Effect of Mixed Populations on Extreme Flood Flow Estimates

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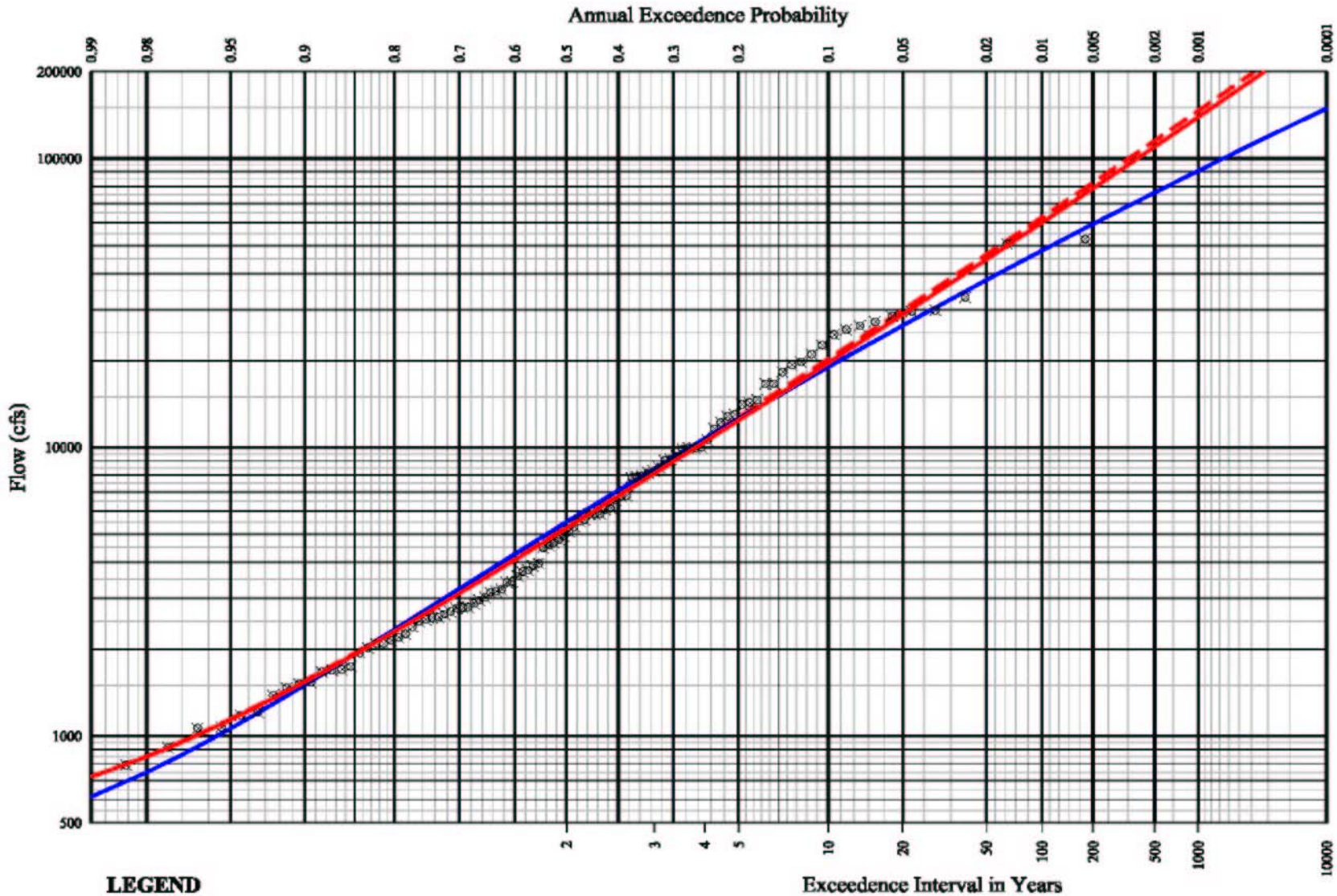
BIOGRAPHICAL SKETCH

Mr. Countryman worked for the U.S. Army Corps of Engineers from 1966 through 1988 (22 years). His duties included flood control hydrology, hydraulic design, water resources planning, and design of hydraulic structures. In addition, he was involved in the operation of flood control reservoirs in California, and Colorado. In 1988 he joined MBK Engineers and in 1992 became a partner in the firm and is currently the president of MBK Engineers. While at MBK he has worked on a diverse array of flood control projects ranging from reservoir reoperation to the design of flood control facilities. He has also served as an expert witness in numerous flood litigation cases.

EDUCATION:
California State University, San Jose
BS in Civil Engineering, 1966

PROFESSIONAL LICENSES, SOCIETIES AND HONORS:
Registered Civil Engineer, California, 20486
Registered Civil Engineer, Nevada, 8086
Member, American Society of Civil Engineers
Award of Distinction, San Jose State University, College of Engineering



LEGEND

		Period of Record	Mean	SD	Skew
Recommended	———	1904-2003	3.727	0.438	-0.2
Corps 1998	– – –	1904-1997	3.736	0.442	0.1
	———	1904-2003	3.727	0.438	0.1
Historical Data (Based on Gringorten plotting position)	⊠	1904-2003			

Note: Drainage area is 1638 square miles.

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San Joaquin River at Friant Dam

3-Day Unregulated Frequency Curve Comparison

JOB NUMBER:	4919
REQUESTED BY:	BT
DRAWN BY:	RDS
DATE:	December 2003

LP III Advantages

- Acceptable Curve Fit
- Allows easy computation of Statistics
- Blessed by Federal Government
- Gives the illusion of Scientific Analysis

LP III Problems

- Is based on converting real data to logs for analysis
- Regional Skew Map is grossly inaccurate
- Extreme values (large floods) can be grossly overestimated
- Used without understanding as if it represents a law of nature

