Milestone 3

Code:

```
# Julia Cuellar
# DSC 540
# Final project

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import urllib.request as urllib2
from bs4 import BeautifulSoup


# Read csv file
def read_csv_file():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    print("Csv data:\n", evcp)


# Drop 1st column from csv file
def csv_drop():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    print("Remove 1st column from csv data:\n", evcp)


# Check, replace, and recheck the nulls from csv file
def csv_cpr_null():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    print("Display csv data with null:\n", evcp.isnull())
    print("Display counts of null from csv data:\n", evcp.isnull().sum())
    evcp = evcp.fillna(" ")
    print("Display csv data with replaced nulls:\n", evcp)
    print("Display recounts of null from csv data:\n", evcp.isnull().sum())


# Rename Model column from csv file
def csv_rename_col():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    evcp = evcp.fillna(" ")
    evcp.rename(columns={'Model': 'Charge'}, inplace=True)
    print("Rename Model column from csv data:\n", evcp)


# Display count plot of Total kWh column from csv file
def csv_showCountplot_kWh():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    evcp = evcp.fillna(" ")
    evcp.rename(columns={'Model': 'Charge'}, inplace=True)
    sns.countplot(x='Total kWh', data=evcp)
    plt.title('kWh')
    plt.show()
```

```
# Display count plot of Site column from csv file
def csv_showCountplot_Site():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    evcp = evcp.fillna(" ")
    evcp.rename(columns={'Model': 'Charge'}, inplace=True)
    sns.countplot(x='Site', data=evcp)
    plt.title('Site')
    plt.show()


# Display count plot of Charge column from csv file
def csv_showCountplot_Charge():
    evcp = pd.read_csv('2019 EVCP use Q1 and Q2.csv')
    evcp.drop('Charging event', axis=1, inplace=True)
    evcp = evcp.fillna(" ")
    evcp.rename(columns={'Model': 'Charge'}, inplace=True)
    sns.countplot(x='Charge', data=evcp)
    plt.title('Charge')
    plt.show()


# Read web data
def read_web():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    print(evcp)
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    print("Web data:\n", evcp_web)


# Drop 1st column from web data
def web_drop():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    print("Remove 1st column from web data:\n", evcp_web)


# Check, replace, and recheck the nulls from web data
def web_cpr_null():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    print("Display web data with null:\n", evcp_web.isnull())
    print("Display counts of null from web data:\n", evcp_web.isnull().sum())
    evcp_web = evcp_web.fillna(" ")
    print("Display web data with replaced nulls:\n", evcp_web)
    print("Display recounts of null from web data:\n",
evcp_web.isnull().sum())


# Rename Electric Vehicle Type column from web data
def web_rename_col():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-
Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    evcp_web = evcp_web.fillna(" ")
    evcp_web.rename(columns={'Electric Vehicle Type': 'Charge'},
inplace=True)
    print("Rename Electric Vehicle Type column from web data:\n", evcp_web)


# Display count plot of Electric Range column from web data
def web_showCountplot_ER():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-
Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    evcp_web = evcp_web.fillna(" ")
    evcp_web.rename(columns={'Electric Vehicle Type': 'Charge'},
inplace=True)
    sns.countplot(x='Electric Range', data=evcp_web)
    plt.title('ER')
    plt.show()


# Display count plot of County column from web data
def web_showCountplot_County():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-
Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    evcp_web = evcp_web.fillna(" ")
    evcp_web.rename(columns={'Electric Vehicle Type': 'Charge'},
inplace=True)
    sns.countplot(x='County', data=evcp_web)
    plt.title('county')
    plt.show()
```

```
# Display count plot of Charge column from web data
def web_showCountplot_Charge():
    response = urllib2.urlopen('https://data.wa.gov/Transportation/Electric-
Vehicle-Population-Data/f6w7-q2d2/data')
    html_doc = response.read()
    soup = BeautifulSoup(html_doc, 'html.parser')
    evcp = soup.prettify()
    evcp_web = pd.read_csv('Electric_Vehicle_Population_Data.csv')
    evcp_web.drop('VIN (1-10)', axis=1, inplace=True)
    evcp_web = evcp_web.fillna(" ")
    evcp_web.rename(columns={'Electric Vehicle Type': 'Charge'},
inplace=True)
    sns.countplot(x='Charge', data=evcp_web)
    plt.title('charge')
    plt.show()


if __name__ == "__main__":
    read_csv_file()
    csv_drop()
    csv_cpr_null()
    csv_rename_col()
    csv_showCountplot_kWh()
    csv_showCountplot_Site()
    csv_showCountplot_Charge()
    read_web()
    web_drop()
    web_cpr_null()
    web_rename_col()
    web_showCountplot_ER()
    web_showCountplot_County()
    web_showCountplot_Charge()
```

