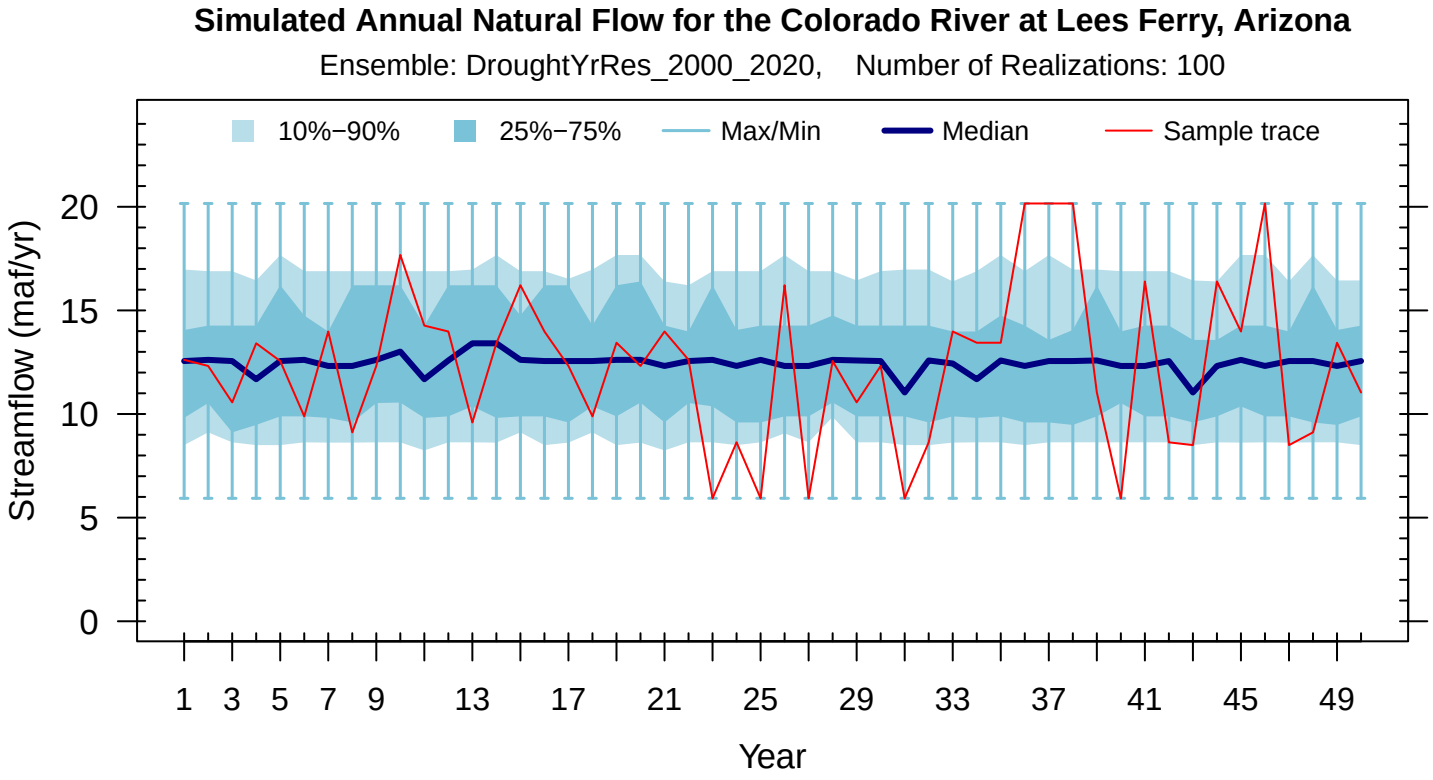
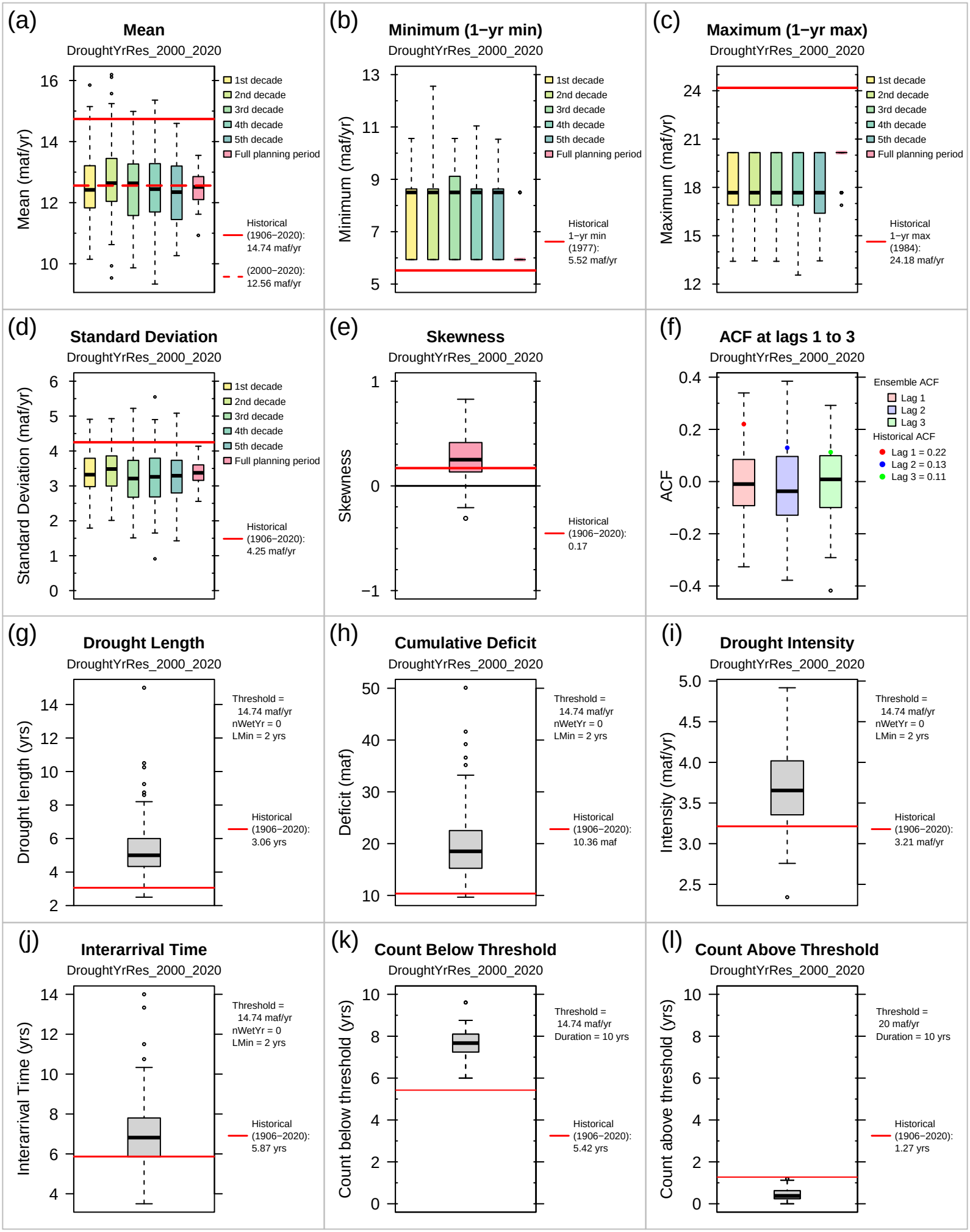
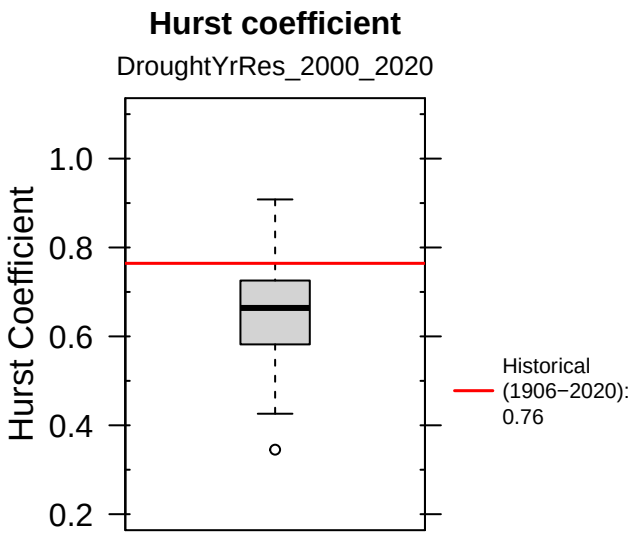
Attributes of Streamflow Ensembles in Colorado River Basin

