358d9d120>
```