In [4]:
```
%matplotlib notebook
from matplotlib import style
style.use('fivethirtyeight')
import matplotlib.pyplot as plt
```

In [ ]:
```

```

In [5]:
```
import numpy as np
import pandas as pd
from sqlalchemy import func
from sqlalchemy import desc
```

In [6]:
```
 import datetime as dt
```

In [3]:
```
import os
from flask import Flask
from flask_sqlalchemy import SQLAlchemy
import sqlalchemy
from sqlalchemy.ext.automap import automap_base
from sqlalchemy.orm import Session
from sqlalchemy import create_engine, func
```

In [8]:
```
import sqlalchemy
```

In [9]:
```
engine = create_engine("sqlite:///hawaii.sqlite")
```

In [10]:
```
 # reflect an existing database into a new model
Base = automap_base()
# reflect the tables
Base.prepare(engine, reflect=True)
```

In [11]:
```
 # We can view all of the classes that automap found
Base.classes.keys()
```

Out[11]:
```
['measurement', 'station']
```

In [12]:
```
# Save references to each table
Measurement = Base.classes.measurement
Station = Base.classes.station
```

In [13]:
```
 # Create our session (link) from Python to the DB
session = Session(engine)
```

In [14]:
```
# Calculate the date 1 year ago from today
yearago=(dt.date.today() - dt.timedelta(days=365*2))
```

In [15]:
```
yearago.strftime('%Y/%m/%d')
```

Out[15]:
```
'2016/08/28'
```

In [16]:
```
# Perform a query to retrieve the data and precipitation scores
results = session.query(Measurement.date,Measurement.prcp).filter(Measuremer
```

In [17]:
```
# Save the query results as a Pandas DataFrame and set the index to the date
df=pd.DataFrame(results)
df.set_index('date')
df.head()
```

Out[17]:

	date	prcp
0	2016-08-29	0.00
1	2016-08-30	0.00
2	2016-08-31	0.13
3	2016-09-01	0.00
4	2016-09-02	0.00

In [18]:
```
#Sort the dataframe by date
df.sort_values(by='date',ascending=False)
```

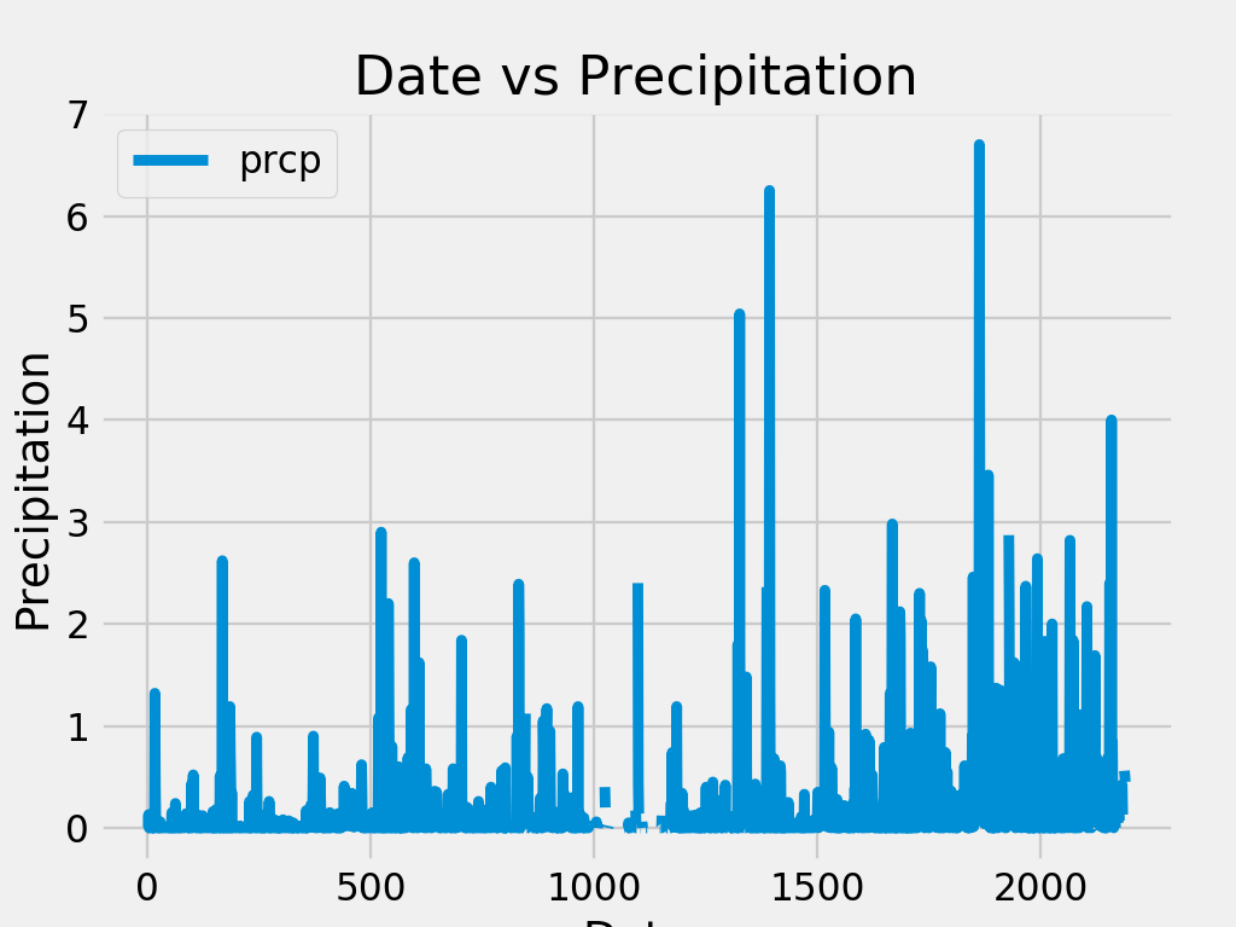
Out[18]:

	date	prcp
2190	2017-08-23	0.45
1500	2017-08-23	0.08
990	2017-08-23	0.00
354	2017-08-23	0.00
1499	2017-08-22	0.00
2189	2017-08-22	0.50
353	2017-08-22	0.00
2188	2017-08-21	0.56
989	2017-08-21	0.02
1498	2017-08-21	NaN
352	2017-08-21	0.00
988	2017-08-20	0.01
2187	2017-08-20	NaN
351	2017-08-20	0.00
2186	2017-08-19	0.09
1497	2017-08-19	NaN
350	2017-08-19	0.00
987	2017-08-19	0.00
986	2017-08-18	0.00
1846	2017-08-18	0.06
349	2017-08-18	0.00
2185	2017-08-18	NaN
1496	2017-08-17	0.05
985	2017-08-17	0.00
1845	2017-08-17	0.01
2184	2017-08-17	0.13
1495	2017-08-16	0.07
2183	2017-08-16	0.42
1844	2017-08-16	0.12
984	2017-08-16	0.00
...	...	...
359	2016-09-02	0.02

	date	prcp
1851	2016-09-02	0.03
1173	2016-09-02	NaN
4	2016-09-02	0.00
358	2016-09-01	0.00
694	2016-09-01	0.00
1850	2016-09-01	0.01
3	2016-09-01	0.00
1504	2016-09-01	0.02
994	2016-09-01	NaN
357	2016-08-31	0.10
1849	2016-08-31	2.46
1172	2016-08-31	0.25
1503	2016-08-31	0.24
2	2016-08-31	0.13
993	2016-08-31	NaN
693	2016-08-31	NaN
1	2016-08-30	0.00
1502	2016-08-30	0.00
356	2016-08-30	0.00
1848	2016-08-30	0.05
1171	2016-08-30	0.00
992	2016-08-30	0.02
692	2016-08-29	0.04
1501	2016-08-29	0.35
355	2016-08-29	0.17
1847	2016-08-29	0.90
1170	2016-08-29	0.00
991	2016-08-29	NaN
0	2016-08-29	0.00

2191 rows × 2 columns

In [81]:
```
# Use Pandas Plotting with Matplotlib to plot the data
df.plot.line()
plt.title("Date vs Precipitation")
plt.ylabel("Precipitation")
plt.xlabel("Date")
fig.tight_layout()
plt.savefig("Trip_Date_pres.png")
plt.show()
```



In [20]:
```
# Use Pandas to calcualte the summary statistics for the precipitation data
df['prcp'].describe()
```

Out[20]:
```
count    1985.000000
mean        0.172383
std         0.453252
min         0.000000
25%         0.000000
50%         0.020000
75%         0.130000
max         6.700000
Name: prcp, dtype: float64
```