Output:

Csv data:

```
      Charging event  ...                   Model
0            8124494  ...       APT 7kW Dual Outlet
1            8124522  ...       APT 7kW Dual Outlet
2            8124828  ...       APT 7kW Dual Outlet
3            8124987  ...       APT 7kW Dual Outlet
4            8125100  ...       APT 7kW Dual Outlet
...              ...  ...                       ...
3401         8702065  ...  APT Triple Rapid Charger
3402         8702103  ...  APT Triple Rapid Charger
3403         8702255  ...  APT Triple Rapid Charger
3404         8702426  ...       APT 7kW Dual Outlet
3405         8702978  ...       APT 7kW Dual Outlet

[3406 rows x 11 columns]
```

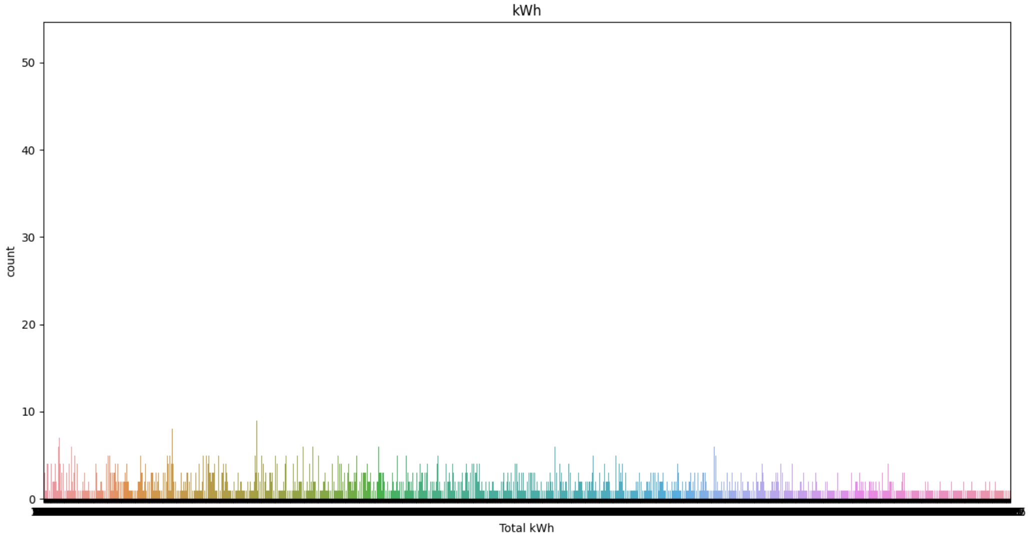
Remove 1st column from csv data:

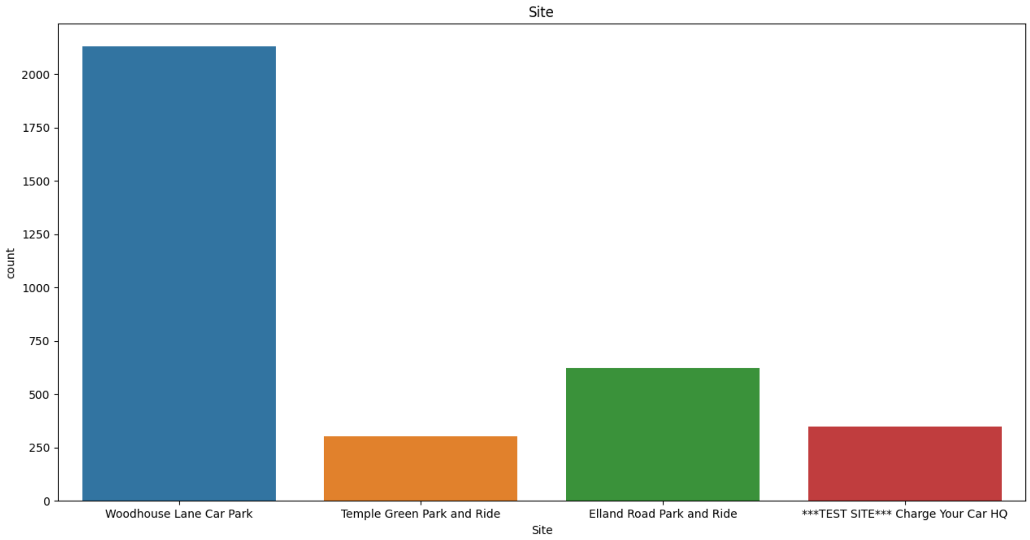
```
       User ID  CP ID  ...                        Site                     Model
0     User 406  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
1     User 546  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
2     User 279  80085  ...  Temple Green Park and Ride       APT 7kW Dual Outlet
3     User 399  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
4     User 771  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
...        ...    ...  ...                         ...                       ...
3401  User 131  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3402  User 573  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3403  User 418  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3404  User 306  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
```

