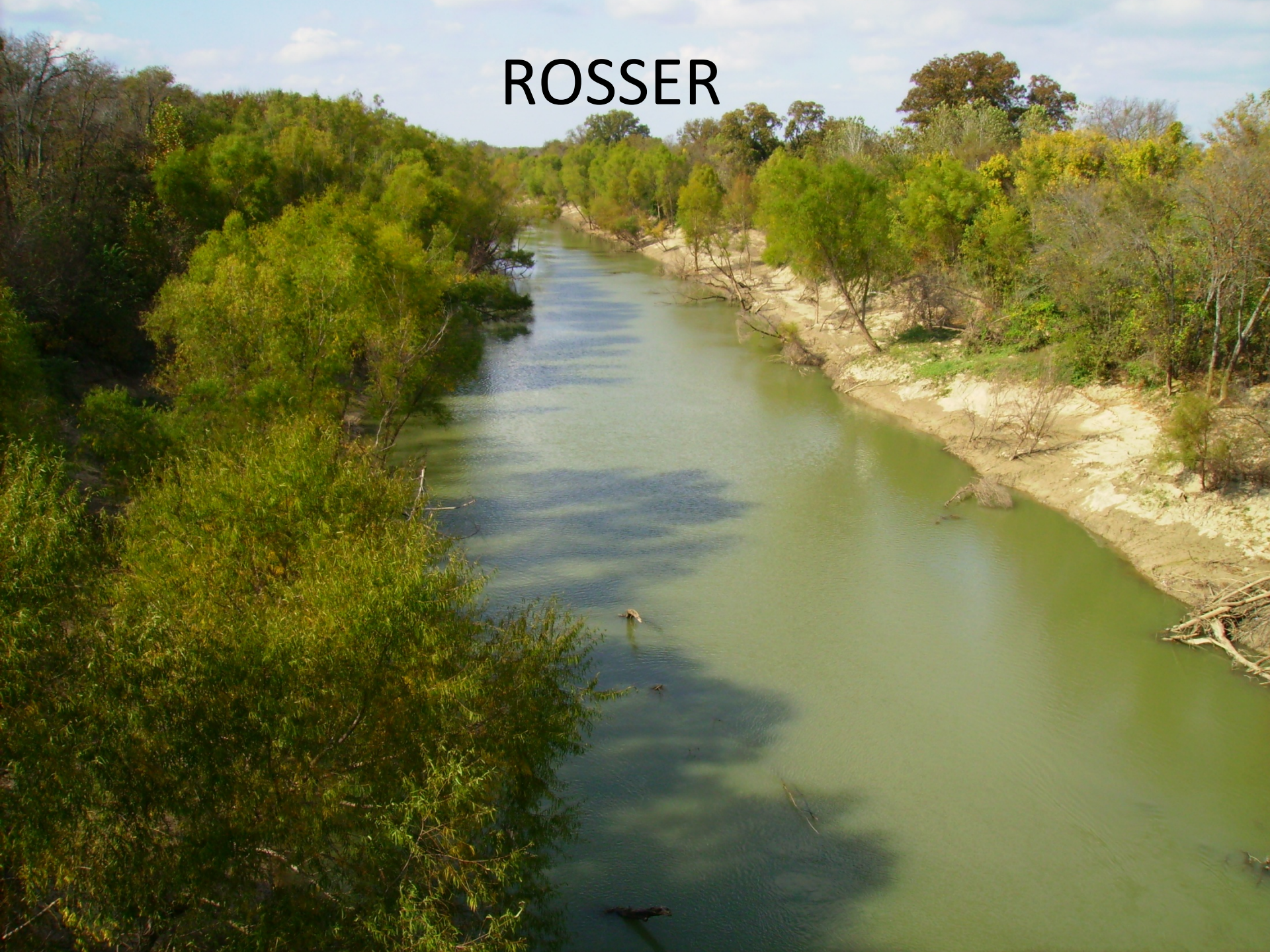
TRINITY RIVER PAST & PRESENT

CONFIDENCE/UNCERTAINTY

REGION H TARGETS

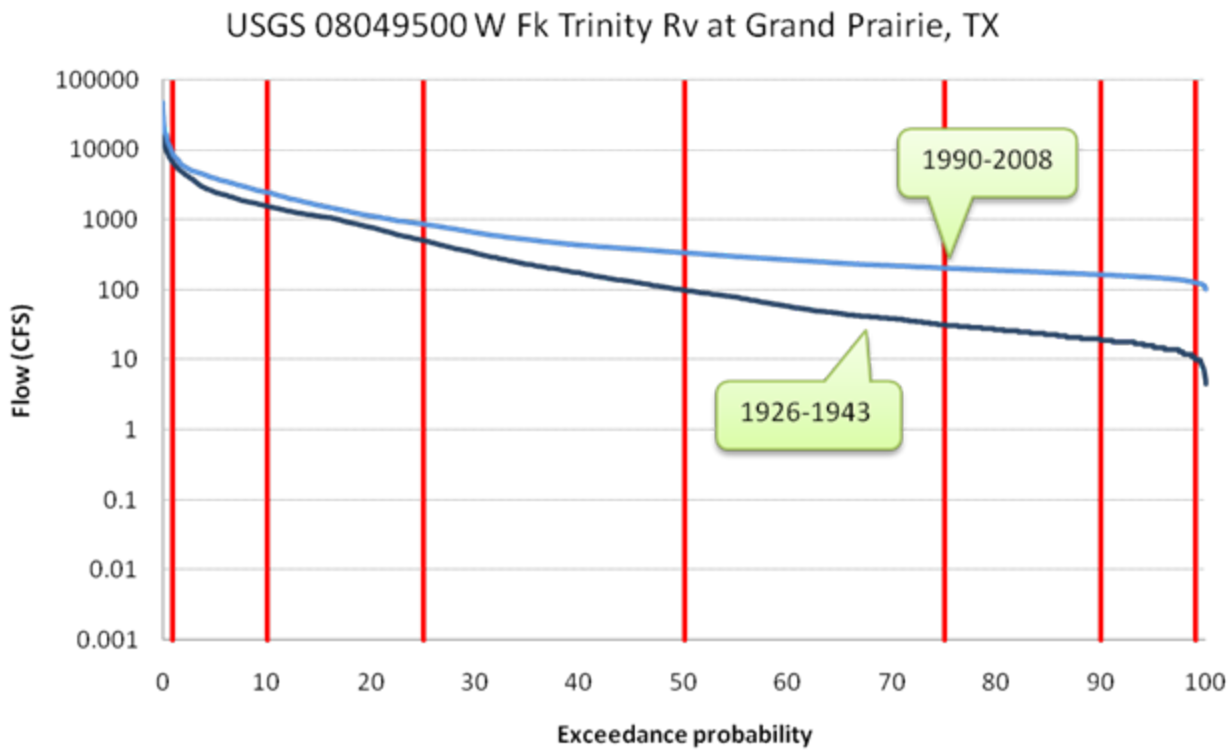
Richard Browning

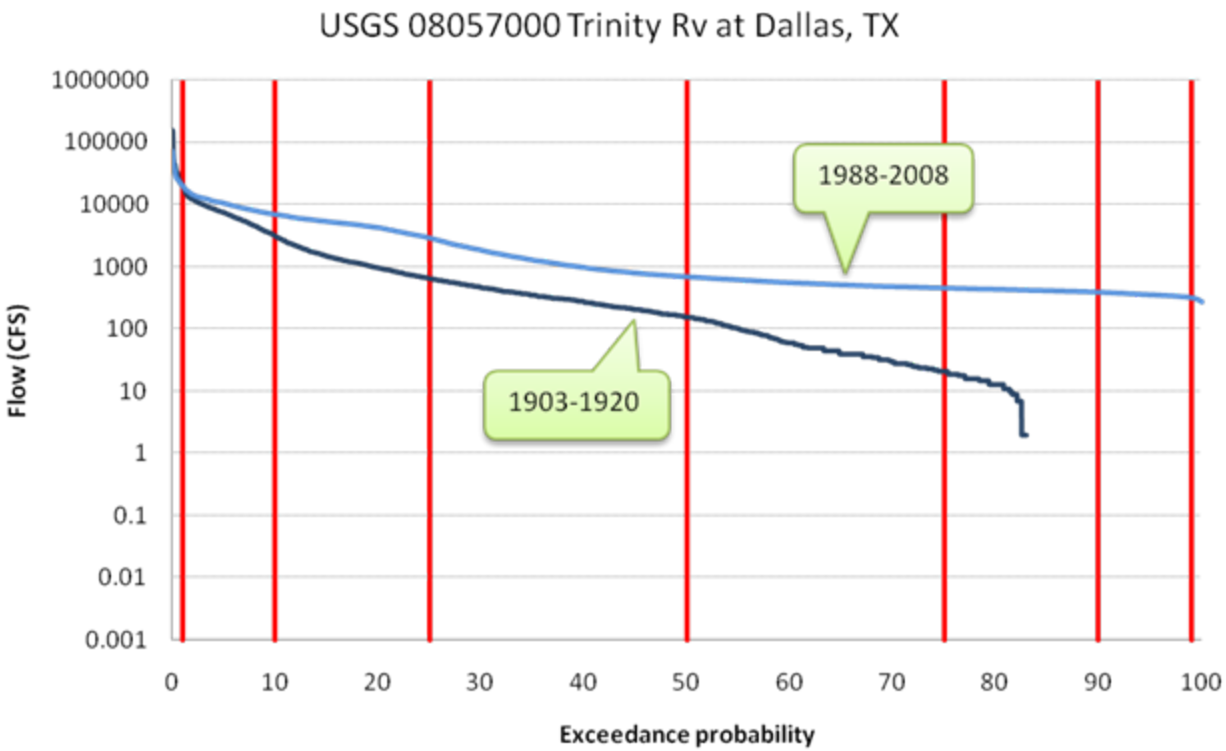