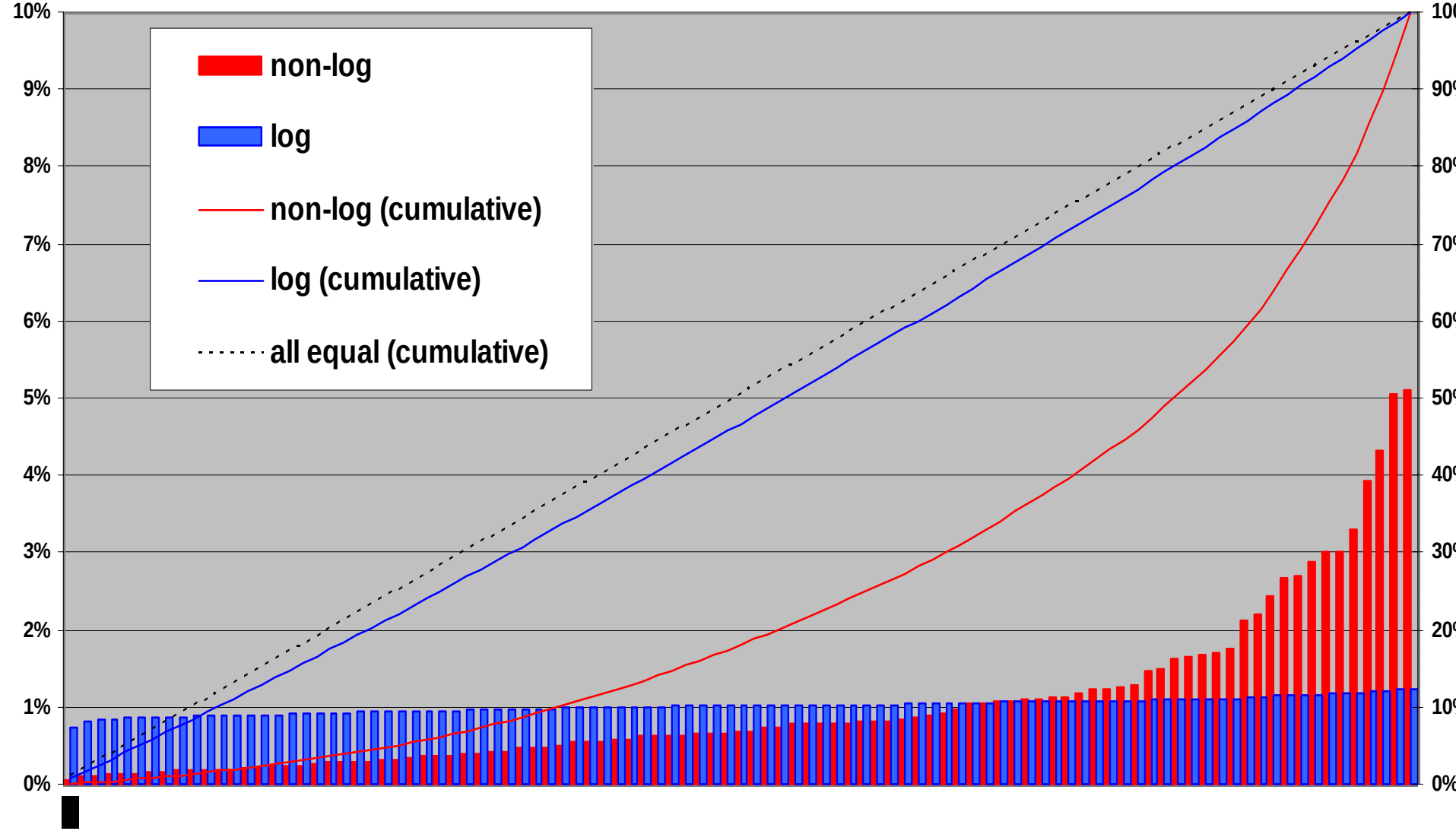
Mathematistry

“In such areas as sociology, psychology, education, and even, I sadly say engineering, investigators who are not themselves statisticians sometimes take mathematistry seriously. Overawed by what they do not understand, they mistakenly distrust their own common sense and adopt inappropriate procedures devised by mathematicians with no scientific experience.”