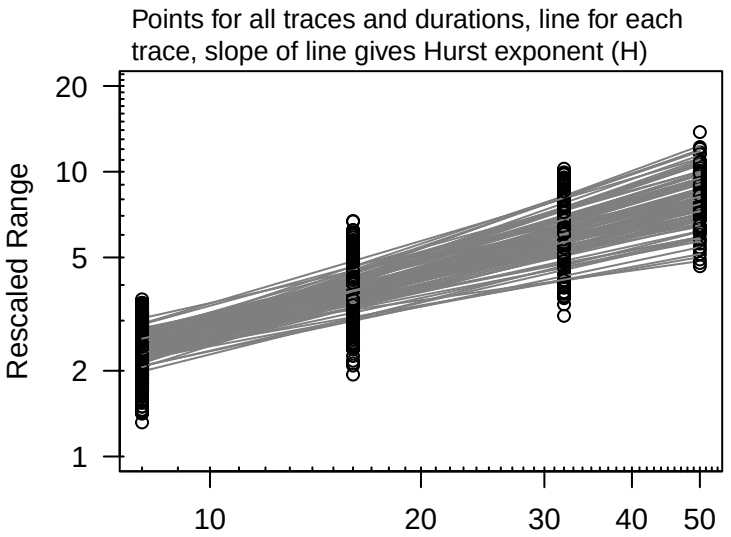
Ensemble: DroughtYrRes_2000_2020
Number of Realizations: 100
Planning Period: Next 50 Years