Trinity River Authority of Texas

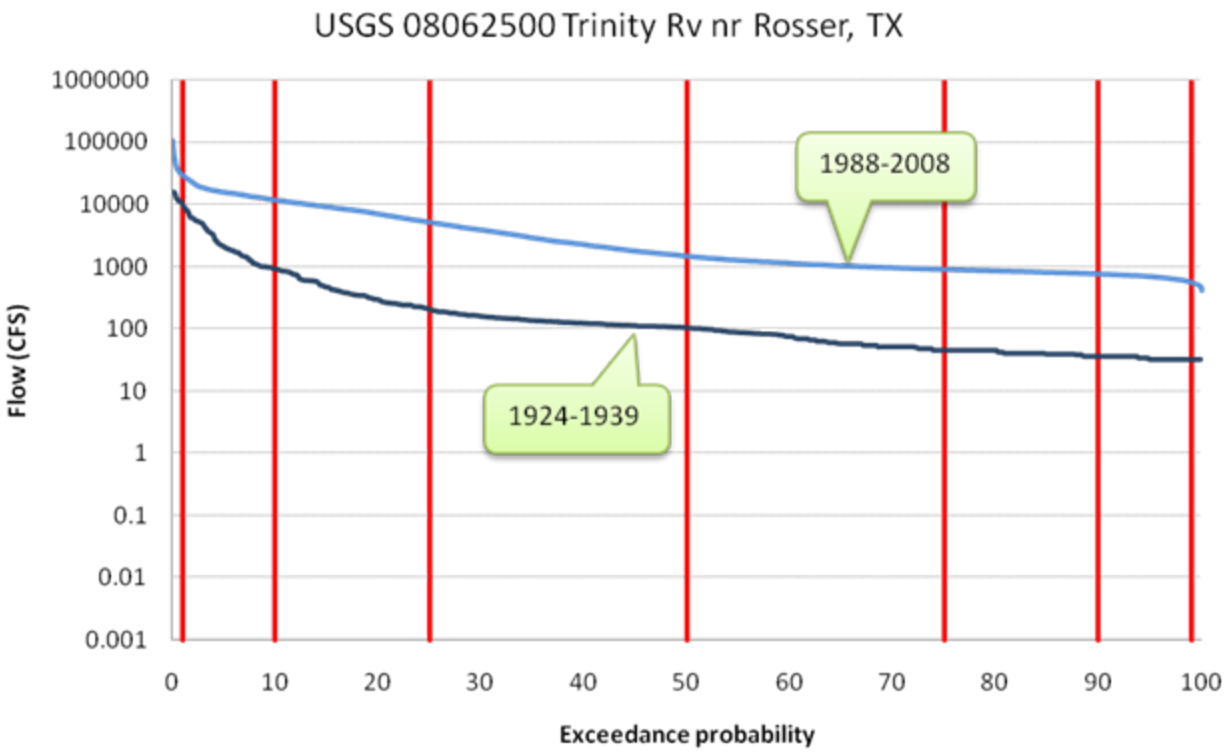

ROSSER

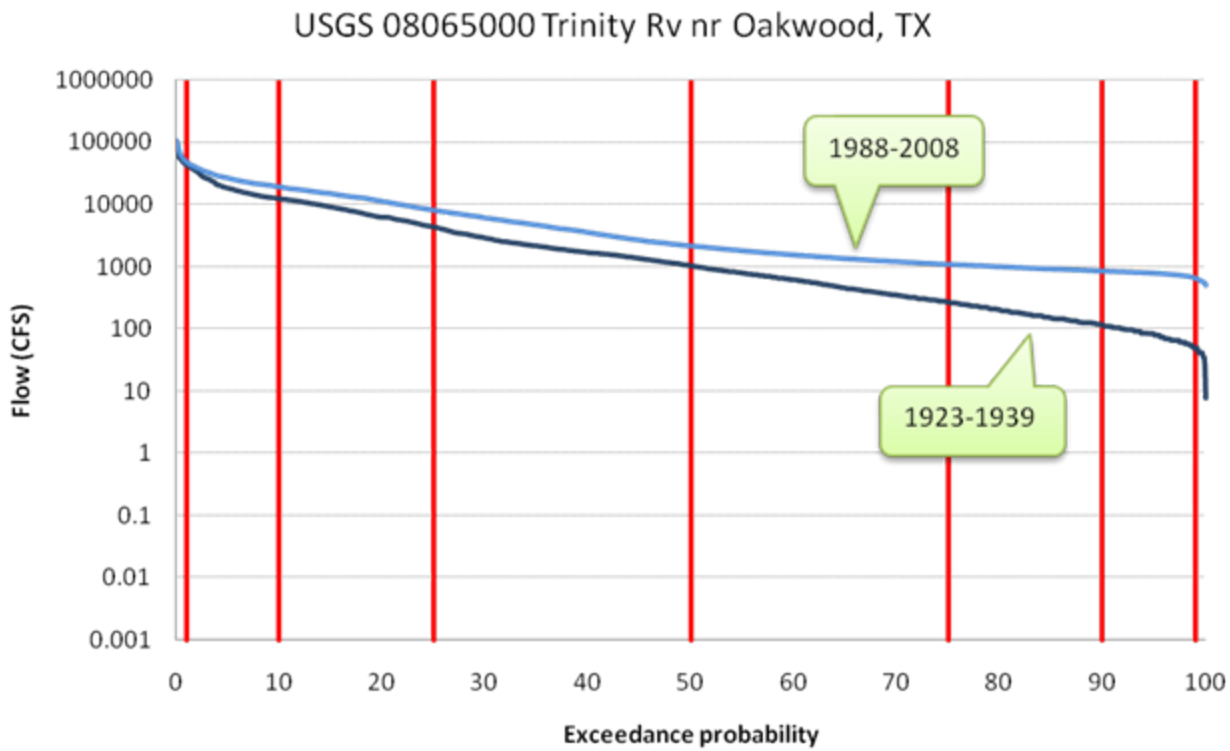
TRINIDAD

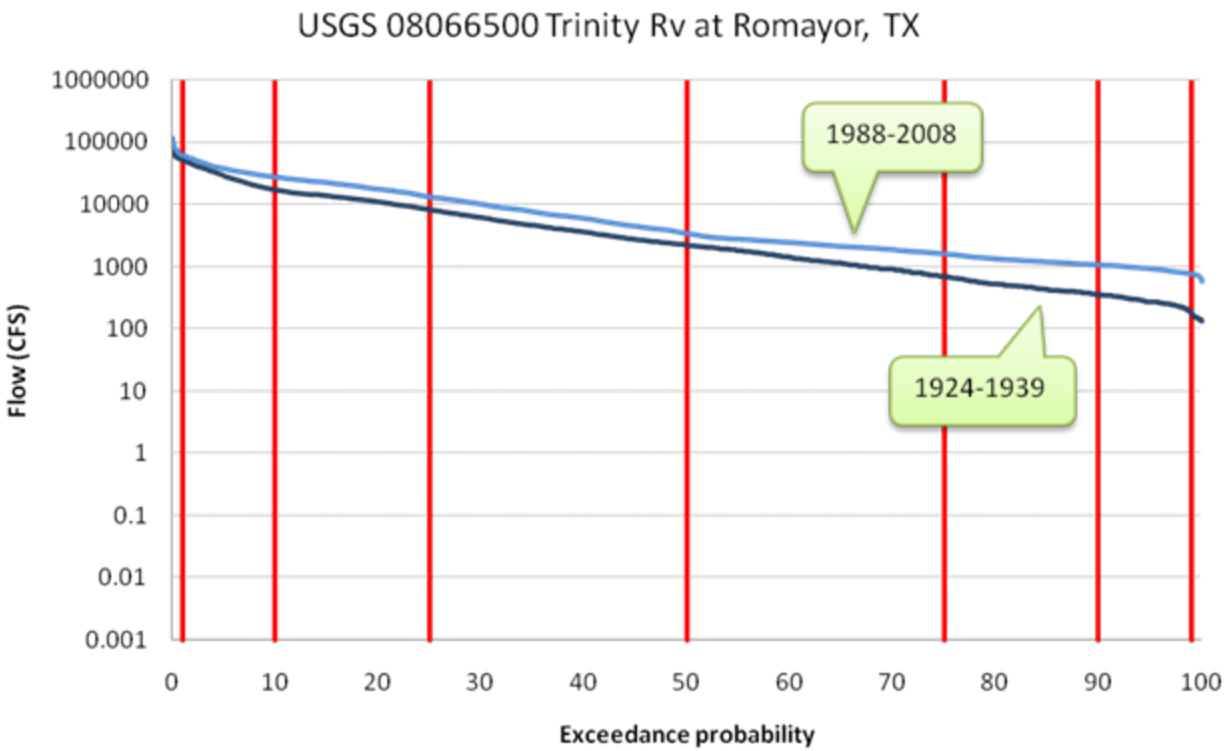
OAKWOOD


USGS 08049500 W Fk Trinity Rv at Grand Prairie, TX
100000
10000
1000
100
10
1
0.1
0.01
0.001
Flow (CFS)
0
10
20
30
40
50
60
70
80
90
100
Exceedance probability
1990-2008
1926-1943