In [21]:
```
 # How many stations are available in this dataset?
no_stations=session.query(Station.id).count()
no_stations
```

Out[21]:
```
9
```

In [22]:
```
# What are the most active stations?
# List the stations and the counts in descending order.
r1=session.query(Measurement.station, func.count(Measurement.tobs)).group_by
r1
```

Out[22]:
```
[('USC00519281', 2772),
 ('USC00519397', 2724),
 ('USC00513117', 2709),
 ('USC00519523', 2669),
 ('USC00516128', 2612),
 ('USC00514830', 2202),
 ('USC00511918', 1979),
 ('USC00517948', 1372),
 ('USC00518838', 511)]
```

In [23]:
```
# Using the station id from the previous query, calculate the lowest tempera
# highest temperature recorded, and average temperature most active station?
st_id=r1[0][0]
minmaxavg=session.query(
    func.min(Measurement.tobs).label("min_temperature"),
    func.max(Measurement.tobs).label("max_temperature"),
    func.avg(Measurement.tobs).label("avg_temperature")
).filter(Measurement.station==st_id).one()
minmaxavg
```

Out[23]:
```
(54.0, 85.0, 71.66378066378067)
```

In [24]:
```
# Choose the station with the highest number of temperature observations.
# Query the last 12 months of temperature observation data for this station
tem= session.query(Measurement.date,Measurement.tobs).filter(Measurement.sta
tem
```

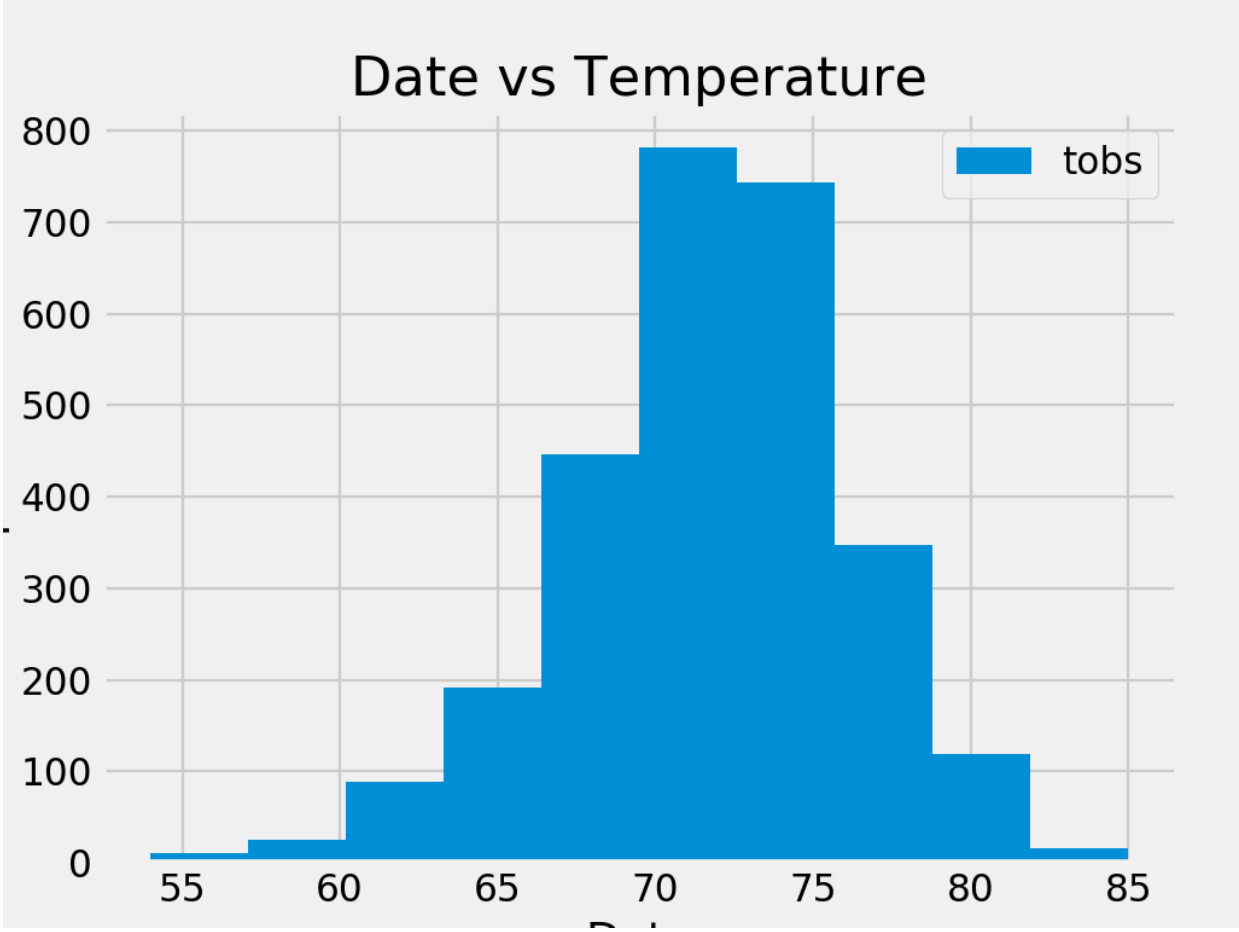
Out[24]:
```
[('2010-01-01', 70.0),
 ('2010-01-02', 62.0),
 ('2010-01-03', 74.0),
 ('2010-01-04', 75.0),
 ('2010-01-05', 74.0),
 ('2010-01-06', 76.0),
 ('2010-01-07', 69.0),
 ('2010-01-08', 66.0),
 ('2010-01-09', 70.0),
 ('2010-01-10', 75.0),
 ('2010-01-11', 64.0),
 ('2010-01-12', 60.0),
 ('2010-01-13', 61.0),
 ('2010-01-14', 68.0),
 ('2010-01-15', 64.0),
 ('2010-01-16', 66.0),
 ('2010-01-17', 67.0),
 ('2010-01-18', 70.0),
 ('2010-01-19', 67.0),
```