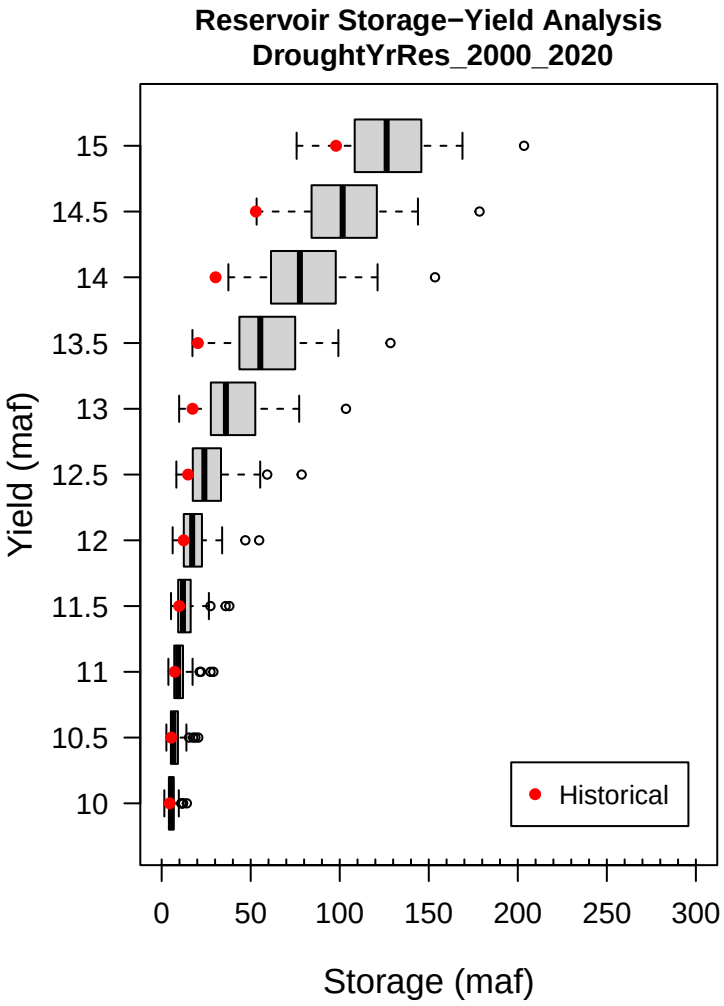


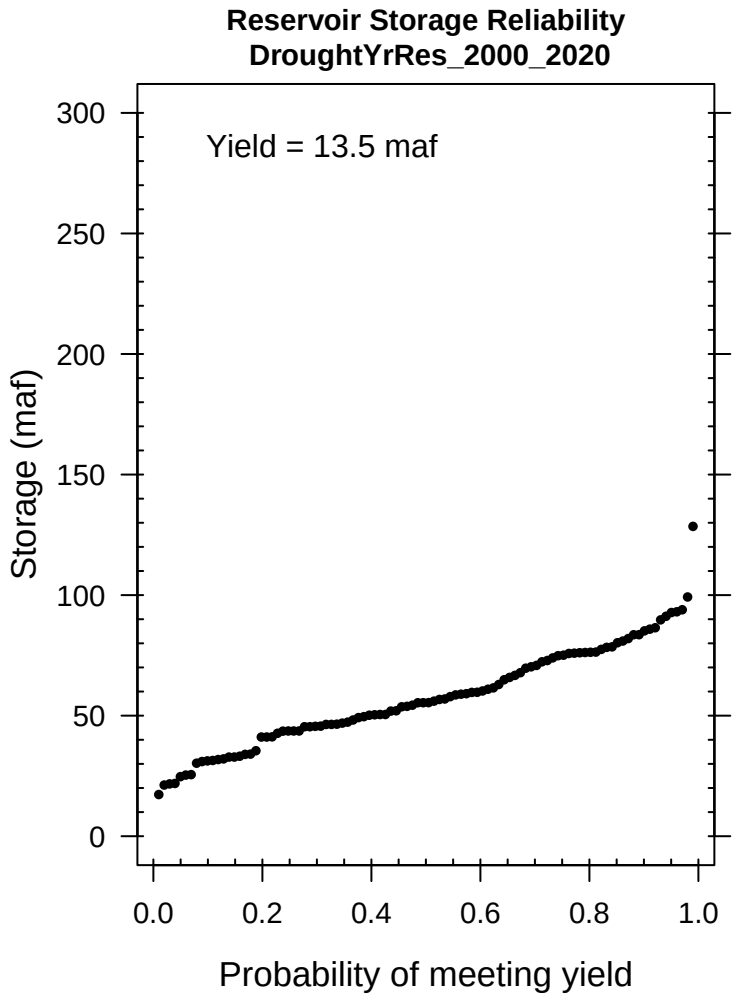
Mann−Kendall Trend Test: Tau = −0.2, P−Value = 0.0558
Trend = −0.0055 maf/yr, Not Statistically Significant