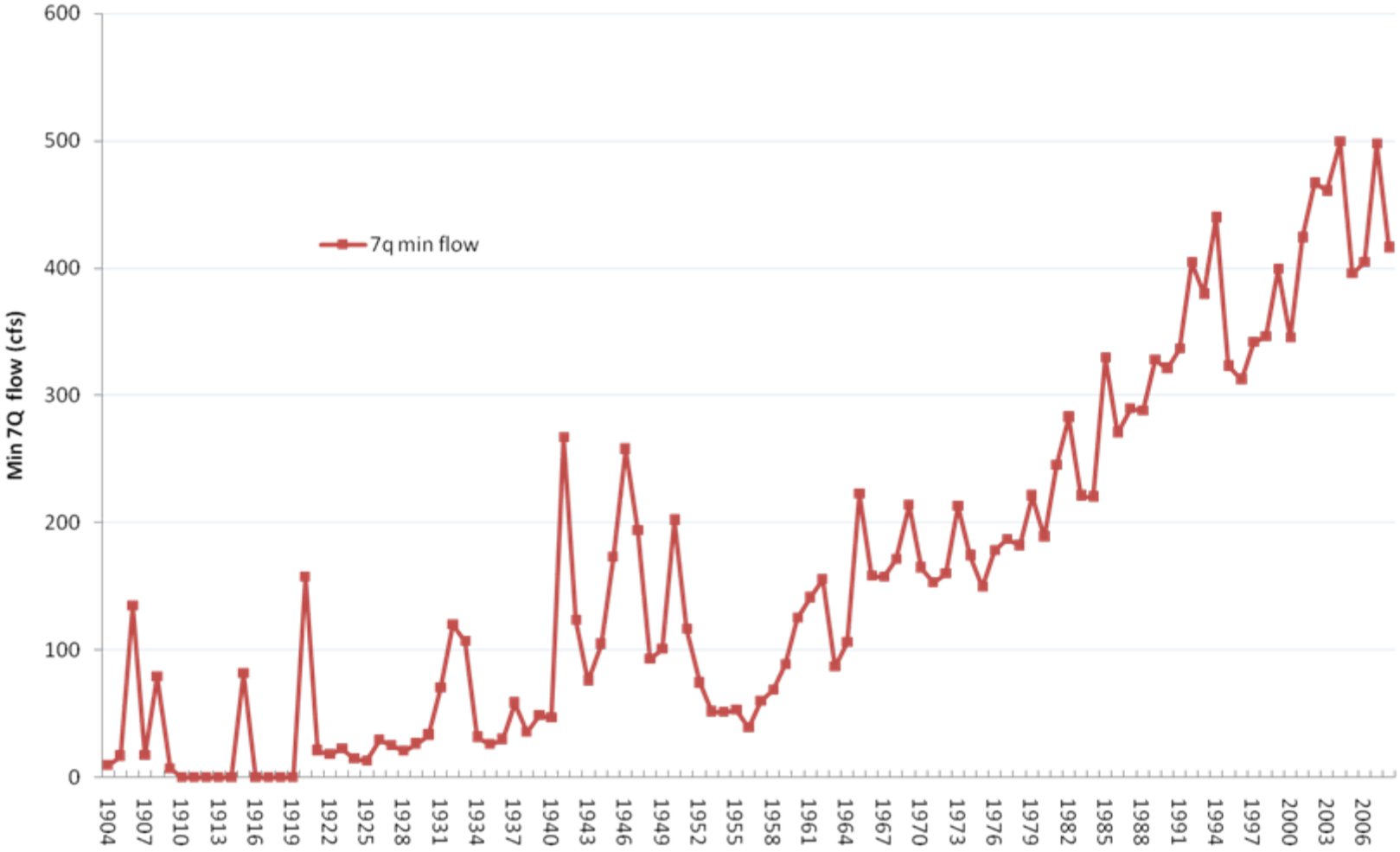

USGS 08057000 Trinity Rv at Dallas, TX
1988-2008
1903-1920
Flow (CFS)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0
10
20
30
40
50
60
70
80
90
100
Exceedance probability

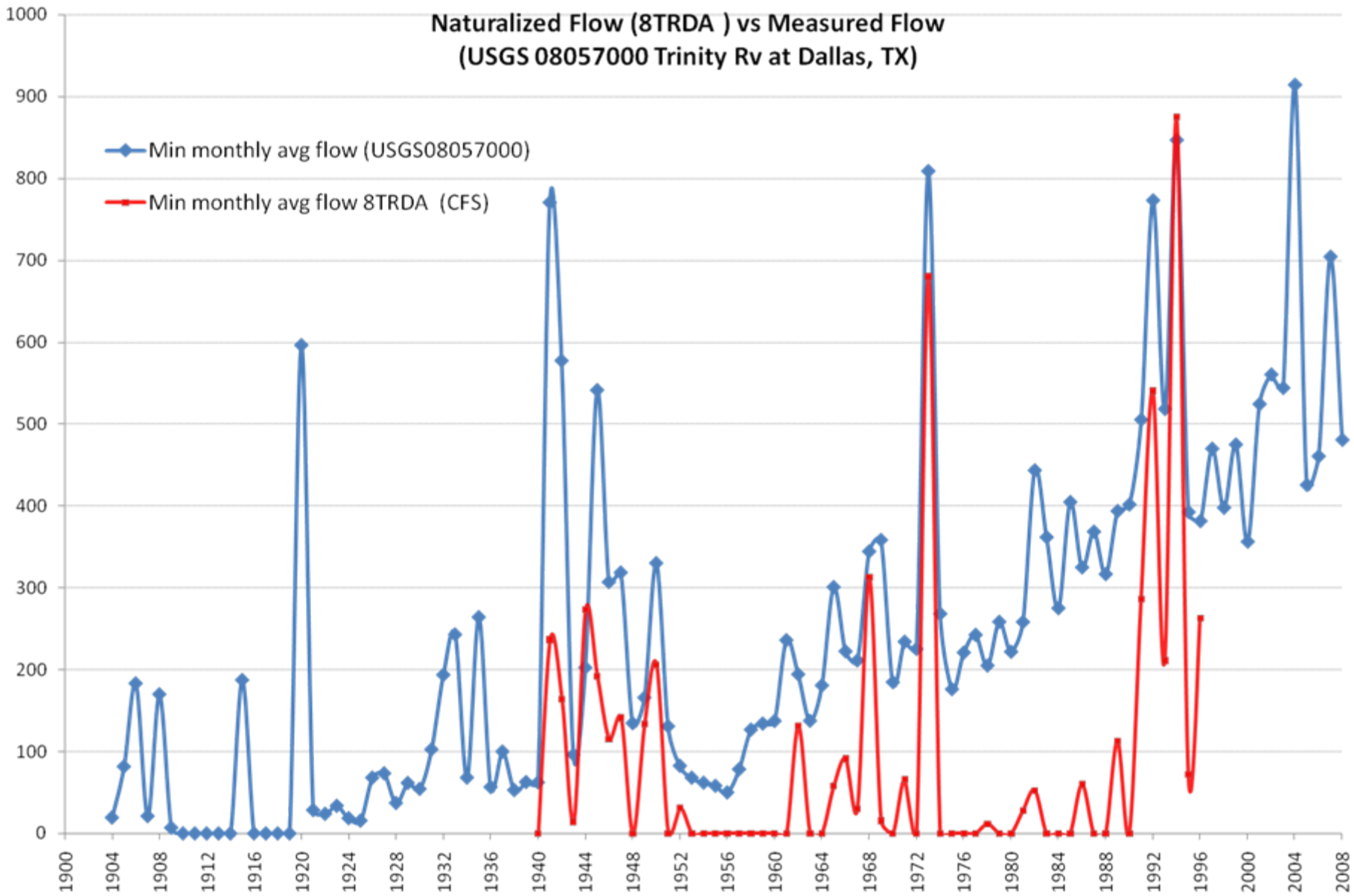

USGS 08062500 Trinity Rv nr Rosser, TX
1988-2008
1924-1939
Flow (CFS)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0
10
20
30
40
50
60
70
80
90
100
Exceedance probability


USGS 08065000 Trinity Rv nr Oakwood, TX
1988-2008
1923-1939
Flow (CFS)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0
10
20
30
40
50
60
70
80
90
100
Exceedance probability


USGS 08066500 Trinity Rv at Romayor, TX
1988-2008
1924-1939
Flow (CFS)
1000000
100000
10000
1000
100
10
1
0.1
0.01
0.001
0
10
20
30
40
50
60
70
80
90
100
Exceedance probability