In [25]:
```
df2=pd.DataFrame(tem)
df2.head()
```

Out[25]:

	date	tobs
0	2010-01-01	70.0
1	2010-01-02	62.0
2	2010-01-03	74.0
3	2010-01-04	75.0
4	2010-01-05	74.0

In [80]:
```
df2.plot.hist()
plt.title("Date vs Temperature")
plt.ylabel("Temperature")
plt.xlabel("Date")
plt.savefig("Date_vs_temp.png")
plt.show()
```



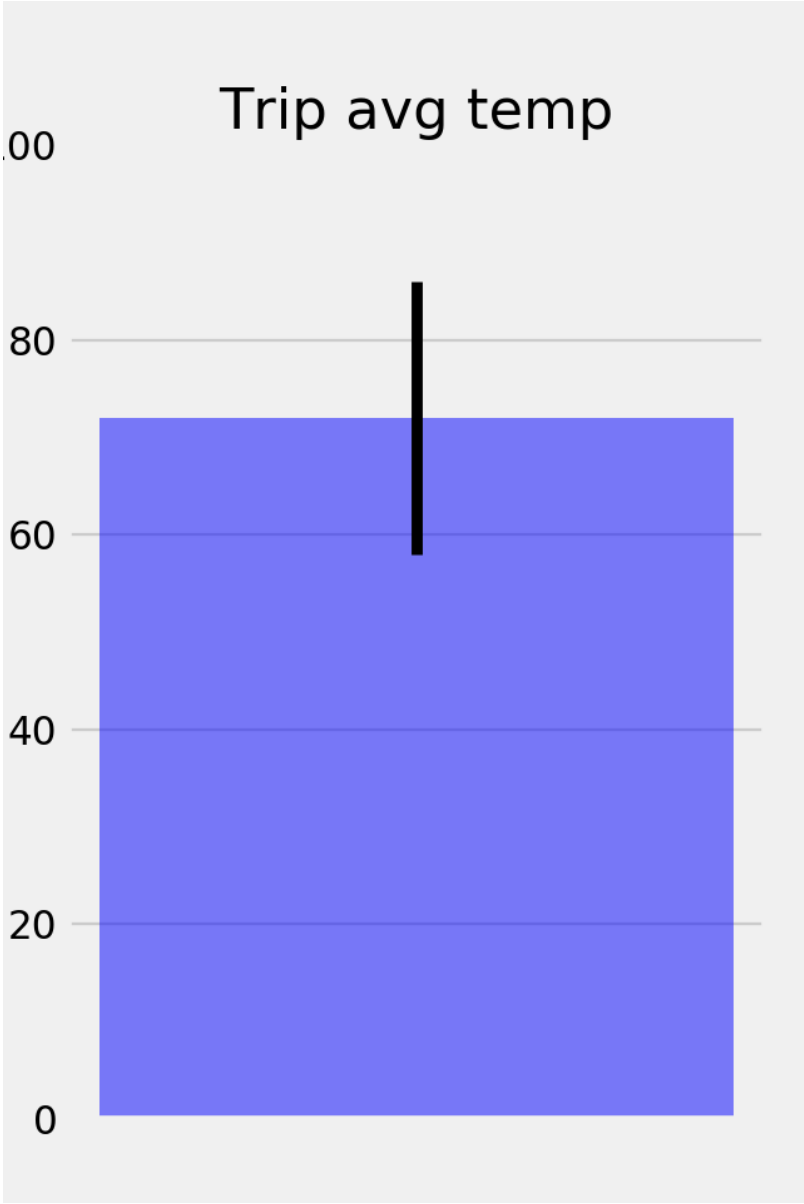
In [29]:
```
# Write a function called `calc_temps` that will accept start date and end d
# and return the minimum, average, and maximum temperatures for that range d

def calc_temps(session, start_date, end_date):
    return session.query(
        func.min(Measurement.tobs),
        func.avg(Measurement.tobs),
        func.max(Measurement.tobs)
    ).filter(
        Measurement.date >= start_date
    ).filter(
        Measurement.date <= end_date
    ).all()
```

