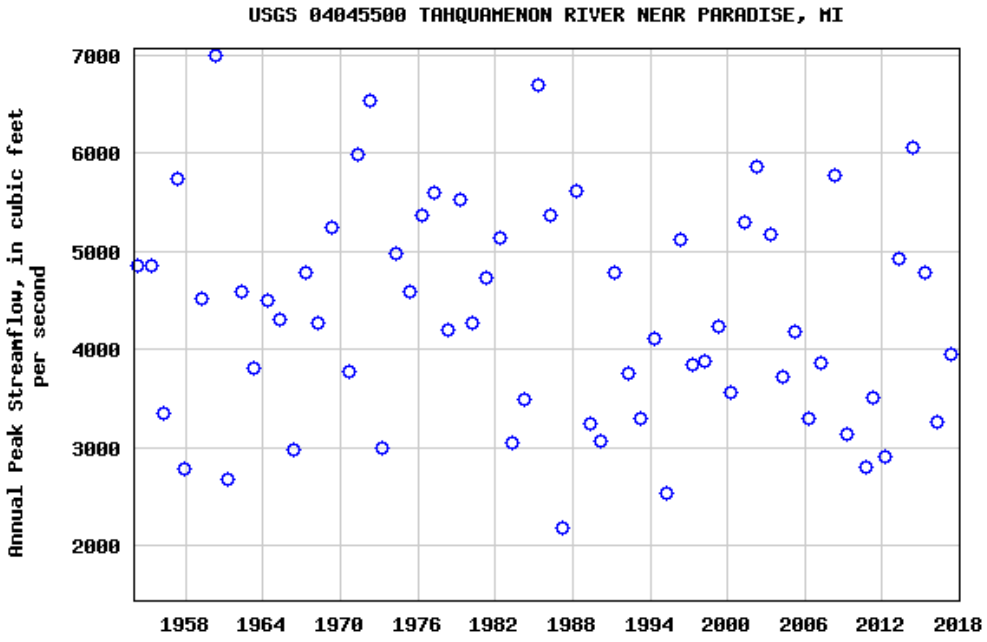
Project-03

February 6, 2019

1 Flood Frequency Estimates for Watershed

A) See the graph below from USGS 04045500 TAHQUAMENON RIVER NEAR PARADISE, MI for peak annual streamflow