USGS 08057000 Trinity Rv at Dallas, TX




Naturalized Flow (8TRDA) vs Measured Flow
(USGS 08057000 Trinity Rv at Dallas, TX)
Min monthly avg flow (USGS08057000)
Min monthly avg flow 8TRDA (CFS)
1000
900
800
700
600
500
400
300
200
100
0
1900
1904
1908
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
2004
2008

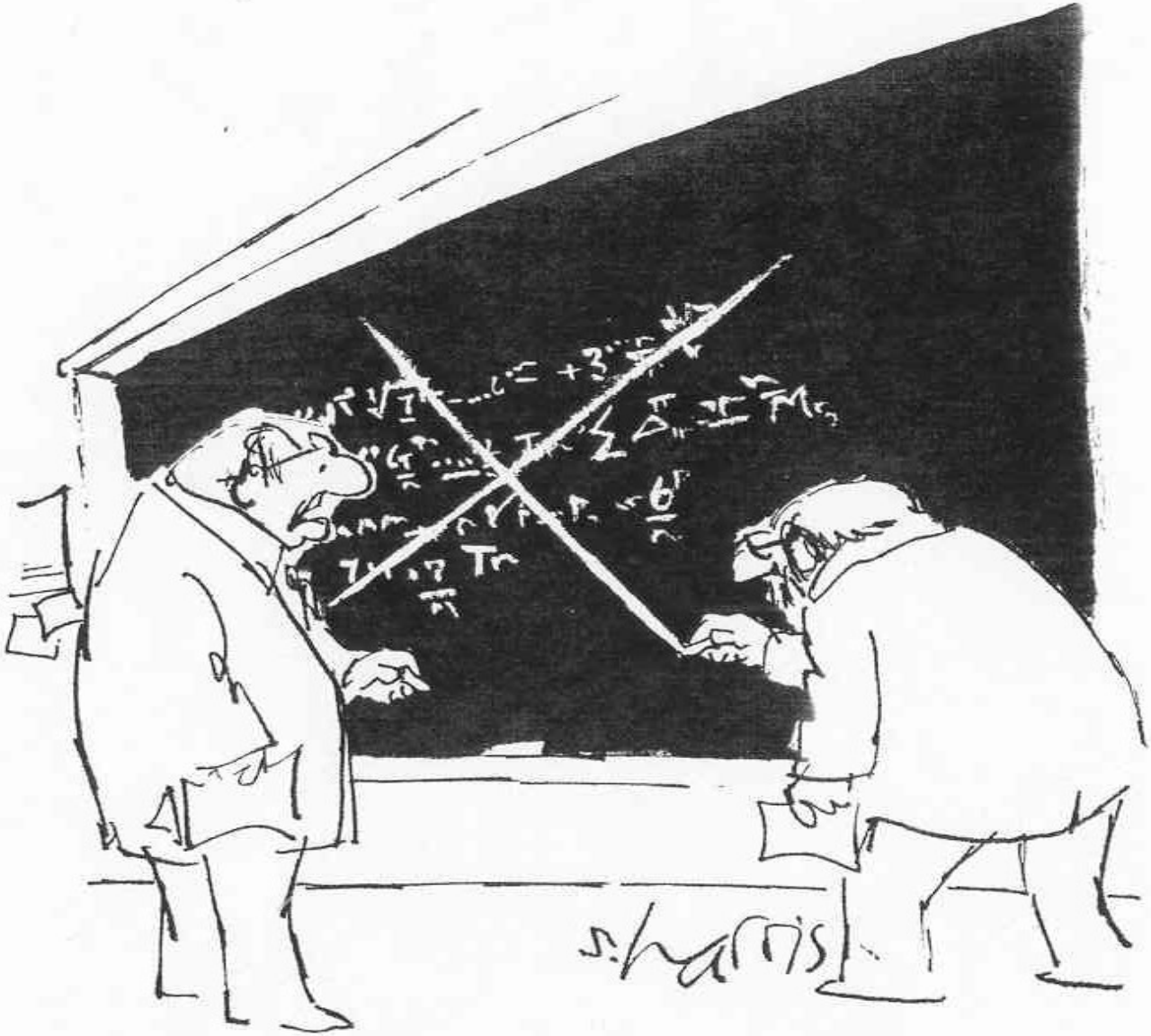
PAST & PRESENT

- (MAIN STEM – MID BASIN)
- SIMILAR CHANNEL
- FLOWS DIFFERENT
- SURPRISED NOT MORE DIFFERENT
- MUST CONSIDER BOTH

NATURALIZED & PRESENT

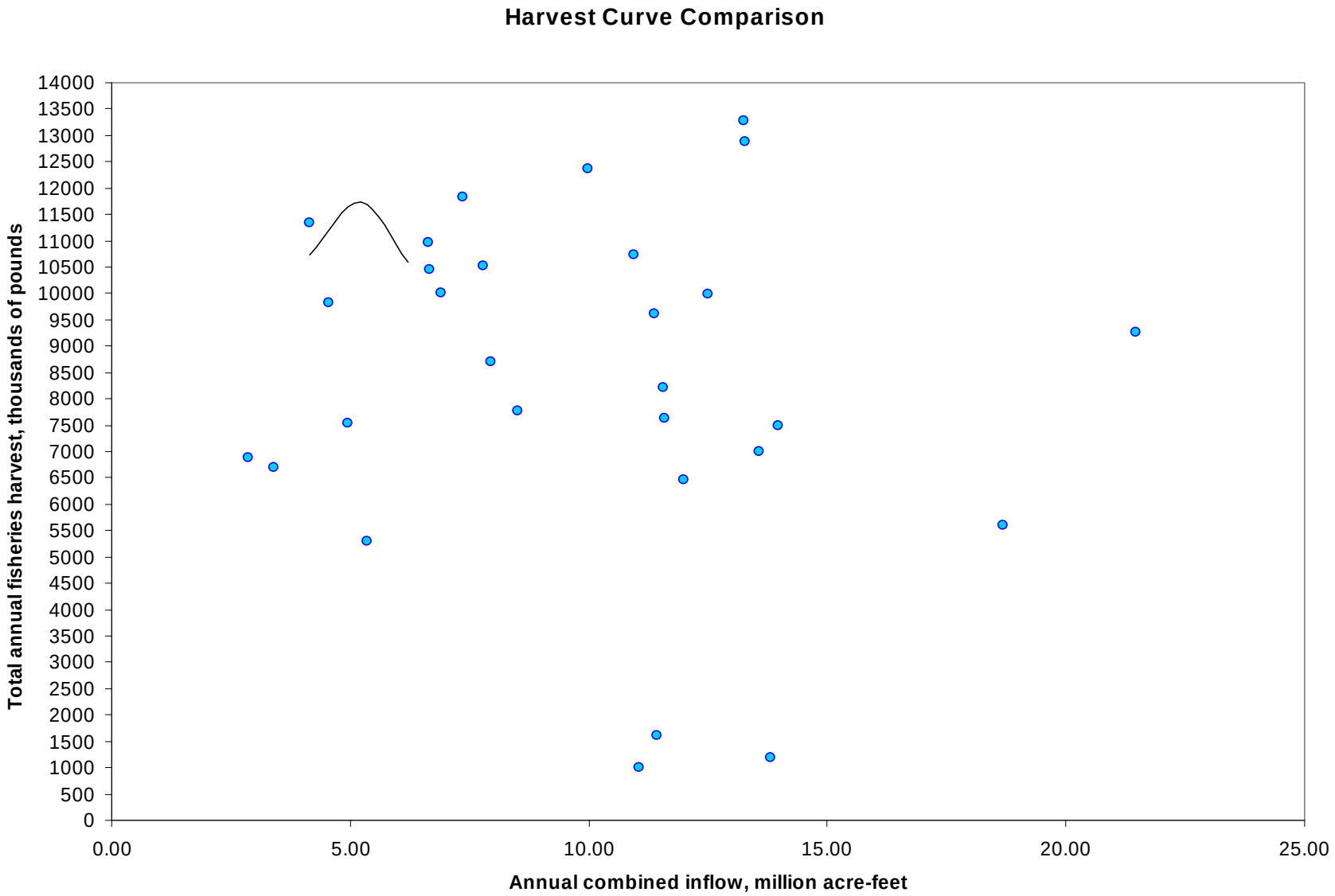
REVIEW OF STATE METHODOLOGY (B&E)