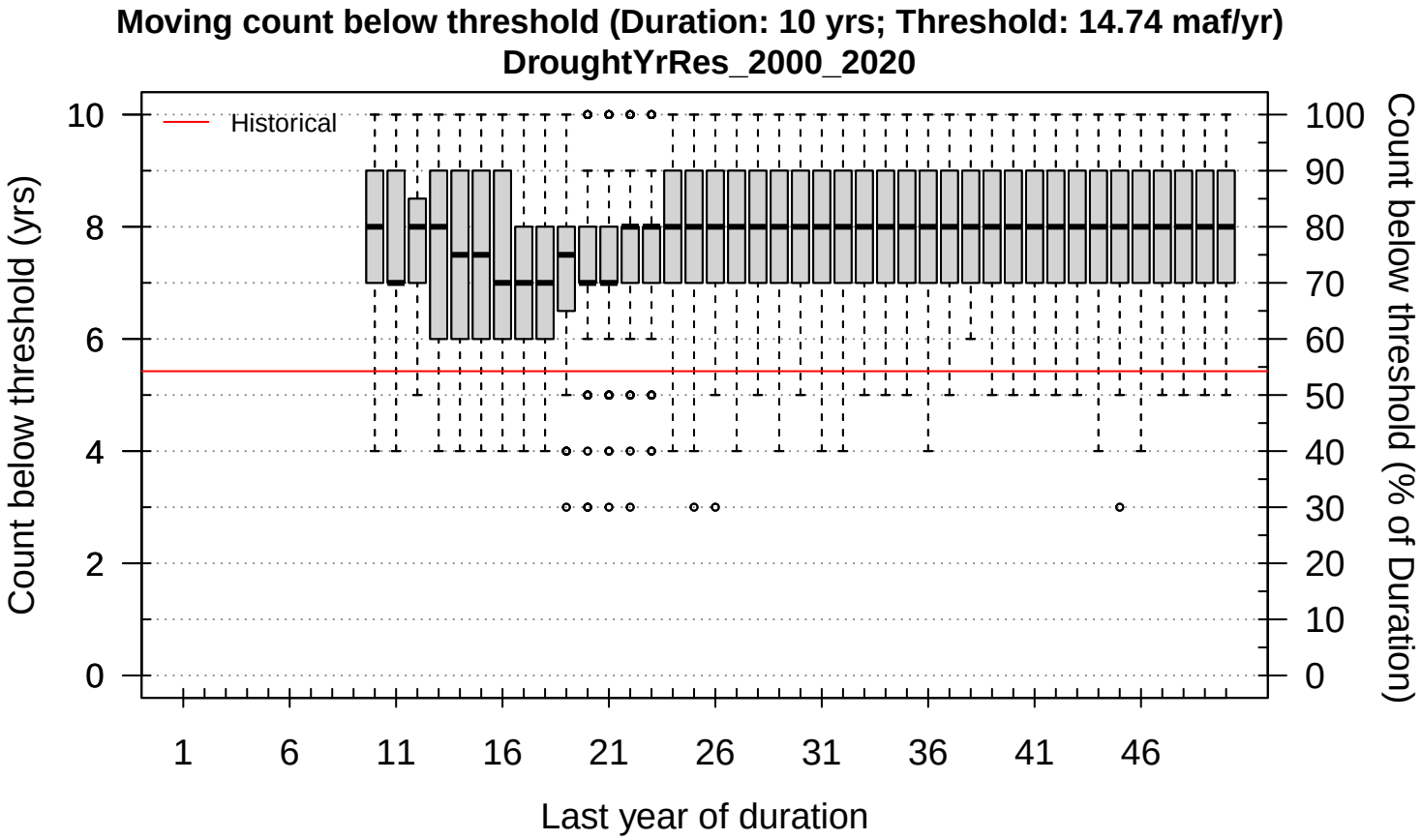

(a)
Mean
DroughtYrRes_2000_2020
Mean (maf/yr)
16
14
12
10
1st decade
2nd decade
3rd decade
4th decade
5th decade
Full planning period
Historical (1906−2020): 14.74 maf/yr
(2000−2020): 12.56 maf/yr
(b)
Minimum (1−yr min)
DroughtYrRes_2000_2020
Minimum (maf/yr)
13
11
9
7
5
1st decade
2nd decade
3rd decade
4th decade
5th decade
Full planning period
Historical 1−yr min (1977): 5.52 maf/yr
(c)
Maximum (1−yr max)
DroughtYrRes_2000_2020
Maximum (maf/yr)
24
21
18
15
12
1st decade
2nd decade
3rd decade
4th decade
5th decade
Full planning period
Historical 1−yr max (1984): 24.18 maf/yr
(d)
Standard Deviation
DroughtYrRes_2000_2020
Standard Deviation (maf/yr)
6
5
4
3
2
1
0
1st decade
2nd decade
3rd decade
4th decade
5th decade
Full planning period
Historical (1906−2020): 4.25 maf/yr
(e)
Skewness
DroughtYrRes_2000_2020
Skewness
1
0
−1
Historical (1906−2020): 0.17
(f)
ACF at lags 1 to 3
DroughtYrRes_2000_2020
ACF
0.4
0.2
0.0
−0.2
−0.4
Ensemble ACF
Lag 1
Lag 2
Lag 3
Historical ACF
Lag 1 = 0.22
Lag 2 = 0.13
Lag 3 = 0.11
(g)
Drought Length
DroughtYrRes_2000_2020
Drought length (yrs)
14
12
10
8
6
4
2
Threshold = 14.74 maf/yr
nWetYr = 0
LMin = 2 yrs
Historical (1906−2020): 3.06 yrs
(h)
Cumulative Deficit
DroughtYrRes_2000_2020
Deficit (maf)
50
40
30
20
10
Threshold = 14.74 maf/yr
nWetYr = 0
LMin = 2 yrs
Historical (1906−2020): 10.36 maf
(i)
Drought Intensity
DroughtYrRes_2000_2020
Intensity (maf/yr)
5.0
4.5
4.0
3.5
3.0
2.5
Threshold = 14.74 maf/yr
nWetYr = 0
LMin = 2 yrs
Historical (1906−2020): 3.21 maf/yr
(j)
Interarrival Time
DroughtYrRes_2000_2020
Interarrival Time (yrs)
14
12
10
8
6
4
Threshold = 14.74 maf/yr
nWetYr = 0
LMin = 2 yrs
Historical (1906−2020): 5.87 yrs
(k)
Count Below Threshold
DroughtYrRes_2000_2020
Count below threshold (yrs)
10
8
6
4
2
0
Threshold = 14.74 maf/yr
Duration = 10 yrs
Historical (1906−2020): 5.42 yrs
(l)
Count Above Threshold
DroughtYrRes_2000_2020
Count above threshold (yrs)
10
8
6
4
2
0
Threshold = 20 maf/yr
Duration = 10 yrs
Historical (1906−2020): 1.27 yrs

