```
clear all
close all

disp(' Alex Weech')
disp(' ATMOS 6040/ Spring 2019')
disp(' Chapter 3')
disp(' hundred year flood on Bear River')

disp('requires bear_river_corinne.csv')
disp('requires weibullparam.m')



bear=csvread('../data/bear_river_corinne.csv');
figure(11)
yr = bear(:,1);
mon = bear(:,2);
date = yr + (mon-.5)/12;
flow = bear(:,3);
bar(date,flow)
axis([1950 2018 0 10000])
xlabel('Date');
ylabel('Streamflow ft^3/s');
title('Bear River  Streamflow: Alex Weech 2/19/19');
hold on
grid on
%going to add some lines to this figure in a bit

fint = 100;
xf = 0:fint:10000;
hf=histnorm(flow,xf);
hf_sum=sum(hf);
hf = hf * fint;

%get weibull parameters
[alpha beta] = weibullparam(flow);
% compute weibull parametric distribution
pdfw_flow = fint * (alpha/beta)*((xf/beta).^(alpha-1)).*exp(-(xf/
beta).^alpha);

figure(12)
subplot(1,2,1)
bar(xf,hf)
axis([xf(1) xf(length(xf)) 0 .1])
hold on
plot(xf,pdfw_flow,'g')
xlabel(' Flow (ft^3/s)');
ylabel('Fractional Contribution');
title('Bear River Flow, Weibull Fit: Alex Weech 2/19/19');
pdf_sum = sum(pdfw_flow);
% plot cumulative distribution
subplot(1,2,2)
```

```
[cf yf] =cdfnorm(flow,xf);
plot(yf,cf)
hold on
axis([yf(1) yf(length(yf)) 0 1])
xlabel('Flow (ft^3/s)');
ylabel('Cumulative Distribution');
title('Bear River CDF &  Weibull Fit: Alex Weech 2/19/19');
nf = length(xf);
cdfw_flow(nf)= 0;
for i = 2:nf
    cdfw_flow(i) = cdfw_flow(i-1) + pdfw_flow(i)/pdf_sum;
end
cdfw_flow(nf+1) = 1;
grid on

plot(yf,cdfw_flow,'g');

%create quantile-quantile plot for weibull for klamath flow
%see wilks
cdfw = .001:.001:0.999;
% compute quantile values for a weibull fit to the data
qw = beta * (-log(1-cdfw)).^(1/alpha);

% now need to guestimate the empirical CDF
flows = sort(flow);
lth = length(flow);
id = 1:lth;
%this is called the median estimate of the empirical CDF
rm = (id-0.3)/(lth+0.4);
% now compute quantile values for empirical CDF
qe = beta * (-log(1-rm)).^(1/alpha);

figure(13)
subplot(1,2,1)
% plotting a straight line which would be where the points
% should line up if a weibull fit is really appropriate
loglog(qw,qw,'g')
grid on
hold on
% plot the empirical estimates vs those observed
loglog(qe,flows,'x')
axis([100 10000 100 10000]);
xlabel('Weibull Estimate of Peak flow');
ylabel('Observed Peak Flow (ft^3/s)');
title('Bear River Quantile-Quantile with Weibull Fit: 2/19/19');


%create probability-probability plot for weibull for klamath flow
%see wilks
subplot(1,2,2)
% plotting a straight line which would be where the points
% should line up if a weibull fit is really appropriate

loglog(cdfw,cdfw,'g')
```

```
hold on
grid on
%need to interpolate the empirical cdf to the values observed
opc = interp1q(yf',cf',flows);

loglog(rm,opc,'x')
axis([.001 1 .001 1])
xlabel('Weibull Probability Estimate');
ylabel('Observed Probability');
title('Bear River Prob-Prob Plot with Weibull Fit: 2/19/19');

figure(11)
% add some guestimates for one in a hundred year floods
%  weibull fit value for the one in hundred event
qw99 = beta * (-log(1-0.99)).^(1/alpha);
line([1910 2018],[qw99 qw99],'Color',[0,1,0]);
%to get the empirical 1 in 100 event
% need to interpolate  from the empirical cdf
emp99 = interp1q(cf',yf',.99);
line([1910 2018],[emp99 emp99],'Color',[0,0,1]);

%find months where greater than a 1 in a hundred chance according to
%empirical fit
g99e = find(flow>=emp99);
g99_em(:,1) = yr(g99e);
g99_em(:,2) = mon(g99e);
g99_em(:,3) = flow(g99e);
%find months where greater than a 1 in a hundred chance according to
 the
%weibull fit
g99w = find(flow>=emp99);
g99_we(:,1) = yr(g99w);
g99_we(:,2) = mon(g99w);
g99_we(:,3) = flow(g99w);
```

