Lab5_RyanAvery

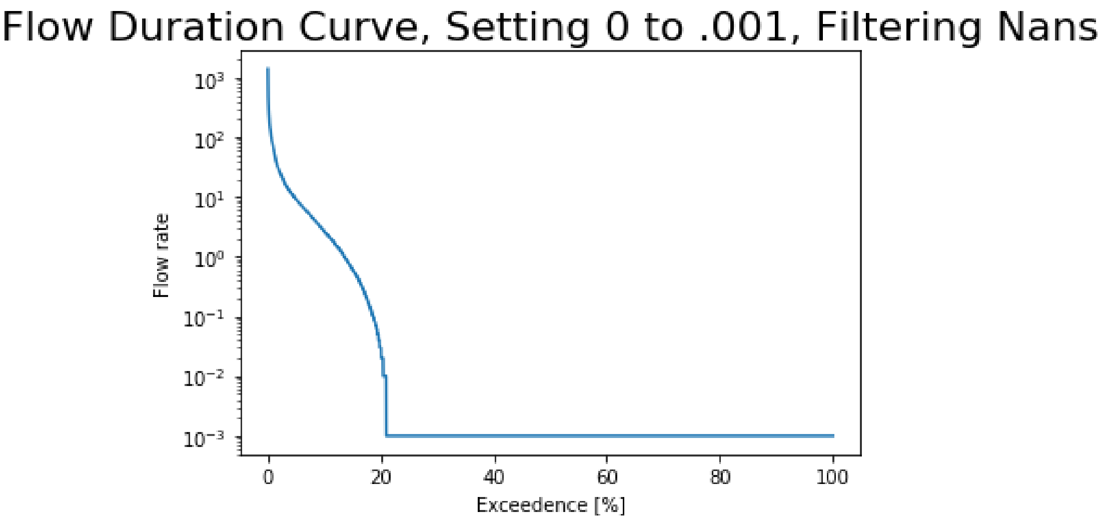
February 14, 2019

Metadata for the stream gauge we are using

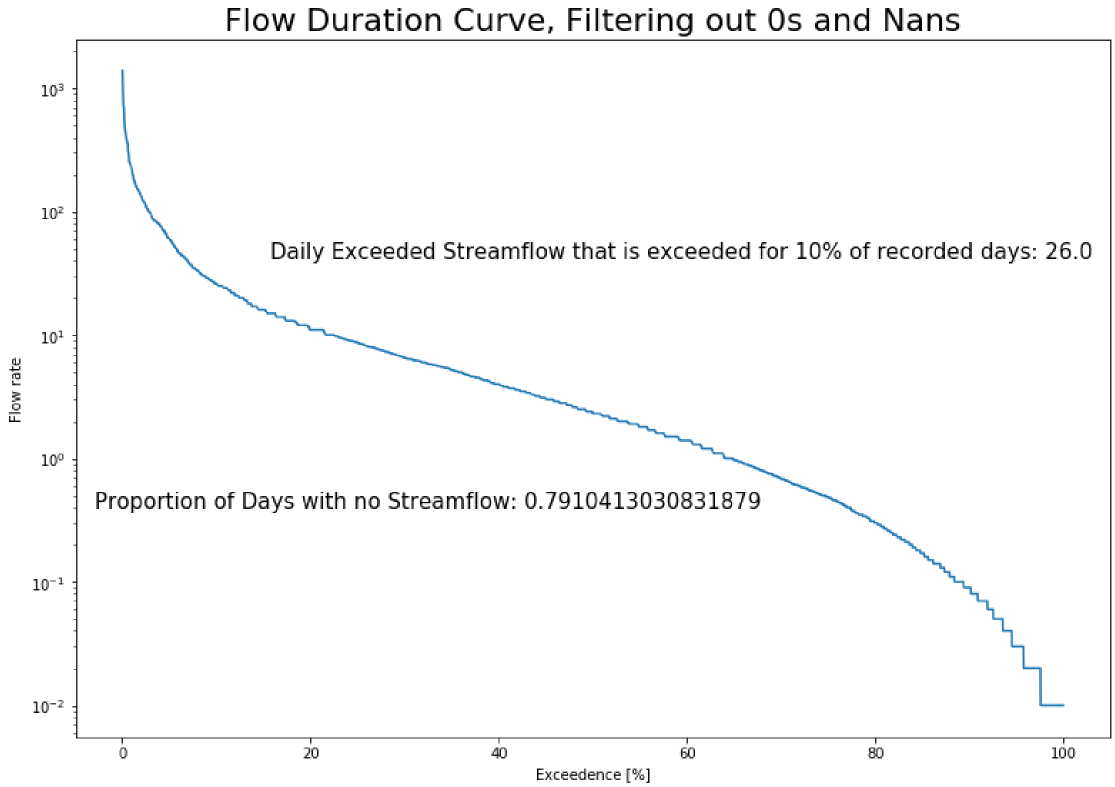
USGS 11119750 MISSION C NR MISSION ST NR SANTA BARBARA CA Latitude 34ř25’39", Longitude 119ř43’31" NAD83Santa Barbara County, California, Hydrologic Unit 18060013 Drainage area: 8.38 square miles Datum of gage: 140 feet above NGVD29.