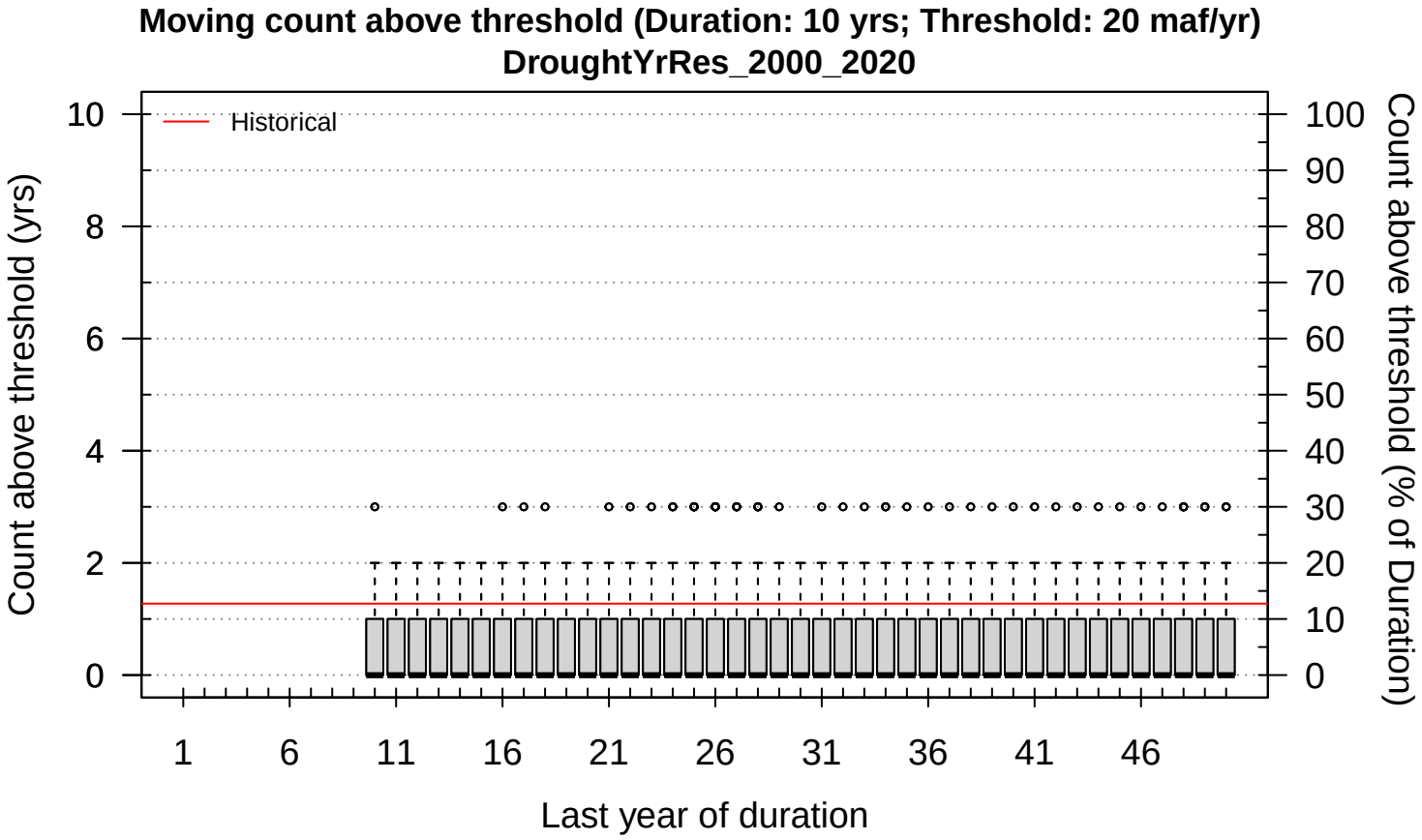

Hurst coefficient
DroughtYrRes_2000_2020
Hurst Coefficient
1.0
0.8
0.6
0.4
0.2
Historical
(1906−2020):
0.76