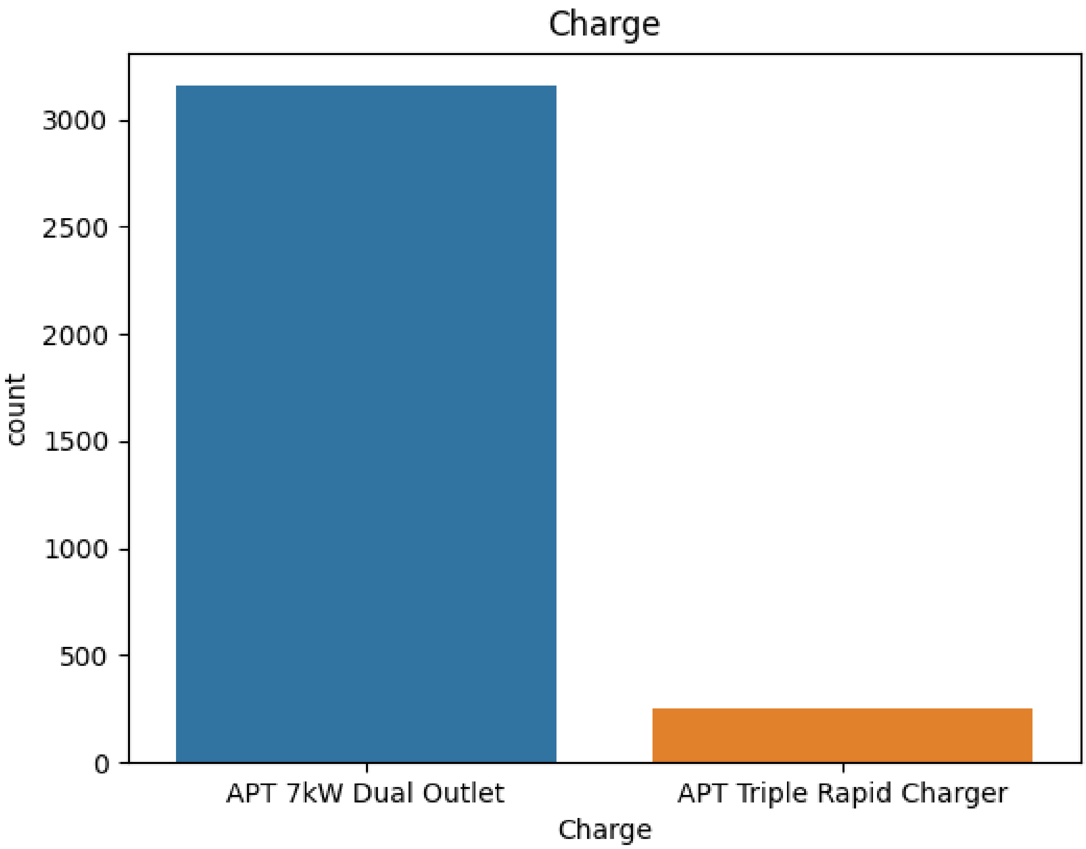
```
3405  User 308  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet

[3406 rows x 10 columns]
Display csv data with null:
      User ID  CP ID  Connector  Start Date  ...  End Time  Total kWh   Site  Model
0       False  False      False       False  ...     False      False  False  False
1       False  False      False       False  ...     False      False  False  False
2       False  False      False       False  ...     False      False  False  False
3       False  False      False       False  ...     False      False  False  False
4       False  False      False       False  ...     False      False  False  False
...       ...    ...        ...         ...  ...       ...        ...    ...    ...
3401    False  False      False       False  ...      True       True  False  False
3402    False  False      False       False  ...     False      False  False  False
3403    False  False      False       False  ...     False      False  False  False
3404    False  False      False       False  ...     False      False  False  False
3405    False  False      False       False  ...     False      False  False  False

[3406 rows x 10 columns]
Display counts of null from csv data:
 User ID       0
CP ID          0
Connector      0
Start Date     0
Start Time     0
End Date      52
End Time      52
Total kWh     52
Site           0
```

```
Model         0
dtype: int64
Display csv data with replaced nulls:
       User ID  CP ID  ...                       Site                    Model
0     User 406  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
1     User 546  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
2     User 279  80085  ...  Temple Green Park and Ride       APT 7kW Dual Outlet
3     User 399  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
4     User 771  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
...        ...    ...  ...                         ...                       ...
3401  User 131  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3402  User 573  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3403  User 418  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3404  User 306  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
3405  User 308  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet

[3406 rows x 10 columns]
Display recounts of null from csv data:
 User ID       0
CP ID         0
Connector     0
Start Date    0
Start Time    0
End Date      0
End Time      0
Total kWh     0
Site          0
Model         0
```

```
dtype: int64
Rename Model column from csv data:
      User ID  CP ID  ...                      Site                 Charge
0     User 406  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
1     User 546  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
2     User 279  80085  ...  Temple Green Park and Ride       APT 7kW Dual Outlet
3     User 399  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
4     User 771  70202  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
...        ...    ...  ...                         ...                       ...
3401  User 131  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3402  User 573  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3403  User 418  80164  ...   Elland Road Park and Ride  APT Triple Rapid Charger
3404  User 306  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet
3405  User 308  70204  ...     Woodhouse Lane Car Park       APT 7kW Dual Outlet

[3406 rows x 10 columns]
```