0.1 Part 1 - Flow Duration Curve

```
In [1]: import pandas as pd
        import numpy as np
        import matplotlib.pyplot as plt
        import xlrd

        df = pd.read_excel('daily_flows.xlsx')
        df = df.set_index('Decimal Year').drop(df.columns[0], axis = 1)

In [2]: df_nonan = df.dropna()

In [3]: df_nonan = df_nonan.replace({'Flow':0},.001)

In [4]: sort = np.sort(np.array(df_nonan.Flow))[::-1]
        exceedance = np.arange(1.,len(sort)+1) / len(sort)
        plt.plot(exceedance*100, sort)
        plt.xlabel("Exceedence [%]")
        plt.ylabel("Flow rate")
        plt.yscale("log")
        plt.title("Flow Duration Curve, Setting 0 to .001, Filtering Nans", fontsize=22)
        plt.show()
```

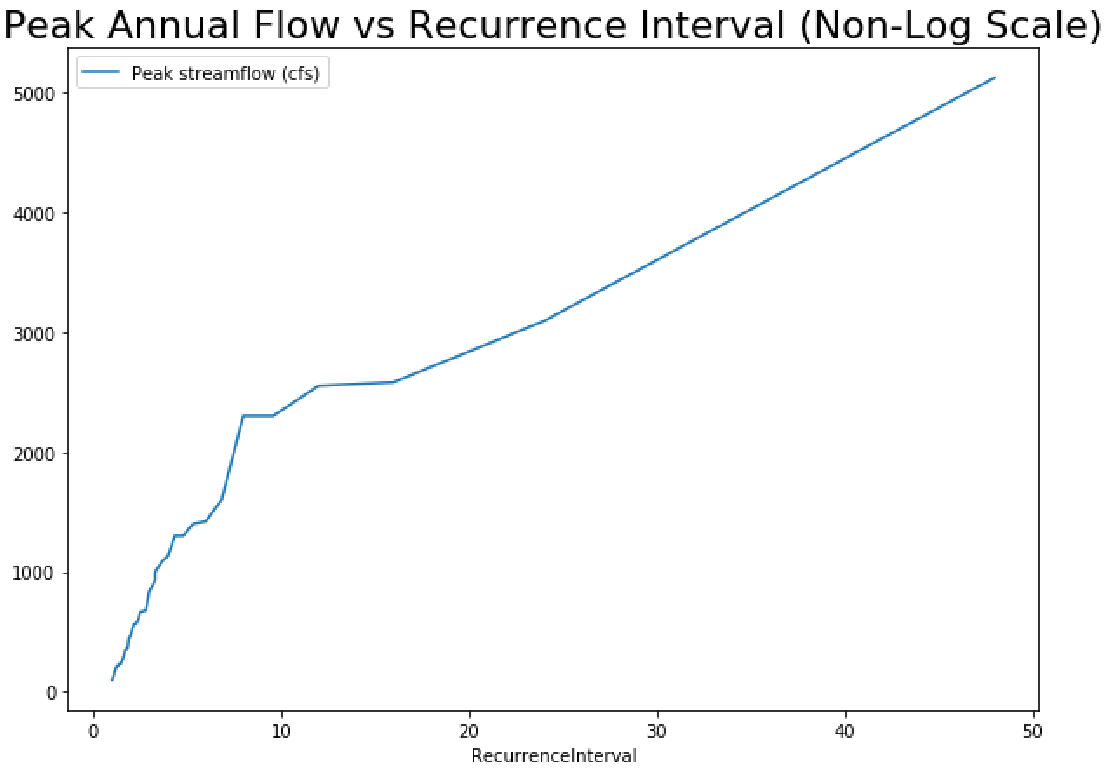


```
In [5]: df_nonan = df.dropna()

In [6]: df_nonan_nozero = df_nonan[(df_nonan != 0).all(1)]

        sort = np.sort(np.array(df_nonan_nozero.Flow))[::-1]
        exceedance = np.arange(1.,len(sort)+1) / len(sort)
        plt.figure(figsize=(13,9))
        plt.plot(exceedance*100, sort)
        plt.xlabel("Exceedence [%]")
        plt.ylabel("Flow rate")
        plt.yscale("log")
        plt.title("Flow Duration Curve, Filtering out 0s and Nans", fontsize=22)
        prop_zeros = "Proportion of Days with no Streamflow: " + \
            str(df[df.Flow == 0].count()[0]/df_nonan.count()[0])

        exceedance_df = pd.DataFrame({'sorted_flow':sort,\
                                      'exceedance':exceedance})
        daily_exceeded_10_perc = exceedance_df[(exceedance_df.exceedance < 0.10025)&\
            (exceedance_df.exceedance > 0.09995)]['sorted_flow'].values[0]

        daily_exc_text = "Daily Exceeded Streamflow that is exceeded for 10% of recorded days: "
            str(daily_exceeded_10_perc)

        plt.text(-3, .4, prop_zeros, fontsize=15)
        plt.text(15.75, 41.75, daily_exc_text, fontsize=15)
        plt.show()
```