G.E.P. Box
Journal of Science an Statistics

American River at Fair Oaks

3-Day Unregulated Flows



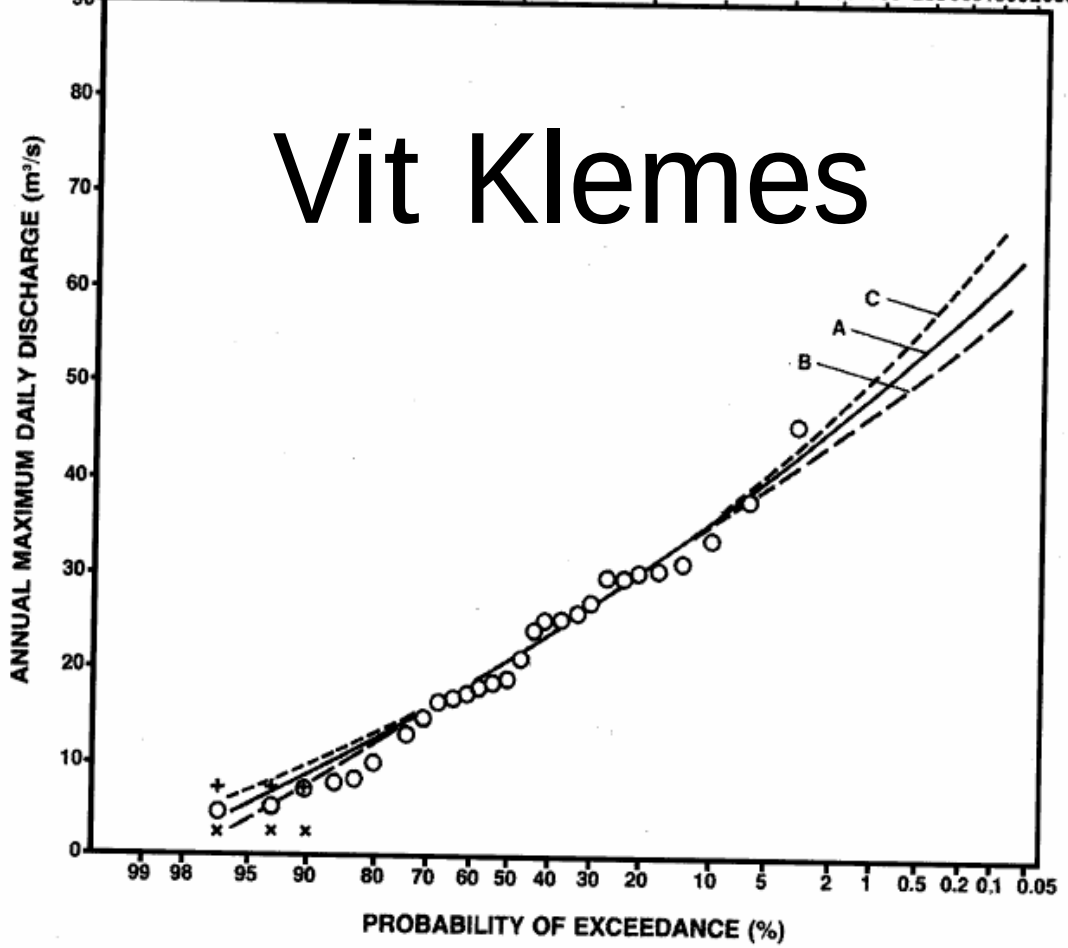
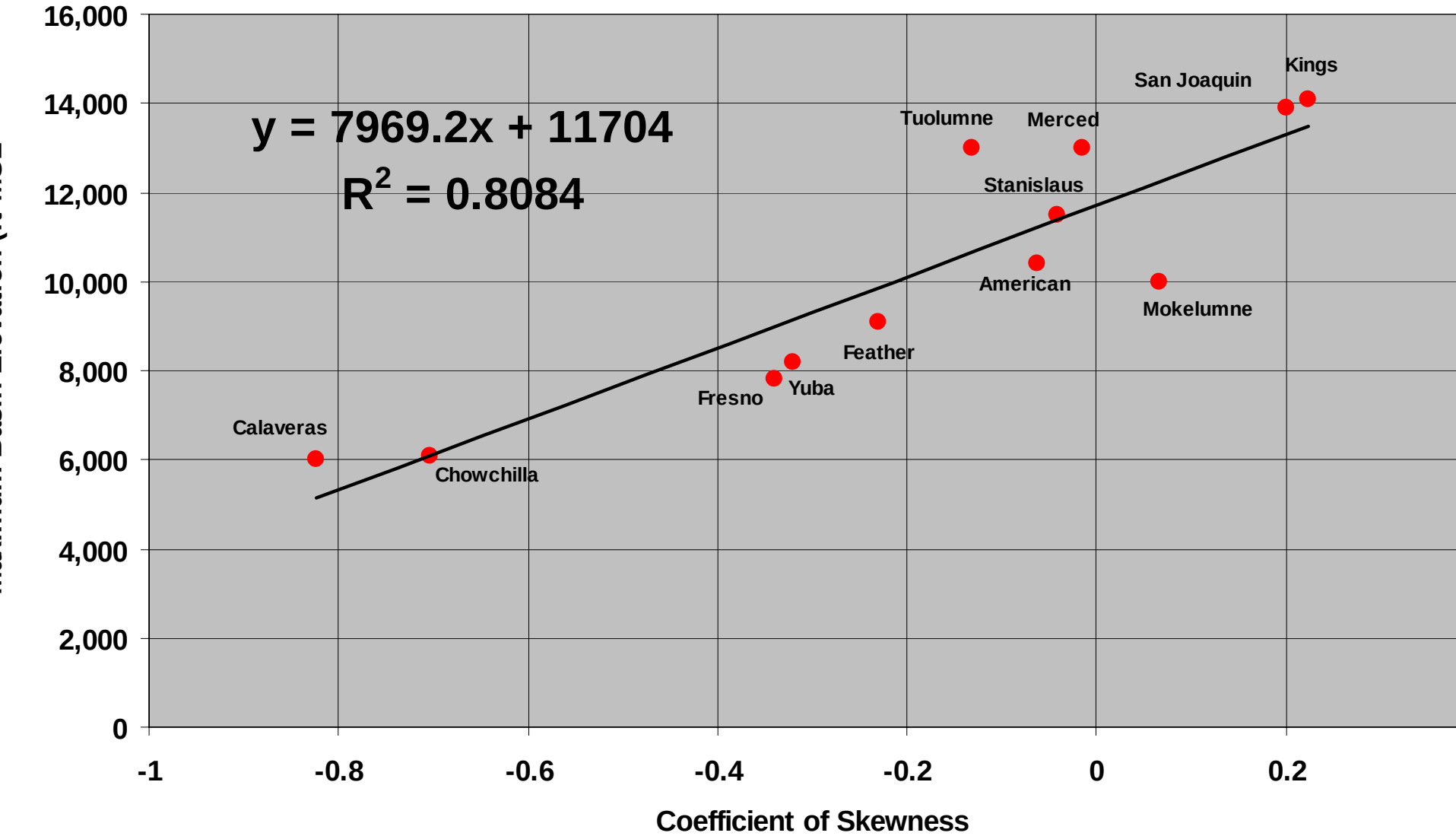
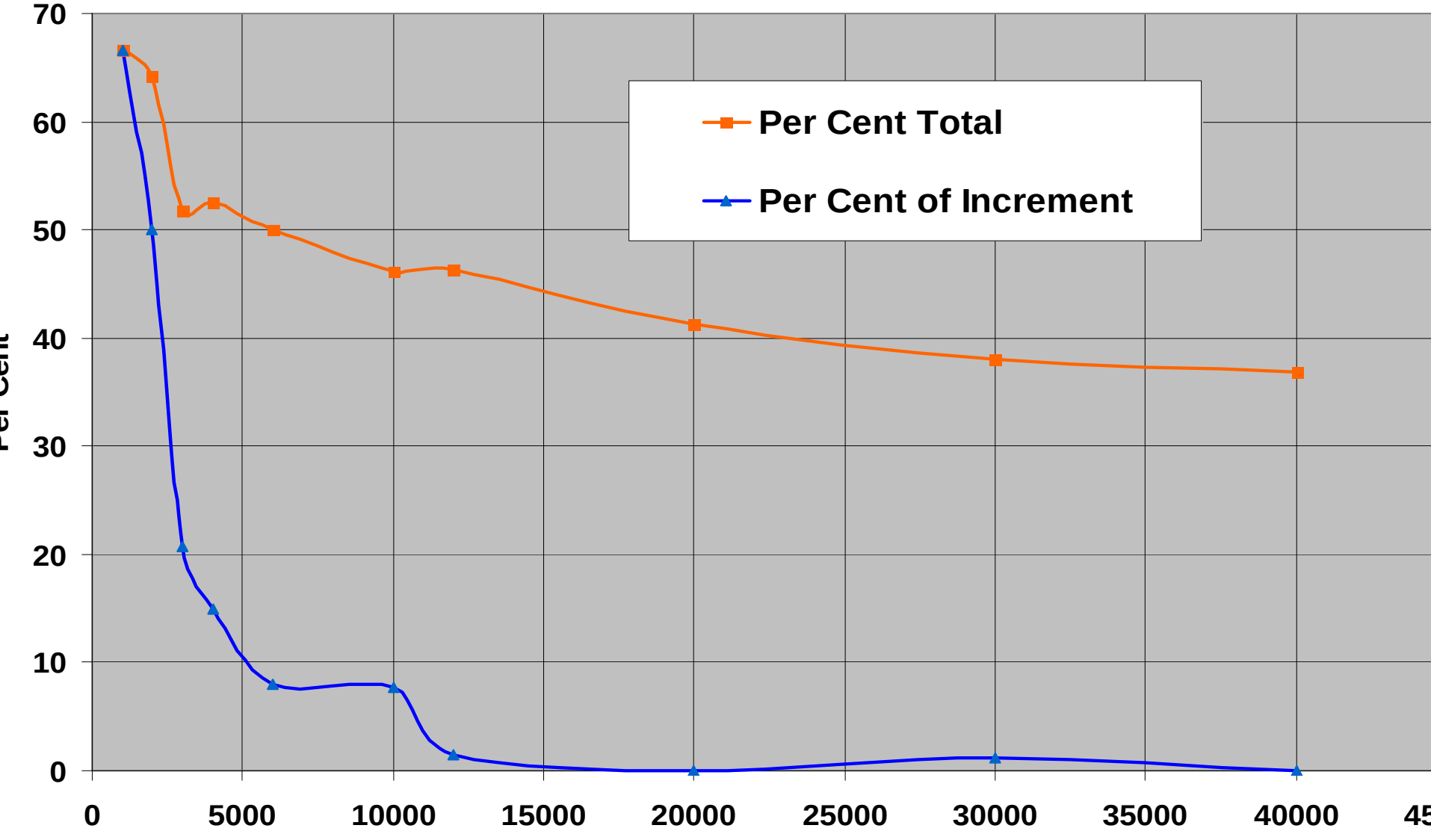


Figure 5.
Results of flood frequency analysis for data shown in Figure 4*b* (excluding the Hurricane Hazel flood of 1954) obtained by a maximum likelihood fit of a three–parameter lognormal distribution using a Flood Frequency Analysis Package developed and operated by Water Resources Branch of Environment Canada, Ottawa. (A) Fit to historic data. (B) Effect of an arbitrary reduction of the three lowest records to 3 m^3/s. (C) Effect of an arbitrary increase of the three lowest records to 7.5 m^3/s.