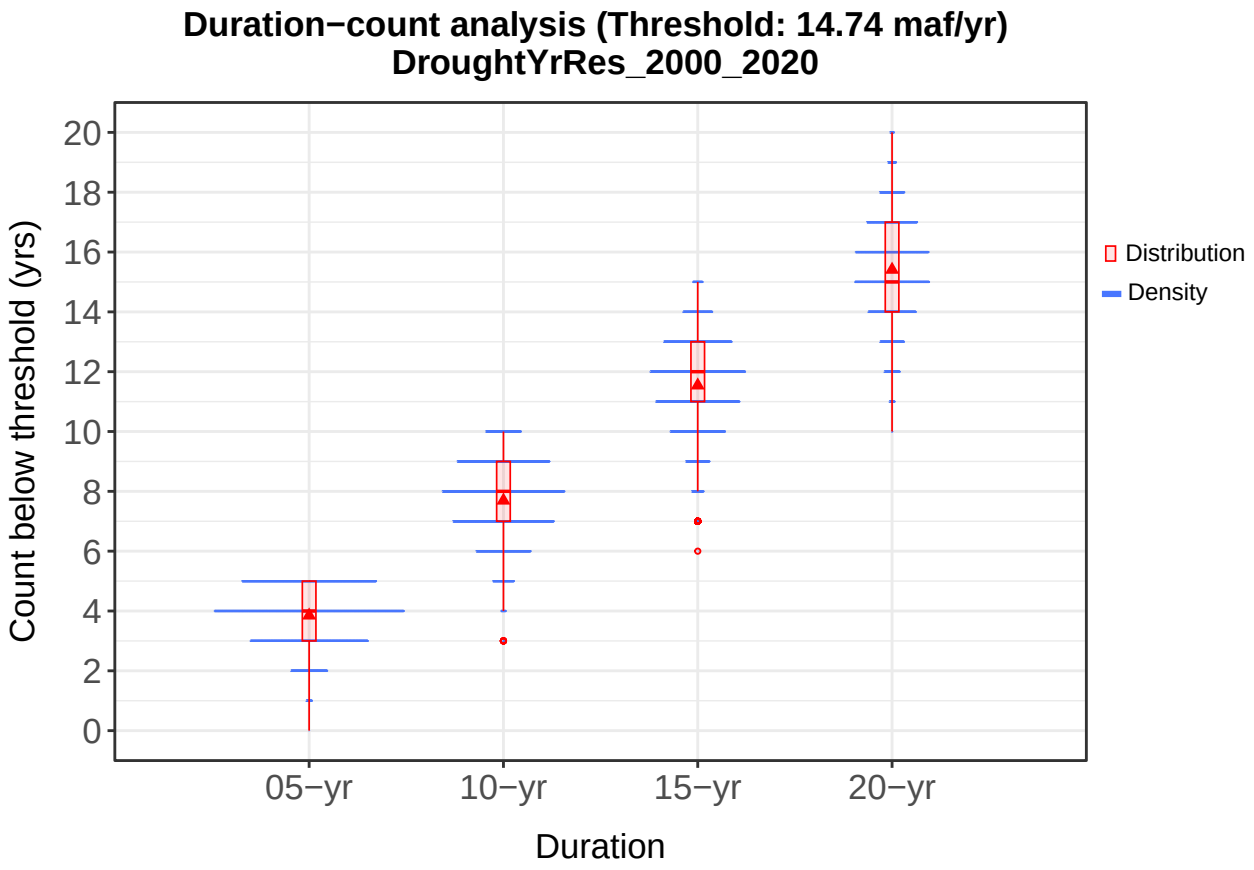

Points for all traces and durations, line for each
trace, slope of line gives Hurst exponent (H)
Rescaled Range
20
10
5
2
1
10
20
30
40
50