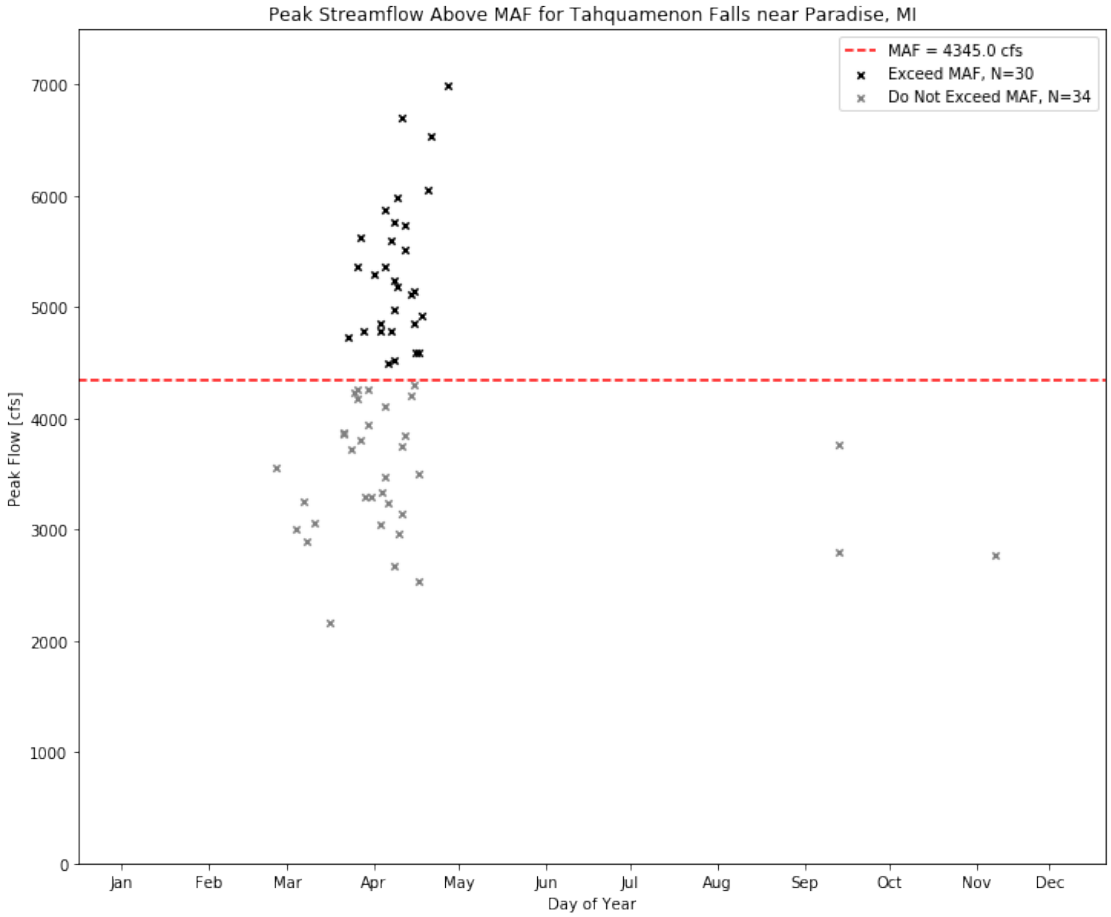


B)Create a graph showing the flood climatology. Plot the streamflow (in cfs) for all peaks that exceed the mean annual flood (MAF) versus the calendar day of the peak (Month/Day). Exclude any historic peak streamflows.

```
In [131]: data = pd.read_csv(
              'AnnualPeaks_Tahquamenon.txt',
              sep = '\t',
              skiprows = 69
          )

          data = pd.concat([data['10d'],data['8s'],data['8s.1']],axis=1)
          data.columns = ['Date',"Peak Flow [cfs]","Stage Height [ft]"]

          # Manipulate Data to prepare plot
```

```
data.Date = pd.to_datetime(data.Date)
data['DayOfYear'] = data['Date'].dt.dayofyear
data = data.set_index(['Date'])

# No historic peaks, all modern
modern = data

# Calculate Mean Annual Flood
MAF = modern['Peak Flow [cfs]'].mean()
print("Mean Annual Flood: " + str(MAF.round()) + " cfs \n")

# Slice for above MAF
FloodExceed = modern[modern['Peak Flow [cfs]'] >= MAF]
NotExceed = modern[modern['Peak Flow [cfs]'] < MAF]

# Scatter Plot by day of year
fig,ax = plt.subplots(figsize=(12,10))
FloodExceed.reset_index().plot.scatter(x='DayOfYear',y='Peak Flow [cfs]',ax=ax,color='
NotExceed.reset_index().plot.scatter(x='DayOfYear',y='Peak Flow [cfs]',ax=ax,color='gr

ax.set_xlabel('Day of Year')
ax.set_xlim([0,365])
ax.set_ylim([0,7500])
ax.axhline(y=MAF,linestyle='--',color='r')

labels = ['Jan','Feb','Mar','Apr','May','Jun','Jul','Aug','Sep','Oct','Nov','Dec']
ticks = [15,46,74,105,135,166,196,227,258,288,319,345]
plt.xticks(ticks,labels)

plt.legend(
    [
        'MAF = {0} cfs'.format(MAF.round()),
        'Exceed MAF, N={0}'.format(len(FloodExceed)),
        'Do Not Exceed MAF, N={0}'.format(len(NotExceed))
    ]
)
plt.title('Peak Streamflow Above MAF for Tahquamenon Falls near Paradise, MI')

plt.savefig('MAF.png')
plt.show()
```

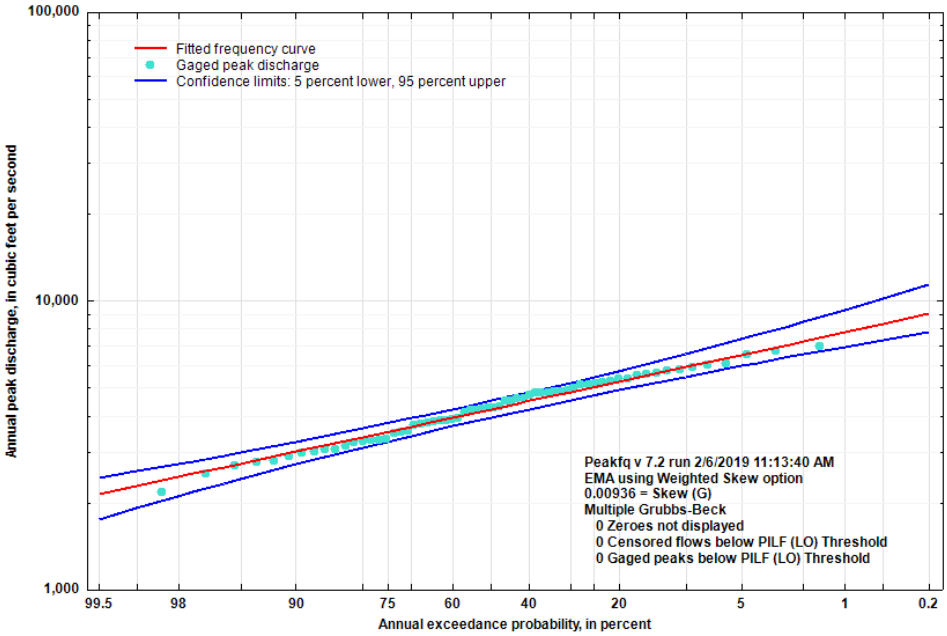
```
Mean Annual Flood: 4345.0 cfs
```



C) Use the USGS PeakFQ program to do a flood frequency analysis. Include a graph showing the output from PeakFQ. Report results for 2-, 10-, and 100- year peak discharge using the 17B estimates.

Per this publication, https://pubs.er.usgs.gov/publication/wri834194, the Upper Peninsula has a skew of 0.12 and the mean-square error associated with generalized skew on the basis of designated regions is 0.2. Using these values PeakFQ was run with the watstore data.

Occurence Interval, Years	Occurrence Probability	Flow [cfs]
2	0.5	4,201
10	0.1	5,894
100	0.01	7,776


Fitted frequency curve
Gaged peak discharge
Confidence limits: 5 percent lower, 95 percent upper
Peakfq v 7.2 run 2/6/2019 11:13:40 AM
EMA using Weighted Skew option
0.00936 = Skew (G)
Multiple Grubbs-Beck
0 Zeroes not displayed
0 Censored flows below PILF (LO) Threshold
0 Gaged peaks below PILF (LO) Threshold
Annual peak discharge, in cubic feet per second
100,000
10,000
1,000
99.5
98
90
75
60
40
20
5
1
0.2
Annual exceedance probability, in percent