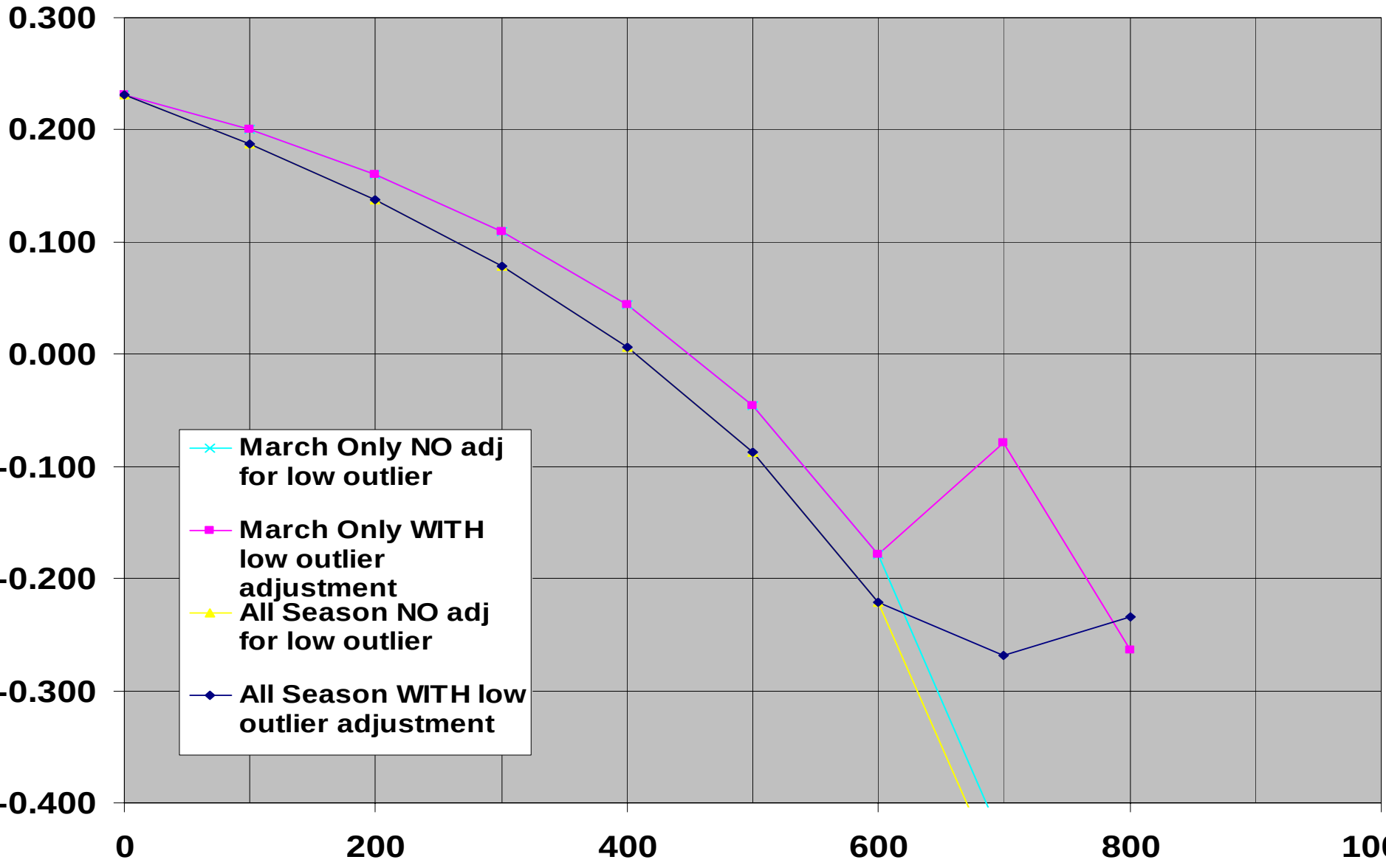
Basin Elevation vs. Skew

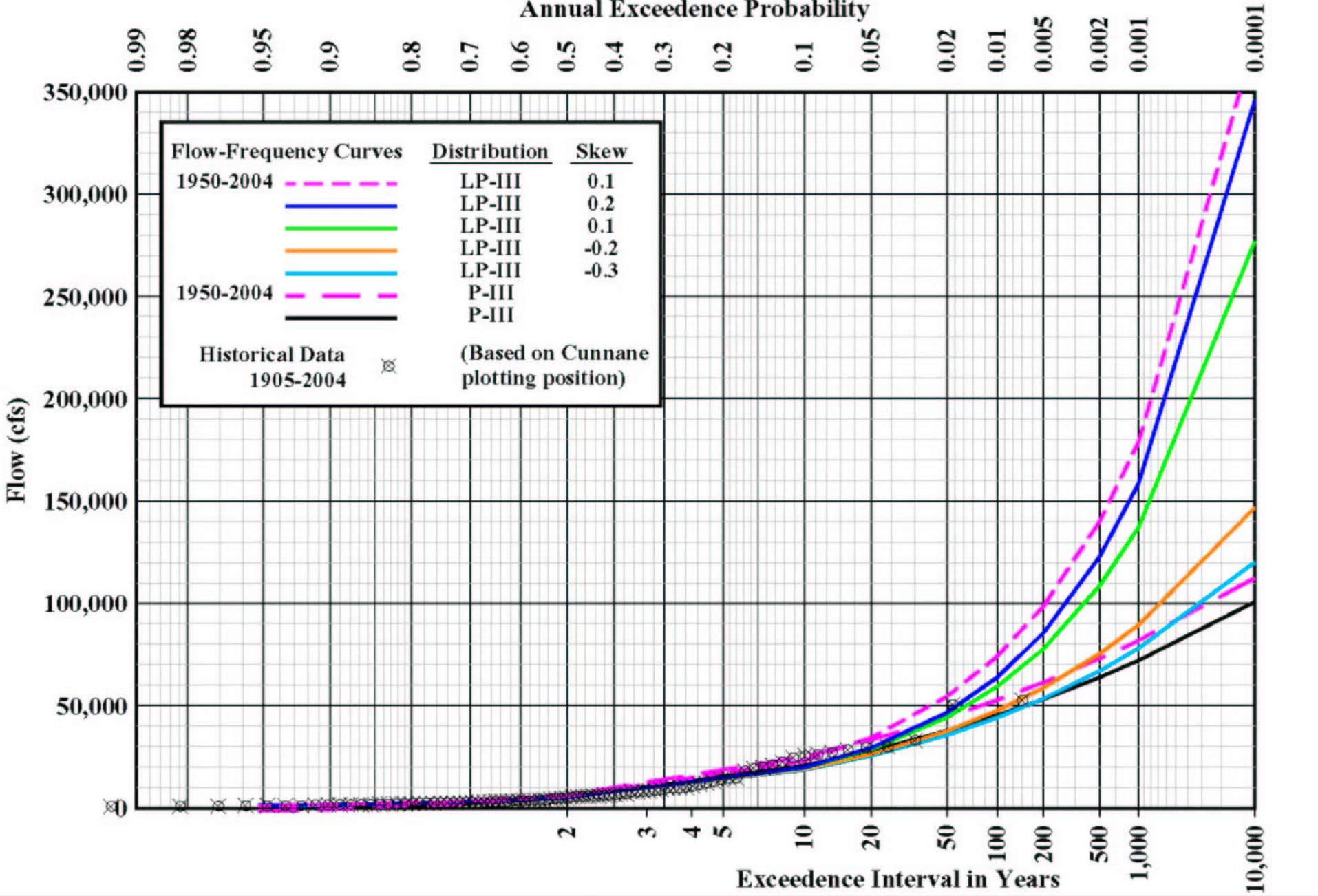


San Joaquin River
March Flows



San Joaquin River
Low Flow Impact on Skew





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