Web data:

VIN (1-10) ... Vehicle Location

```
0      3FA6P0SU3L  ...  POINT (-122.11667400000002 47.363112)
1      5YJYGDEE6L  ...         POINT (-122.137386 47.444808)
2      KNDCC3LG6L  ...         POINT (-122.215501 47.476576)
3      1N4AZ0CP5D  ...   POINT (-122.31336800000001 47.54411)
4      5YJSA1H22E  ...         POINT (-122.297534 47.685291)
...           ...  ...                                   ...
63850  YV4BC0ZX1H  ...  POINT (-117.50543600000002 47.633834)
63851  5YJ3E1EC5L  ...          POINT (-122.30033 47.585339)
63852  KNDCE3LG3K  ...  POINT (-122.97996899999998 47.078241)
63853  5YJ3E1EBXJ  ...         POINT (-122.227947 47.565443)
63854  5YJ3E1EA1L  ...         POINT (-122.132064 47.494834)

[63855 rows x 15 columns]
```

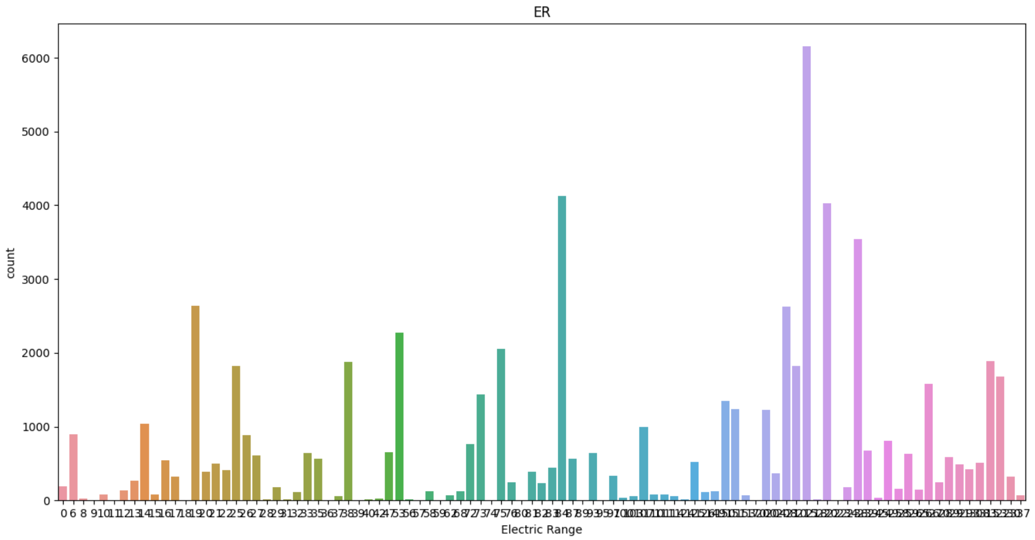
Remove 1st column from web data:

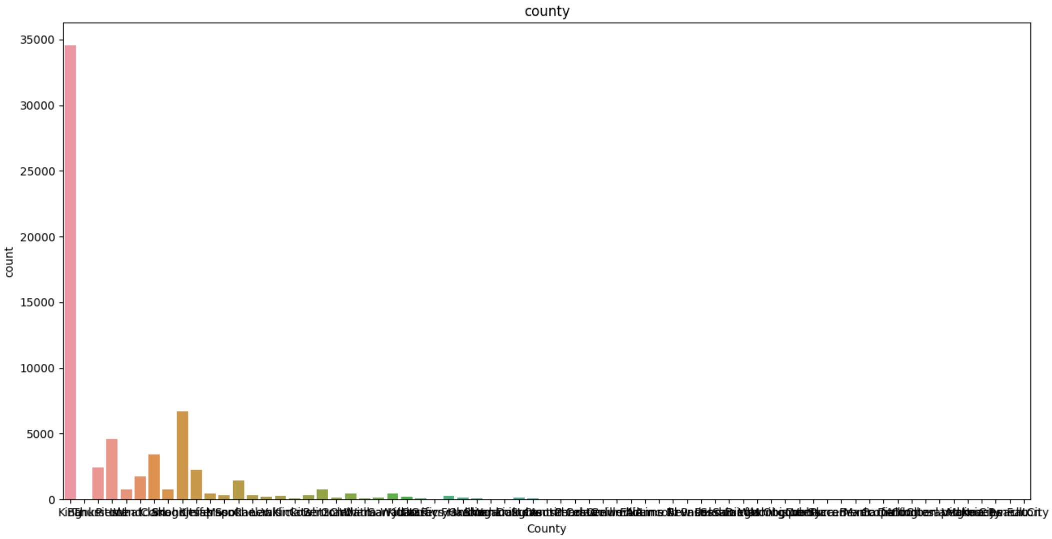
```
         County  ...                       Vehicle Location
0          King  ...  POINT (-122.11667400000002 47.363112)
1          King  ...         POINT (-122.137386 47.444808)
2          King  ...         POINT (-122.215501 47.476576)
3          King  ...   POINT (-122.31336800000001 47.54411)
4          King  ...         POINT (-122.297534 47.685291)
...         ...  ...                                   ...
63850   Spokane  ...  POINT (-117.50543600000002 47.633834)
63851      King  ...          POINT (-122.30033 47.585339)
63852  Thurston  ...  POINT (-122.97996899999998 47.078241)
63853      King  ...         POINT (-122.227947 47.565443)
63854      King  ...         POINT (-122.132064 47.494834)

[63855 rows x 14 columns]
```