- DALLAS, HOUSTON, NTMWD, TRWD, TRA
- ESPEY CONS. , DR. GEO. WARD
- 3 REPORTS
- REVIEW TO UNDERSTAND



"That's *it*? That's peer review?"

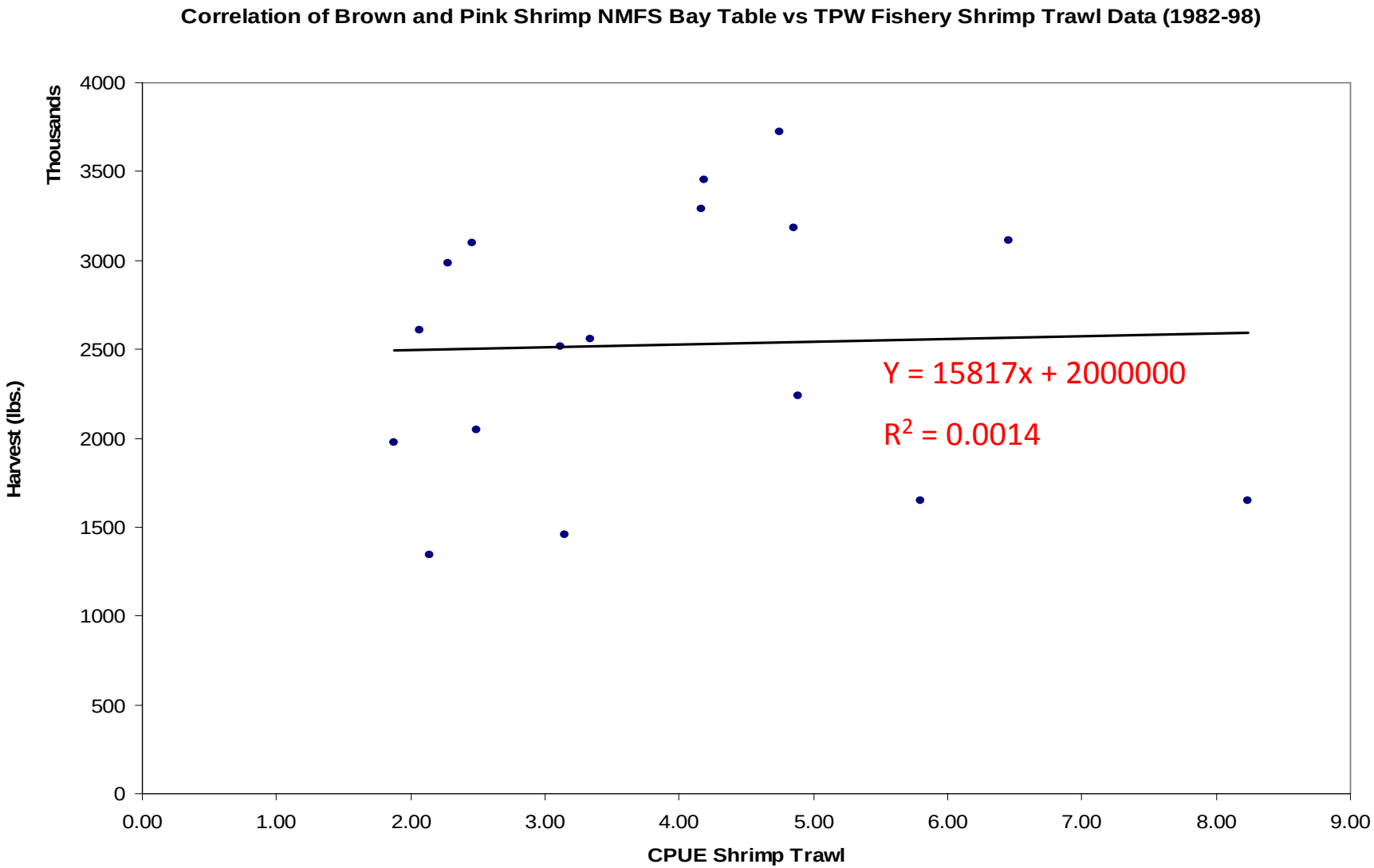
Harvest Curve Comparison (with actual annual harvest data)