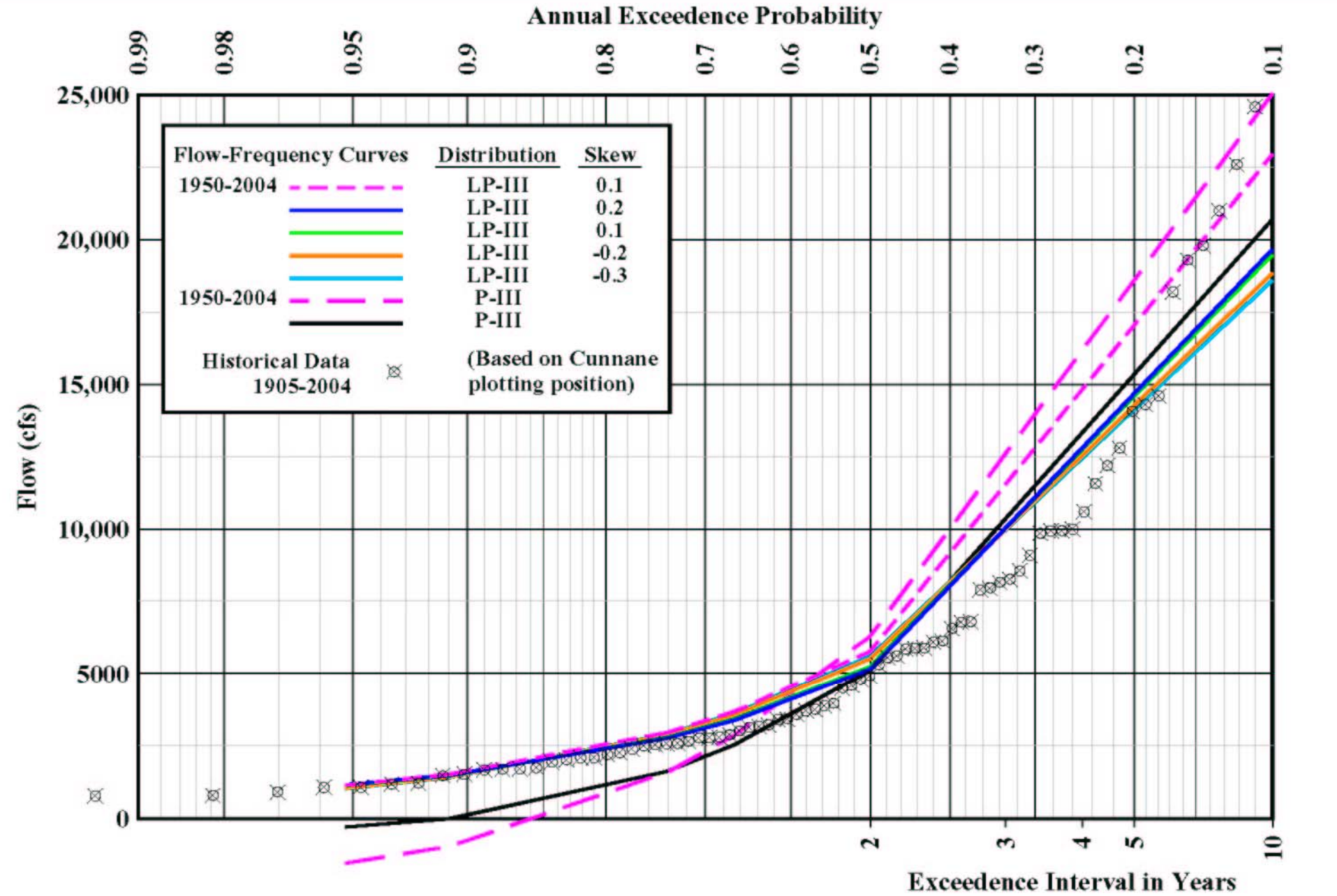
San Joaquin River
Comparison of 3-Day Frequency Estimates



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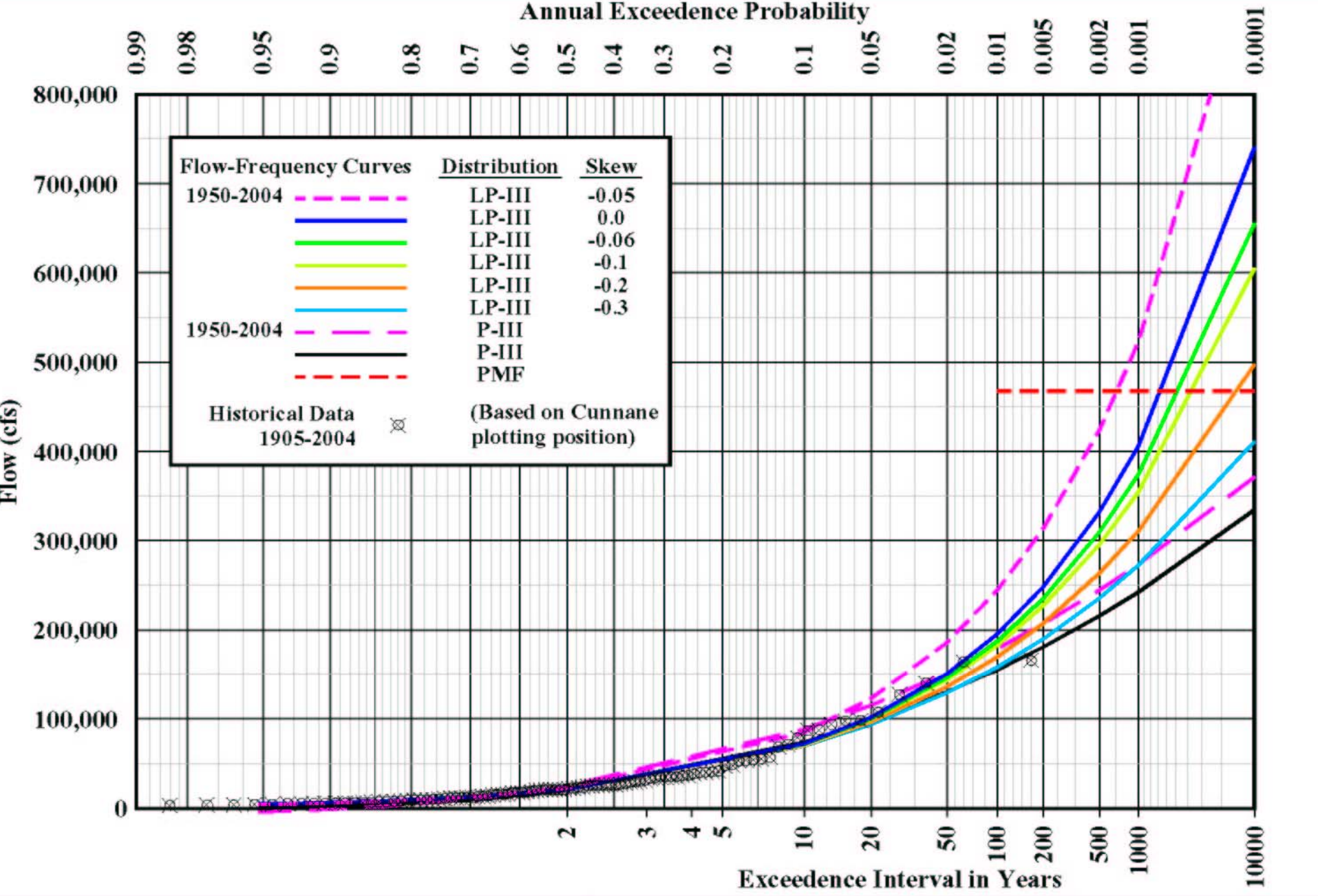
Comparison of 3-Day Frequency Estimates