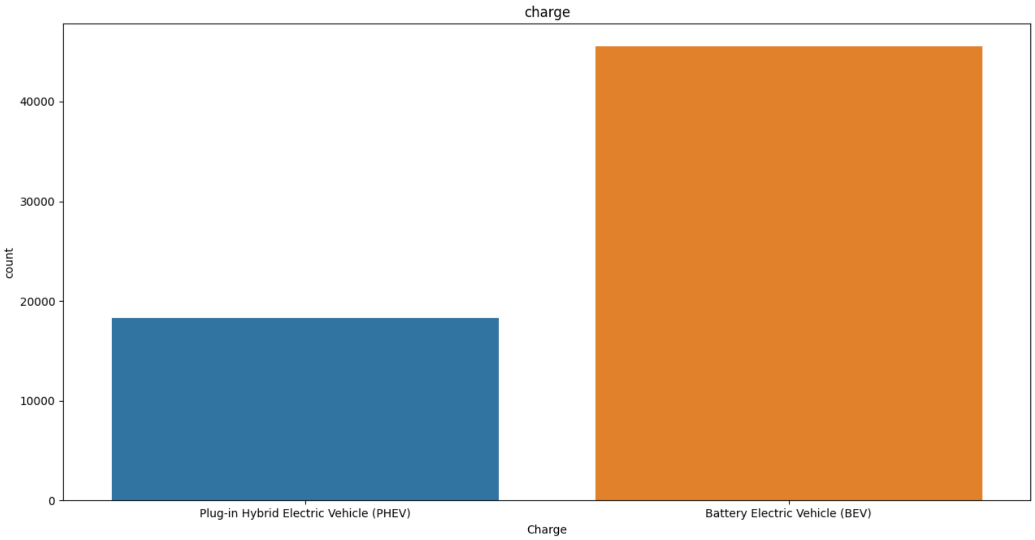
```
Display web data with null:
       County   City  ...  DOL Vehicle ID  Vehicle Location
0       False  False  ...           False             False
1       False  False  ...           False             False
2       False  False  ...           False             False
3       False  False  ...           False             False
4       False  False  ...           False             False
...       ...    ...  ...             ...               ...
63850   False  False  ...           False             False
63851   False  False  ...           False             False
63852   False  False  ...           False             False
63853   False  False  ...           False             False
63854   False  False  ...           False             False

[63855 rows x 14 columns]
Display counts of null from web data:
 County                                                2
City                                                  0
State                                                 0
ZIP Code                                              0
Model Year                                            0
Make                                                  0
Model                                                 0
Electric Vehicle Type                                 0
Clean Alternative Fuel Vehicle (CAFV) Eligibility     0
Electric Range                                        0
Base MSRP                                             0
Legislative District                                 43
```

```
DOL Vehicle ID                                   0
Vehicle Location                                 2
dtype: int64
Display web data with replaced nulls:
          County  ...                        Vehicle Location
0          King  ...  POINT (-122.11667400000002 47.363112)
1          King  ...          POINT (-122.137386 47.444808)
2          King  ...          POINT (-122.215501 47.476576)
3          King  ...   POINT (-122.31336800000001 47.54411)
4          King  ...          POINT (-122.297534 47.685291)
...         ...  ...                                    ...
63850   Spokane  ...  POINT (-117.50543600000002 47.633834)
63851      King  ...           POINT (-122.30033 47.585339)
63852  Thurston  ...  POINT (-122.97996899999998 47.078241)
63853      King  ...          POINT (-122.227947 47.565443)
63854      King  ...          POINT (-122.132064 47.494834)

[63855 rows x 14 columns]
Display recounts of null from web data:
 County                                          0
City                                             0
State                                            0
ZIP Code                                         0
Model Year                                       0
Make                                             0
Model                                            0
Electric Vehicle Type                            0
Clean Alternative Fuel Vehicle (CAFV) Eligibility    0
```

```
Electric Range                        0
Base MSRP                             0
Legislative District                  0
DOL Vehicle ID                        0
Vehicle Location                      0
dtype: int64
Rename Electric Vehicle Type column from web data:
         County  ...                        Vehicle Location
0          King  ...  POINT (-122.11667400000002 47.363112)
1          King  ...          POINT (-122.137386 47.444808)
2          King  ...          POINT (-122.215501 47.476576)
3          King  ...   POINT (-122.31336800000001 47.54411)
4          King  ...          POINT (-122.297534 47.685291)
...         ...  ...                                    ...
63850   Spokane  ...  POINT (-117.50543600000002 47.633834)
63851      King  ...           POINT (-122.30033 47.585339)
63852  Thurston  ...  POINT (-122.97996899999998 47.078241)
63853      King  ...          POINT (-122.227947 47.565443)
63854      King  ...          POINT (-122.132064 47.494834)

[63855 rows x 14 columns]
```


ER
count
6000
5000
4000
3000
2000
1000
0
0 6 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 25 26 27 28 29 31 32 33 35 36 37 38 39 40 42 47 53 56 57 58 59 62 68 72 73 74 75 76 80 81 82 83 84 87 89 93 95 97
Electric Range


county
count
35000
30000
25000
20000
15000
10000
5000
0
King
County


charge
count
0
10000
20000
30000
40000
Plug-in Hybrid Electric Vehicle (PHEV)
Battery Electric Vehicle (BEV)
Charge