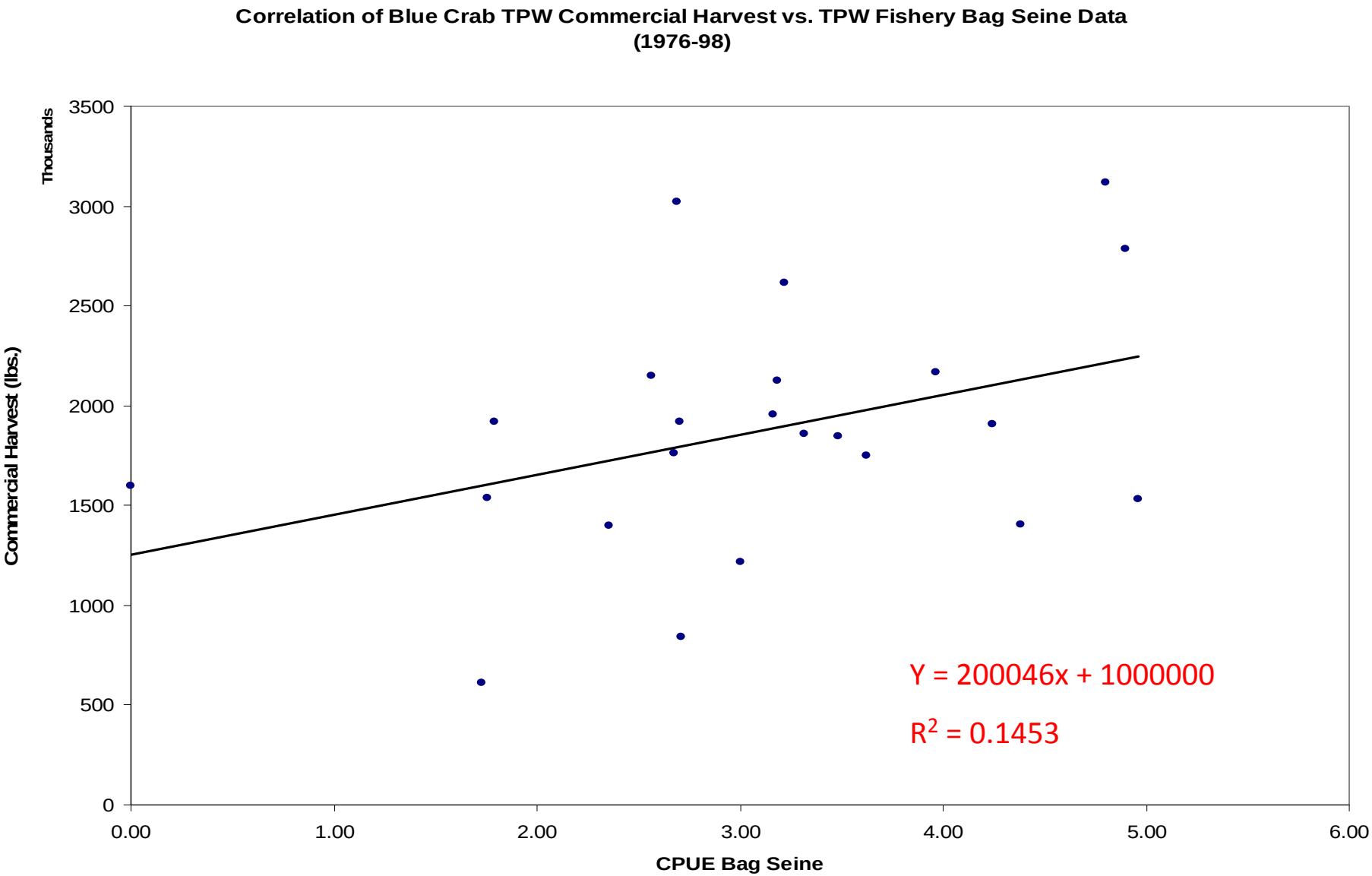
Disaggregated relative contributions of species and bimonthly flow to total computed harvest, for MaxH flows

	const	Q_{JF}	Q_{MA}	Q_{MJ}	Q_{JA}	Q_{SO}	Q_{ND}	***ratio to total harvest***
Flow (MaxH)		0.0586	0.2464	0.4052	0.0674	0.0348	0.1876	
Blue crab	0.0643	-0.0072	0.0932	-0.0333		-0.0074	0.0503	0.160
Oyster	**0.3571**	-0.0246		0.0514	-0.0284			**0.355**
Red drum	0.0020			0.0018	-0.0016	0.0003		0.003
Black drum	0.0043	-0.0008			0.0031	-0.0010	0.0028	0.008
Spotted seatrout								0.029
Brown shrimp	0.0873	-0.0151			0.0126	0.0063	0.0296	0.121
White shrimp	**0.2751**	-0.0181	0.0301		-0.0098		0.0423	**0.320**
Flounder	-0.0010	-0.0008			0.0016		0.0041	0.004
TOTAL	**0.7891**	-0.0666	**0.1233**	0.0199	-0.0224	-0.0018	**0.1290**	1.000

Brown and Pink Shrimp Correlation



Blue Crab Correlation



Disaggregated relative contributions of species and bimonthly flow to total computed harvest, for MaxH flows

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Blue crab	0.0643	-0.0072	0.0932	-0.0333		-0.0074	0.0503	0.160
Oyster	**0.3571**	-0.0246		0.0514	-0.0284			**0.355**
Red drum	0.0020			0.0018	-0.0016	0.0003		0.003
Black drum	0.0043	-0.0008			0.0031	-0.0010	0.0028	0.008
Spotted seatrout								0.029
Brown shrimp	0.0873	-0.0151			0.0126	0.0063	0.0296	0.121
White shrimp	**0.2751**	-0.0181	0.0301		-0.0098		0.0423	**0.320**
Flounder	-0.0010	-0.0008			0.0016		0.0041	0.004
TOTAL	**0.7891**	-0.0666	**0.1233**	0.0199	-0.0224	-0.0018	**0.1290**	1.000

CONFIDENCE/UNCERTAINTY

- VERY UNPREDICTABLE
- OTHER MAJOR INFLUENCES
- MUST QUANTIFY VARIABILITY IN RECOMMENDATIONS

GBF(W)IG / REGION H TARGETS

- MAX H, MIN Q, ETC. ONLY AVAILABLE
- NON-PREDICTIVE, OTHER DRIVERS
- UNEXPLAINED VARIANCE
- NO YR-TO-YR VARIATION

MaxH and MinQ compared to Historical Flow Data

Galveston Bay and the Trinity-San Jacinto Estuary Historical (1941-1990)
Freshwater Inflows and TxEMP Model Solutions (in Acre-Feet)

Month	Hist-Min	10th %	MinQ-Sal	MinQ	MaxH	Median	Average	90th %	Hist-Max
Jan	41,630	150,485	150,490	150,500	150,500	699,490	900,903	2,090,450	2,858,000
Feb	70,990	155,190	216,700	216,700	155,200	946,475	929,369	1,865,649	2,577,000
Mar	73,530	164,399	363,900	363,900	652,800	652,800	927,065	1,982,064	2,729,000
Apr	136,200	193,935	267,270	352,600	632,500	632,500	1,038,525	2,388,805	5,290,000
May	139,400	260,000	309,970	679,700	1,273,700	1,273,700	1,522,301	3,616,000	4,571,000
Jun	56,540	190,324	413,560	448,100	839,700	839,700	1,218,681	3,222,000	4,011,820
Jul	44,350	107,705	211,500	232,700	211,500	340,376	632,396	1,559,200	2,439,189
Aug	20,590	77,980	140,000	154,000	140,000	225,265	379,458	754,760	2,110,600
Sep	15,740	93,325	102,960	330,200	103,000	330,246	533,187	1,466,565	2,484,919
Oct	21,100	49,885	78,600	251,900	78,600	251,895	538,943	1,476,164	3,590,900
Nov	31,300	89,480	164,390	351,500	351,500	351,500	651,704	1,740,750	4,565,000
Dec	55,290	93,865	93,870	626,800	626,800	626,802	768,678	1,812,163	2,582,000
Total Q	706,660	1,626,573	2,513,210	4,158,600	5,215,800	7,170,749	10,041,210	23,974,570	39,809,428