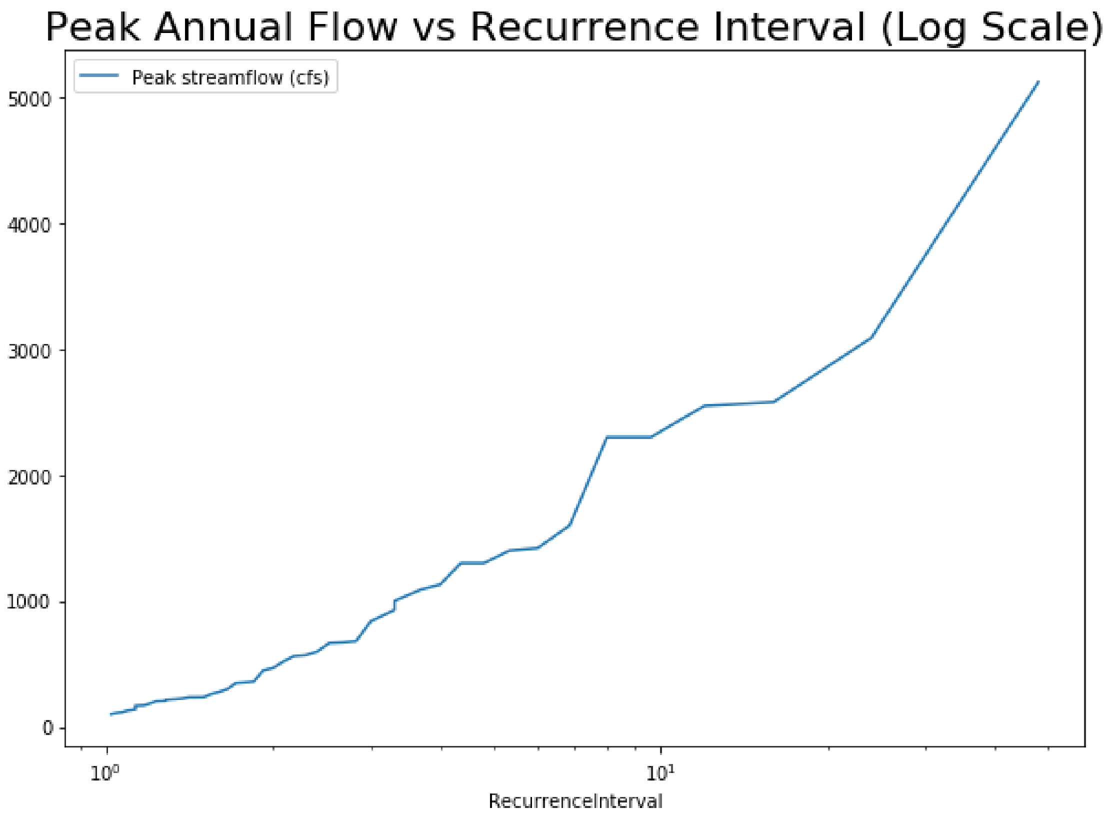


0.2 Part 2 - Recurrence Interval

```
In [7]: peak_df = pd.read_excel('peak_annual_flows.xlsx').drop(columns='Unnamed: 3')

        peak_df['Rank'] = pd.DataFrame(peak_df['Peak streamflow (cfs)']).rank()

        peak_df = peak_df.sort_values("Rank")
        peak_df.Rank = list(peak_df.Rank)[::-1] # reverse the rank order so 1 is highest

In [8]: num_years = len(peak_df)
        peak_df['RecurrenceInterval'] = (1+num_years)/peak_df.Rank

In [9]: fig, ax = plt.subplots(figsize=(10,7))
        peak_df.plot(ax=ax, x='RecurrenceInterval', y='Peak streamflow (cfs)')
        plt.title('Peak Annual Flow vs Recurrence Interval (Non-Log Scale)', fontsize=22)
        # ax.set_xscale('log')
        # ax.get_xaxis().get_major_formatter().labelOnlyBase = False

Out[9]: Text(0.5, 1.0, 'Peak Annual Flow vs Recurrence Interval (Non-Log Scale)')
```



```
In [10]: fig, ax = plt.subplots(figsize=(10,7))
         peak_df.plot(ax=ax, x='RecurrenceInterval', y='Peak streamflow (cfs)')
         plt.title('Peak Annual Flow vs Recurrence Interval (Log Scale)', fontsize=22)
         ax.set_xscale('log')
```