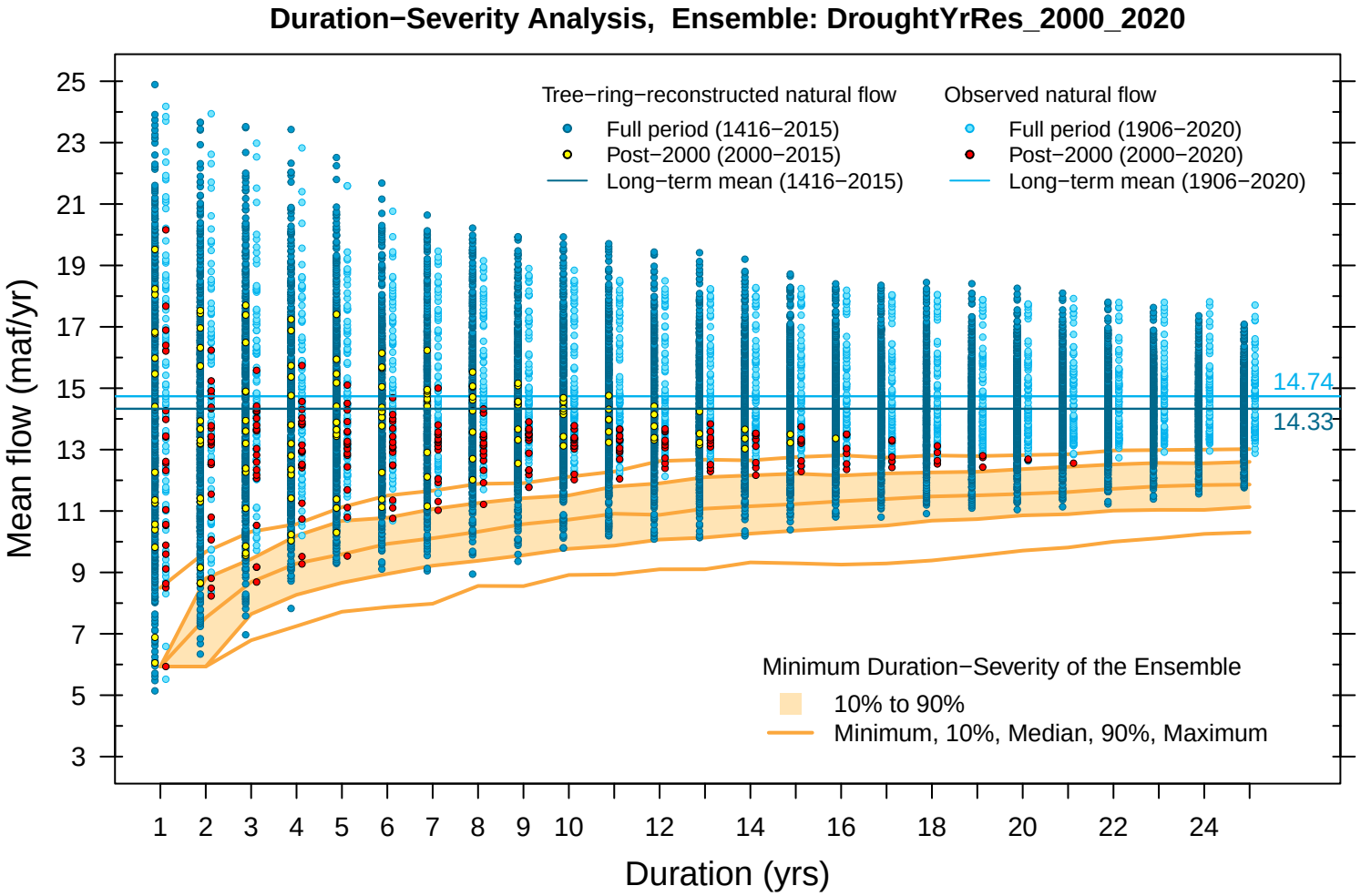

Reservoir Storage−Yield Analysis
DroughtYrRes_2000_2020
Yield (maf)
15
14.5
14
13.5
13
12.5
12
11.5
11
10.5
10
Historical
0
50
100
150
200
250
300
Storage (maf)


Reservoir Storage Reliability
DroughtYrRes_2000_2020
Yield = 13.5 maf
Storage (maf)
300
250
200
150
100
50
0
0.0
0.2
0.4
0.6
0.8
1.0
Probability of meeting yield


Moving count below threshold (Duration: 10 yrs; Threshold: 14.74 maf/yr)
DroughtYrRes_2000_2020
Historical
Count below threshold (yrs)
Count below threshold (% of Duration)
Last year of duration
0
2
4
6
8
10
0
10
20
30
40
50
60
70
80
90
100
1
6
11
16
21
26
31
36
41
46


Moving count above threshold (Duration: 10 yrs; Threshold: 20 maf/yr)
DroughtYrRes_2000_2020
Historical
Count above threshold (yrs)
Count above threshold (% of Duration)
Last year of duration
0
2
4
6
8
10
0
10
20
30
40
50
60
70
80
90
100
1
6
11
16
21
26
31
36
41
46


Duration−count analysis (Threshold: 14.74 maf/yr)
DroughtYrRes_2000_2020
Count below threshold (yrs)
0
2
4
6
8
10
12
14
16
18
20
05−yr
10−yr
15−yr
20−yr
Duration
Distribution
Density


Duration−Severity Analysis, Ensemble: DroughtYrRes_2000_2020
Mean flow (maf/yr)
3
5
7
9
11
13
15
17
19
21
23
25
1
2
3
4
5
6
7
8
9
10
12
14
16
18
20
22
24
Duration (yrs)
Tree−ring−reconstructed natural flow
Full period (1416−2015)
Post−2000 (2000−2015)
Long−term mean (1416−2015)
Observed natural flow
Full period (1906−2020)
Post−2000 (2000−2020)
Long−term mean (1906−2020)
14.74
14.33
Minimum Duration−Severity of the Ensemble
10% to 90%
Minimum, 10%, Median, 90%, Maximum