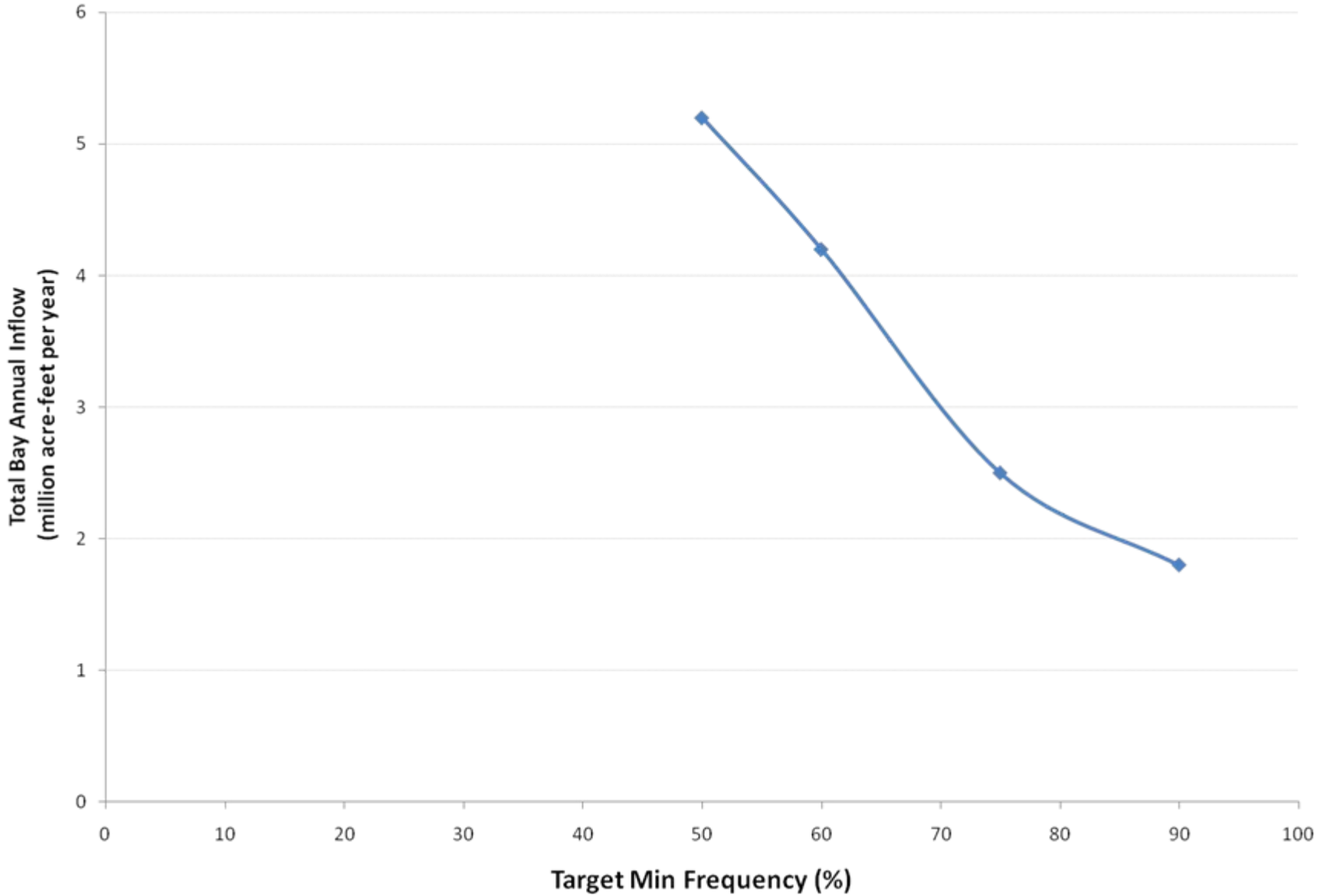
Table ES-6: Environmental Water Needs for Galveston Bay

The frequency of annual Galveston Bay system freshwater inflows recommended by the Galveston Bay Freshwater Inflows Group.

Inflow Scenario	Quantity Needed (acre-feet/year)	Historical Frequency	Target Minimum Frequency
Max H	5.2 million	66%	50%
Min Q	4.2 million	70%	60%
Min Q-Sal	2.5 million	82%	75%
Min Historic	1.8 million	98%	90%

Note: The health and productivity of Galveston Bay must consider the quantity, quality, seasonality (monthly inflows), and location of inflows. It is anticipated that the inflow needs projections will continue to be refined over time. The use of improved data focused on the fisheries production solely from the Galveston Bay system is one example of an anticipated means of refinement.

Region H Annual Inflow Targets Flow-frequency Graph Format



Region H
Water Planning Group

Frequency of Meeting Monthly Galveston Bay Inflow Targets

Inflow Target	Max H	Min Q	Min Q-Sal
Historical Frequency	66%	78%	82%
Target Frequency	50%	60%	75%
Naturalized	68%	67%	83%
Current Conditions	64%	59%	79%
Full Diversions w RF	65%	59%	81%
Full Diversions w/o RF	43%	42%	55%
Full Diversions w RF And Reg C & H Strategies	71%	67%	87%

GBF(W)IG / REGION H TARGETS

- ALLOWS VARIATION CONSISTENT W/ YR-TO-YR & UNEXPLAINED VARIANCE
- CAN BE APPLIED TO NEW WATER RIGHTS APPLICATIONS
- NEEDS WORK BUT NOT BAD APPROACH

CONCLUSIONS

- CONSIDER BOTH NATIVE & RECENT HYDROLOGY IN MID-T.R.
- QUANTIFY UNCERTAINTY IN RECOMMENDATIONS (INSTR. & EST.)
- DON’T OVER-PRESCRIBE – REGION H NOT BAD
- SURPRISING LITTLE PROBLEM W/ ALL THAT HAS BEEN DONE - NOT MUCH MORE CAN BE CONTROLLED.
- MORE SURPRISES TO COME – RIVER & BAY DON’T CARE WHAT PEOPLE THINK

Monthly Galveston Bay Inflow Targets

Month	Max H	Min Q	Min Q-Sal
1	150,500	150,500	150,490
2	155,200	216,700	216,700
3	652,800	363,900	363,900
4	632,500	352,600	267,270
5	1,273,700	679,700	309,970
6	839,700	448,100	413,560
7	211,500	232,700	211,500
8	140,000	154,000	140,000
9	103,000	330,200	102,960
10	78,600	251,900	78,600
11	351,500	351,500	164,390
12	626,800	626,800	93,870
TOTAL	**5,215,800**	**4,158,600**	**2,513,210**

Source: Draft Environmental Flows Analysis by AECOM

- Max H – The annual inflows required for maximum B&E fisheries harvest as recommended by TWDB/Texas Parks and Wildlife Department (TPWD)
- Min Q – The minimum annual inflow required to maintain the B&E fisheries harvest as recommended by TWDB/TPWD
- Min Q-Sal – The minimum acceptable annual inflow required to maintain the salinity needed for B&E fisheries production as recommended by TWDB/TPWD