Question 4

```
idx99p = find(flow >= emp99);
em99 = zeros(length(idx99p), 3);
em99(:, 1) = yr(idx99p);
em99(:, 2) = mon(idx99p);
em99(:, 3) = flow(idx99p);

idx99p = find(flow >= qw99);
we99 = zeros(length(idx99p), 3);
we99(:, 1) = yr(idx99p);
we99(:, 2) = mon(idx99p);
we99(:, 3) = flow(idx99p);

disp(sortrows(em99, 3));
disp(sortrows(we99, 3));
```

Question 5

```
qw05 = beta * (-log(.95)).^(1/alpha);
emp05 = interp1q(cf', yf', .05);

idx5p = find(flow <= emp05);
em5 = zeros(length(idx5p), 3);
em5(:, 1) = yr(idx5p);
em5(:, 2) = mon(idx5p);
em5(:, 3) = flow(idx5p);

idx5p = find(flow <= qw05);
we5 = zeros(length(idx5p), 3);
we5(:, 1) = yr(idx5p);
we5(:, 2) = mon(idx5p);
we5(:, 3) = flow(idx5p);

disp(sortrows(em5, 3));
disp(sortrows(we5, 3));
```

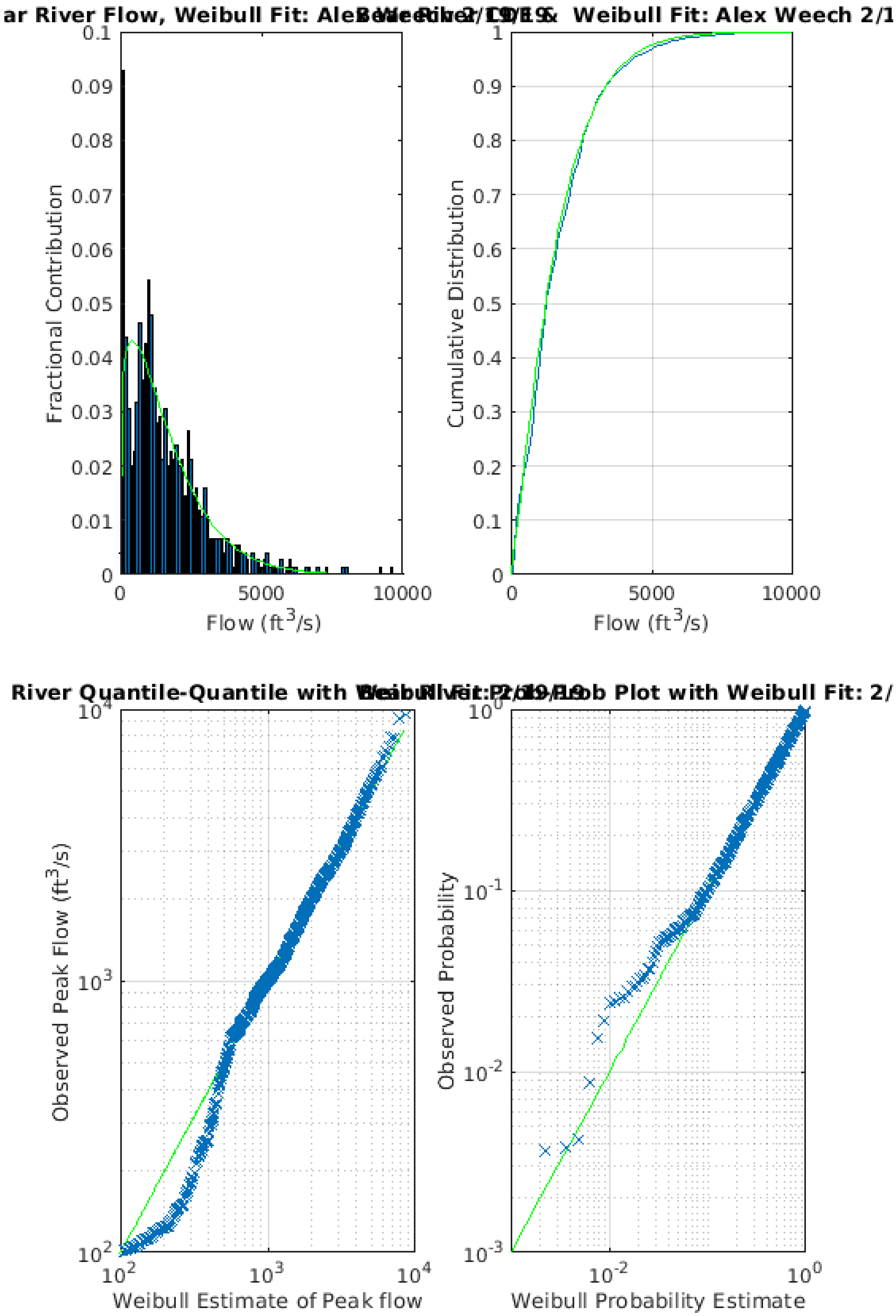
```
 Alex Weech
 ATMOS 6040/ Spring 2019
 Chapter 3
 hundred year flood on Bear River
requires bear_river_corinne.csv
requires weibullparam.m
        1986           6         6645
        1984           4         6690
        1986           4         7037
        1985           4         7258
        1983           6         7898
        1986           5         7952
        1984           6         9201
        1984           5         9598

        1971           6         6092
        1983           5         6173
        1986           6         6645
        1984           4         6690
        1986           4         7037
        1985           4         7258
        1983           6         7898
        1986           5         7952
        1984           6         9201
        1984           5         9598

   1.0e+03 *

    2.0030    0.0070    0.0404
    2.0040    0.0070    0.0430
    2.0040    0.0080    0.0468
    2.0030    0.0080    0.0503
    1.9920    0.0080    0.0552
```