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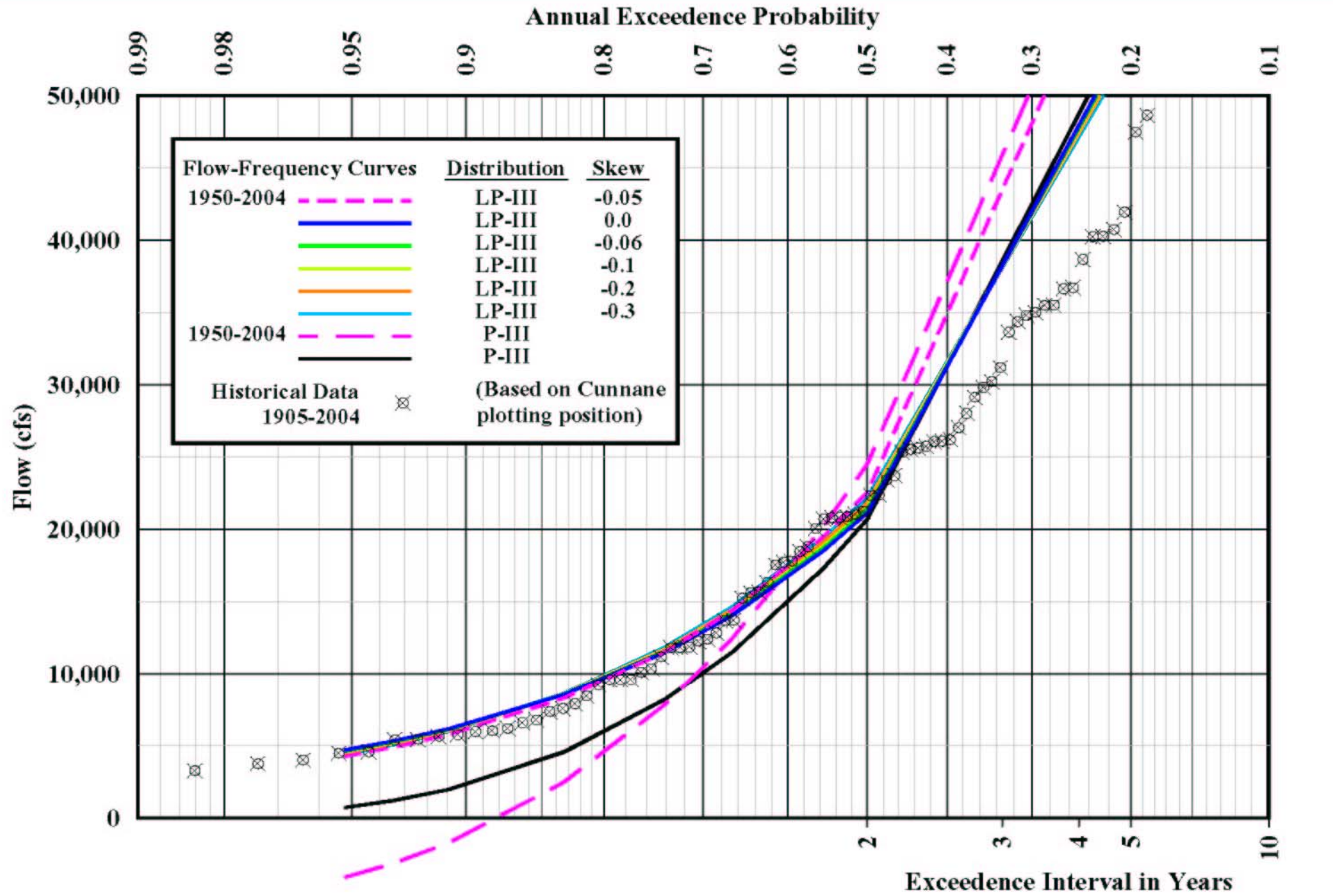
American River
Comparison of 3-Day Frequency Estimates