In [75]:
```
# Use your previous function `calc_temps` to calculate the tmin, tavg, and t
# for your trip using the previous year's data for those same dates.
x = calc_temps(session, '2017-02-28', '2017-03-05')
x
```

Out[75]:
```
[(64.0, 72.02777777777777, 78.0)]
```

In [76]:
```
# Plot the results from your previous query as a bar chart.
# Use "Trip Avg Temp" as your Title
# Use the average temperature for the y value
# Use the peak-to-peak (tmax-tmin) value as the y error bar (yerr)
plt.figure(figsize=(4,6))
plt.bar(1,height=x[0][1],yerr=x[0][2]-x[0][0],width=0.0001, alpha=0.5,color=
plt.title("Trip avg temp")
plt.xticks([])
plt.ylim(0,100)
plt.ylabel("Temp(F)")
plt.savefig("Trip_avg_tem.png")
plt.show()
```



In [77]:
```
 # Calculate the rainfall per weather station for your trip dates using the
# Sort this in descending order by precipitation amount and list the statio
session.query(Station.station, Station.name, Station.latitude, Station.longi
```

Out[77]:
```
[('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  42.480000000000004),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  40.05),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  36.629999999999995),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  26.820000000000014),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  24.660000000000004),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  20.880000000000003),
 ('USC00516128',
  'MANOA LYON ARBO 785.2, HI US',
  21.3331,
  -157.8025,
  152.4,
  10.440000000000001)]
```

In [16]:
```
#Now that you have completed your initial analysis, design a Flask API based

app = Flask(__name__)

@app.route("/api/v1.0/precipitation")
def prcps():
    prcp_results = session.query(Measurement.date, Measurement.prcp).all()
    prcp_dict={}
    for prcp in prcp_results:
           dates=prcp.date
           precipitation=prcp.prcp
           prcp_dict.update({dates:precipitation})
    return(jsonify(prcp_dict))


@app.route("/api/v1.0/stations")
def stations():
    station_results = session.query(Station.station).all()
    all_stations = list(np.ravel(station_results))
    return jsonify(all_stations)

@app.route("/api/v1.0/tobs")
def tobs():
    tob_results = session.query(Measurement.tobs).filter(Measurement.date >=
    all_tobs = list(np.ravel(tob_results))
    return jsonify(all_tobs)


@app.route("/api/v1.0/start/<start>")
def start(start):
    results = pd.DataFrame(session.query(Measurement.date, Measurement.tobs)
    return jsonify(
    {'min temp': results['tobs'].min(),
    'ave temp': results['tobs'].mean(),
    'max temp': results['tobs'].max()})

@app.route("/api/v1.0/start_end/<start>/<end>")
def start_end(start,end):
    combine_results = pd.DataFrame(session.query(Measurement.date, Measureme
    return jsonify({'min temp': combine_results['tobs'].min(),
                    'ave temp': combine_results['tobs'].mean(),
                   'max temp': combine_results['tobs'].max()})
```