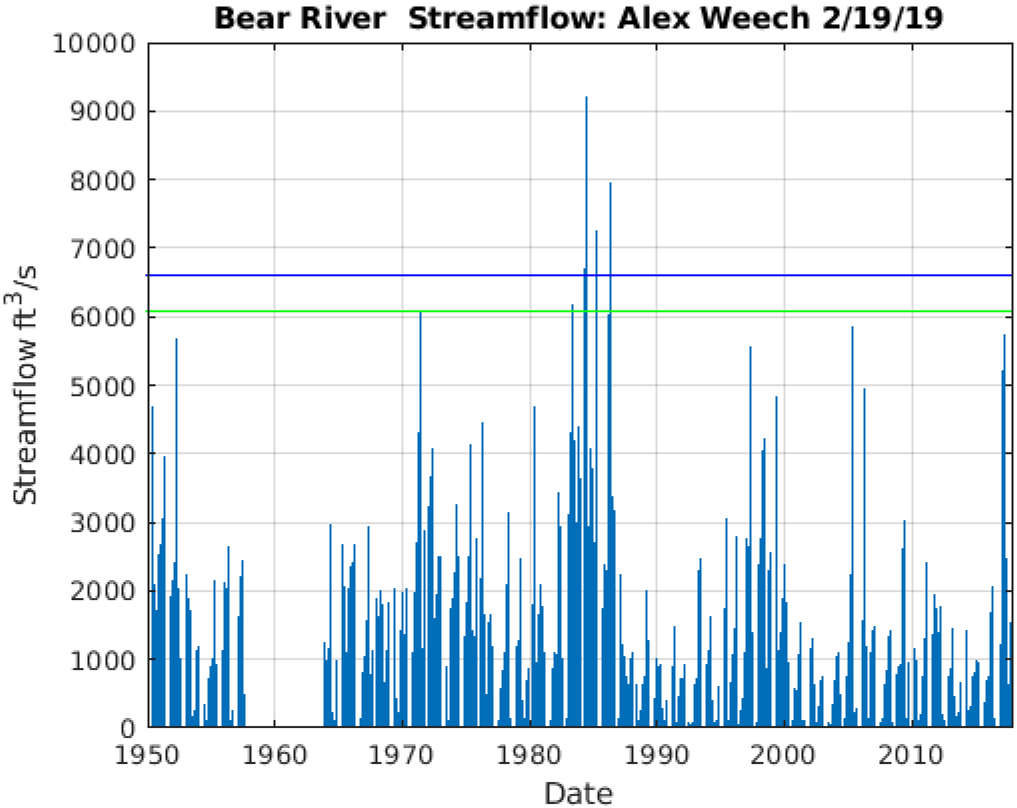
1.9920	0.0090	0.0622
2.0020	0.0080	0.0665
1.9920	0.0050	0.0718
1.9940	0.0070	0.0723
2.0010	0.0090	0.0730
1.9940	0.0080	0.0735
2.0070	0.0080	0.0756
2.0070	0.0070	0.0773
1.9920	0.0060	0.0776
1.9640	0.0080	0.0796
1.9920	0.0070	0.0809
2.0030	0.0060	0.0809
2.0020	0.0070	0.0822
2.0080	0.0070	0.0852
2.0080	0.0080	0.0855
1.9660	0.0080	0.0887
1.9910	0.0070	0.0919
1.9920	0.0100	0.0956
1.9910	0.0080	0.0984