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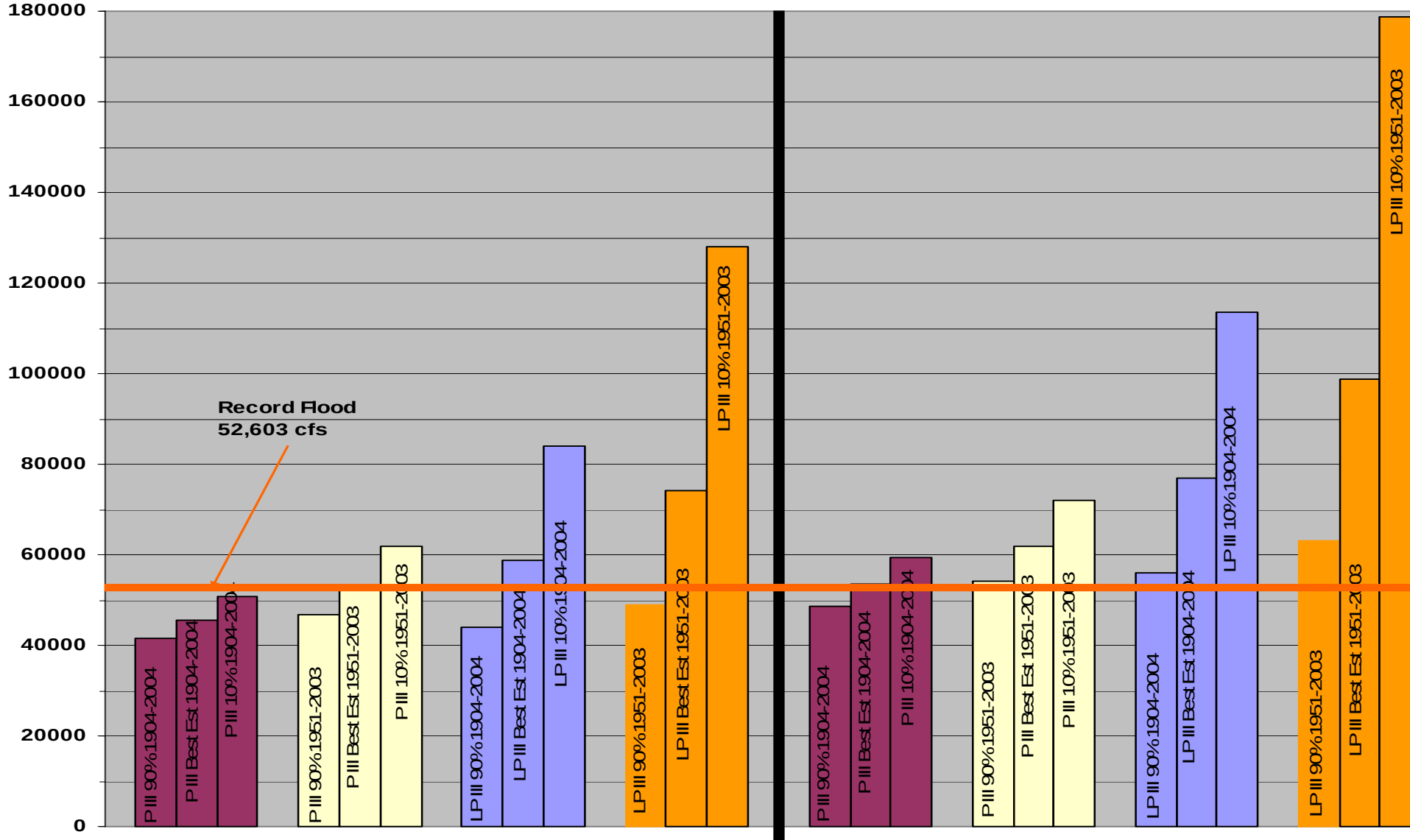
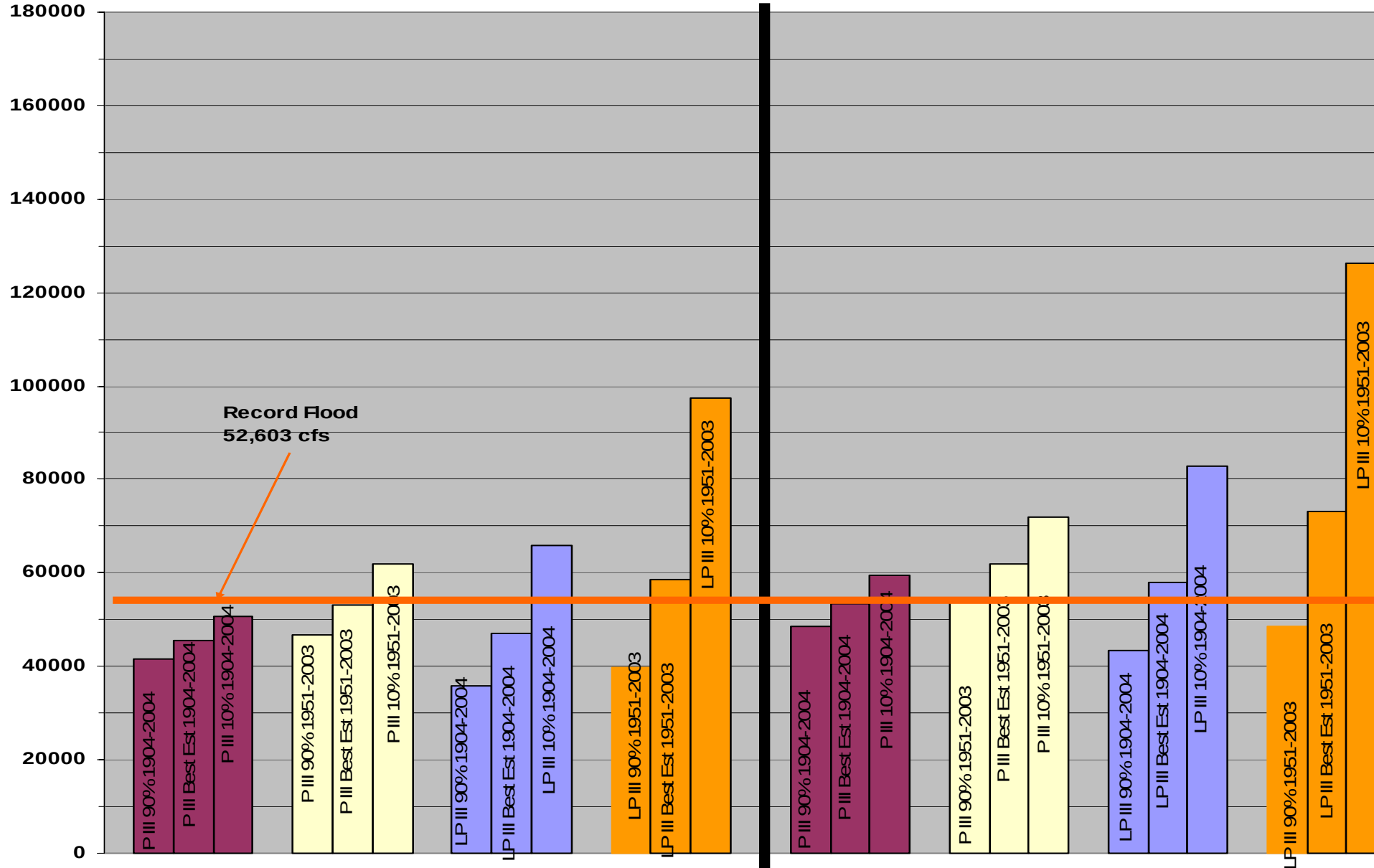
American River
Comparison of 3-Day Frequency Estimates