0.2.1 Calendar Month with Highest Peak Annual Flows

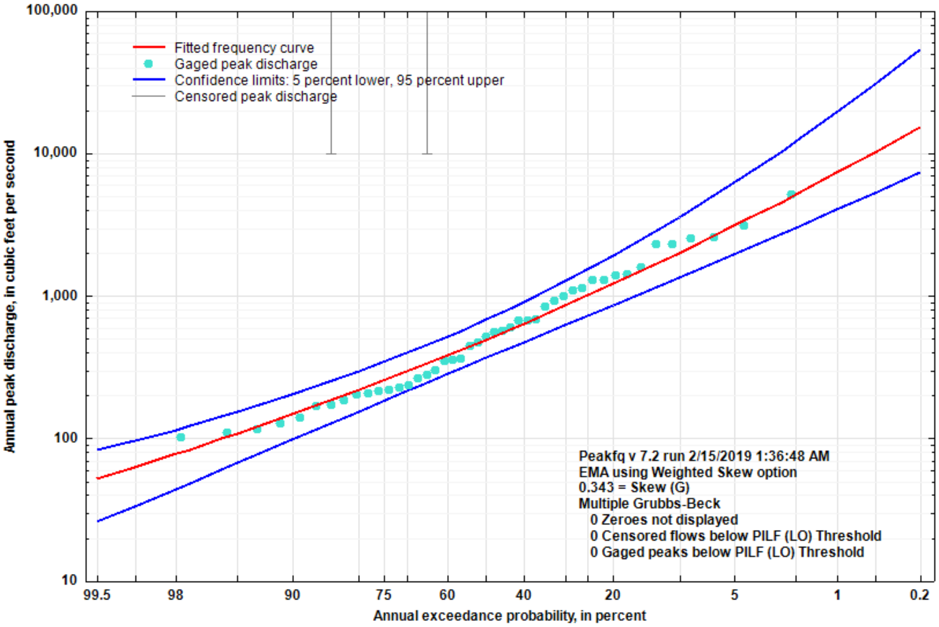
```
In [11]: peak_noestimated = peak_df.drop(labels=\
                 peak_df[peak_df.Date == 'estimated*'].index,axis = 0)
         peak_noestimated['Month'] = pd.DatetimeIndex(pd.to_datetime(\
                                             peak_noestimated.Date)).month
```

```
In [12]: peak_noestimated.groupby('Month').size()
```

```
Out[12]: Month
         1     12
         2     14
         3      9
         4      1
         11     2
         12     7
         dtype: int64
```

The month with the most peak annual flows was February

0.3 Part 3 - Flood Frequency


100,000
10,000
1,000
100
10
Annual peak discharge, in cubic feet per second
99.5
98
90
75
60
40
20
5
1
0.2
Annual exceedance probability, in percent
Fitted frequency curve
Gaged peak discharge
Confidence limits: 5 percent lower, 95 percent upper
Censored peak discharge
Peakfq v 7.2 run 2/15/2019 1:36:48 AM
EMA using Weighted Skew option
0.343 = Skew (G)
Multiple Grubbs-Beck
0 Zeroes not displayed
0 Censored flows below PILF (LO) Threshold
0 Gaged peaks below PILF (LO) Threshold