*1.0e+03 **

2.0030	0.0070	0.0404
2.0040	0.0070	0.0430
2.0040	0.0080	0.0468
2.0030	0.0080	0.0503
1.9920	0.0080	0.0552
1.9920	0.0090	0.0622
2.0020	0.0080	0.0665
1.9920	0.0050	0.0718
1.9940	0.0070	0.0723
2.0010	0.0090	0.0730
1.9940	0.0080	0.0735
2.0070	0.0080	0.0756
2.0070	0.0070	0.0773
1.9920	0.0060	0.0776
1.9640	0.0080	0.0796
1.9920	0.0070	0.0809
2.0030	0.0060	0.0809
2.0020	0.0070	0.0822
2.0080	0.0070	0.0852
2.0080	0.0080	0.0855
1.9660	0.0080	0.0887
1.9910	0.0070	0.0919
1.9920	0.0100	0.0956
1.9910	0.0080	0.0984
1.9700	0.0080	0.1019
1.9810	0.0080	0.1020
1.9940	0.0090	0.1029
2.0000	0.0080	0.1032
1.9880	0.0080	0.1047
1.9770	0.0070	0.1049
2.0000	0.0070	0.1051
1.9900	0.0080	0.1064

2.0070	*0.0060*	*0.1073*
1.9700	*0.0070*	*0.1081*
2.0010	*0.0080*	*0.1102*
2.0010	*0.0070*	*0.1111*
2.0030	*0.0090*	*0.1119*
2.0160	*0.0080*	*0.1122*
1.9660	*0.0070*	*0.1123*
1.9680	*0.0070*	*0.1132*
1.9540	*0.0080*	*0.1133*
1.9950	*0.0080*	*0.1145*
2.0100	*0.0080*	*0.1177*
2.0140	*0.0070*	*0.1177*
1.9550	*0.0070*	*0.1184*
2.0010	*0.0060*	*0.1205*
1.9660	*0.0060*	*0.1209*
2.0100	*0.0070*	*0.1217*
1.9540	*0.0070*	*0.1226*
1.9900	*0.0070*	*0.1226*
2.0060	*0.0070*	*0.1226*
2.0120	*0.0080*	*0.1238*
1.9880	*0.0070*	*0.1241*
1.9560	*0.0070*	*0.1251*
1.9640	*0.0090*	*0.1252*
1.9690	*0.0080*	*0.1254*
1.9730	*0.0080*	*0.1285*
1.9810	*0.0070*	*0.1300*
1.9960	*0.0080*	*0.1308*
2.0040	*0.0090*	*0.1315*
1.9940	*0.0060*	*0.1347*
2.0160	*0.0070*	*0.1362*
2.0150	*0.0080*	*0.1375*
1.9780	*0.0070*	*0.1405*
2.0090	*0.0080*	*0.1431*
1.9660	*0.0090*	*0.1441*
2.0130	*0.0080*	*0.1441*
1.9880	*0.0060*	*0.1445*
1.9770	*0.0060*	*0.1456*
1.9790	*0.0070*	*0.1469*
2.0130	*0.0060*	*0.1489*
1.9790	*0.0080*	*0.1492*
2.0060	*0.0080*	*0.1492*
2.0070	*0.0090*	*0.1501*


Fractional Contribution
Flow (ft^3/s)
Cumulative Distribution
Flow (ft^3/s)
Observed Peak Flow (ft^3/s)
Weibull Estimate of Peak flow
Observed Probability
Weibull Probability Estimate



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