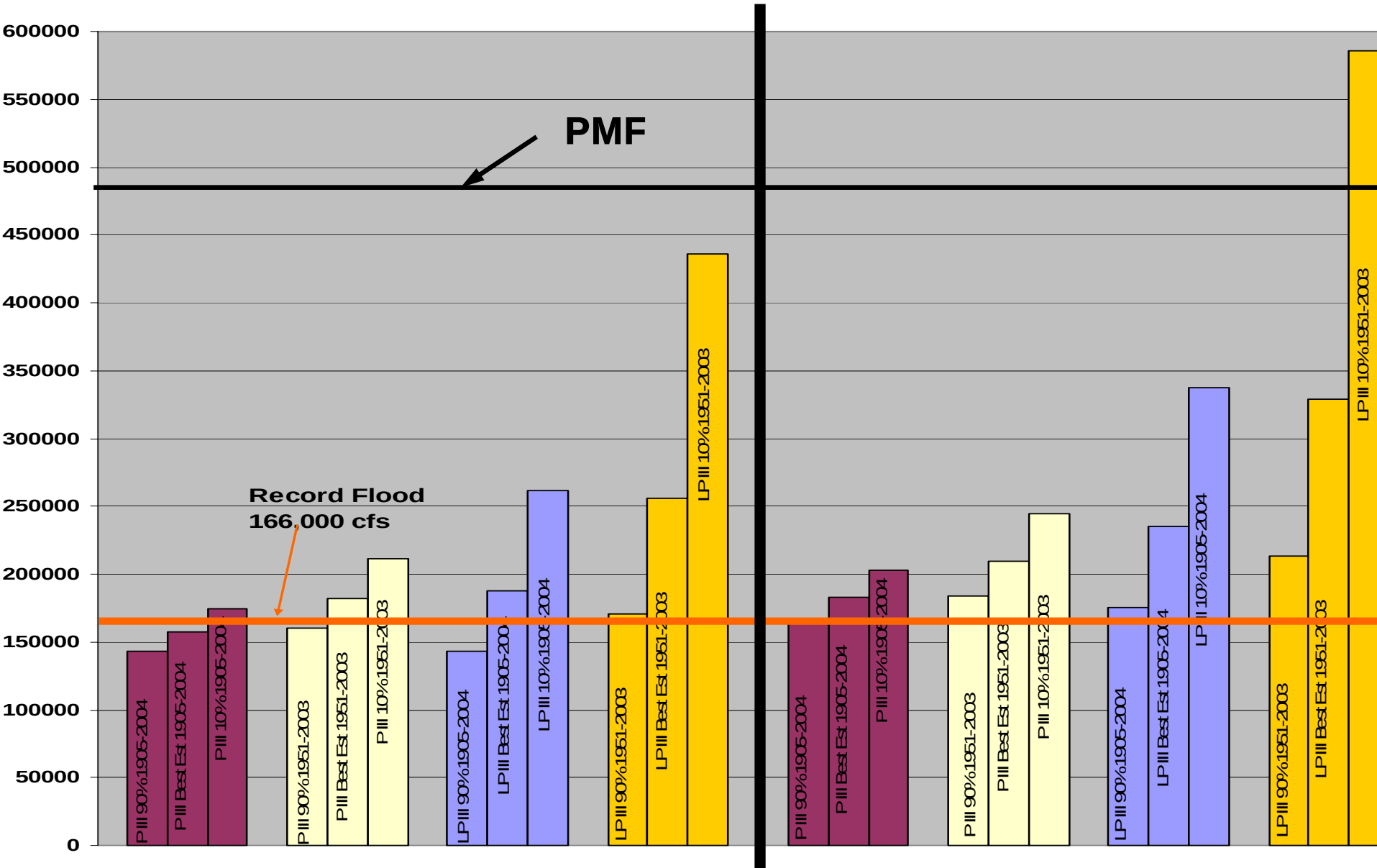
San Joaquin River
LP III Skew = 0.1



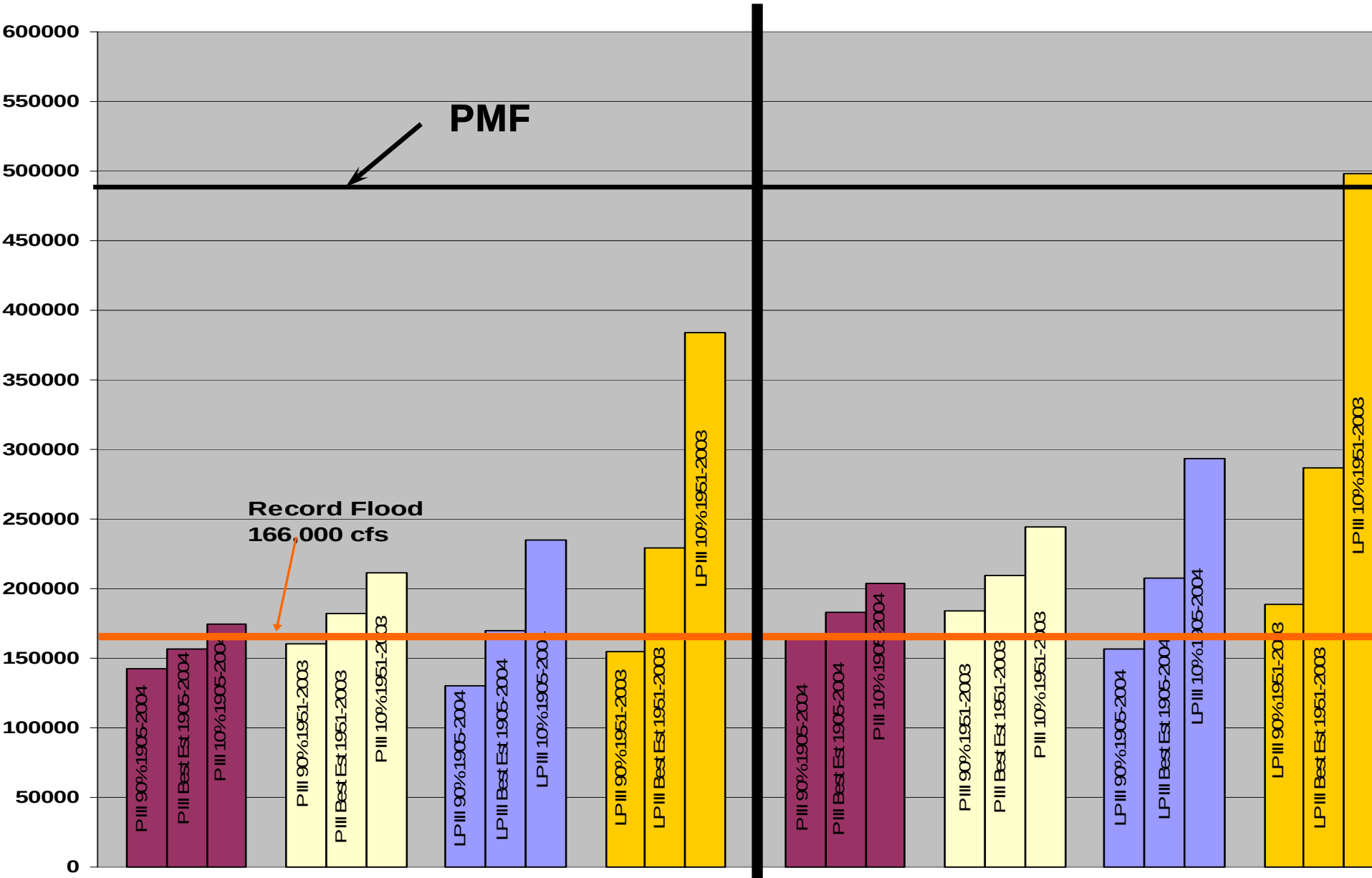
San Joaquin
LP III Skew -0.2



American River
LP III Skew = -0.06



American River
LP III Skew = -0.2



	Area Sq. Miles	Record	Elevation, Ft MSL	Skew	Max cfs	
ngs River at Pine Flat Dam	**1,545**	**104**	**14,100**	**0.1**	**46,000**	**47,40**
an Joaquin @ Friant Dam	**1638**	**100**	**13,900**	**0.1**	**53,000**	**62,50**
kelumne River @ Camanche Dam	**627**	**93**	**10,000**	**0.1**	**39,000**	**46,70**
ced River @ New Exchequer	**1037**	**96**	**13,000**	**0.0**	**44,000**	**53,00**
islaus River @ New Melones Dam	**904**	**82**	**11,500**	**0.0**	**50,000**	**63,20**
nerican River @ Fair Oaks	**1888**	**93**	**10,400**	**-0.06**	**166,000**	**196,1**
uolumne River @ New Don Pedro Dam	**1533**	**101**	**13,000**	**-0.1**	**92,000**	**87,90**
ther River @ Oroville Dam	**3611**	**96**	**9,100**	**-0.2**	**244,000**	**294,8**
Yuba River nr Marysville	**139**	**94**	**8,200**	**-0.3**	**124,000**	**144,2**
a River @ New Bullards Bar Dam	**489**	**94**	**8,200**	**-0.3**	**67,000**	**64,80**
esno River @ Hidden Dam	**234**	**85**	**7,800**	**-0.3**	**6,900**	**11,10**
mnes River @ Michigan Bar	**536**	**91**	**6,000**	**-0.5**	**35,000**	**24,60**
averas River @ New Hogan Dam	**363**	**53**	**6,000**	**-0.6**	**18,000**	**24,60**
owchilla River @ Buchanan Dam	**235**	**85**	**6,100**	**-0.7**	**10,000**	**12,60**

Bulletin 17B

- “Major Problems in flood frequency analysis at gaged locations are encountered when making flood estimates for Probabilities more rare than defined by the available record. For these situations the guide ... allows considerable latitude in analysis”

Summary

- Regional Skew values in Bulletin 17 B should never be used in California
- LP III is very sensitive to low flows
- LP III Skews near -0.3 approximate Pearson Distribution
- LP III based on last 53 years Unreasonable

Summary Cont

- LP III confidence bands very large and cause question of 90% CNP criteria
- Frequency Curves should be evaluated with Pearson Distribution. If fit is reasonable with plotted data and historical or PMF data **use it**
- If LP III is used, skew values should be carefully evaluated