Comparing American River PMP Estimates to Historical Floods

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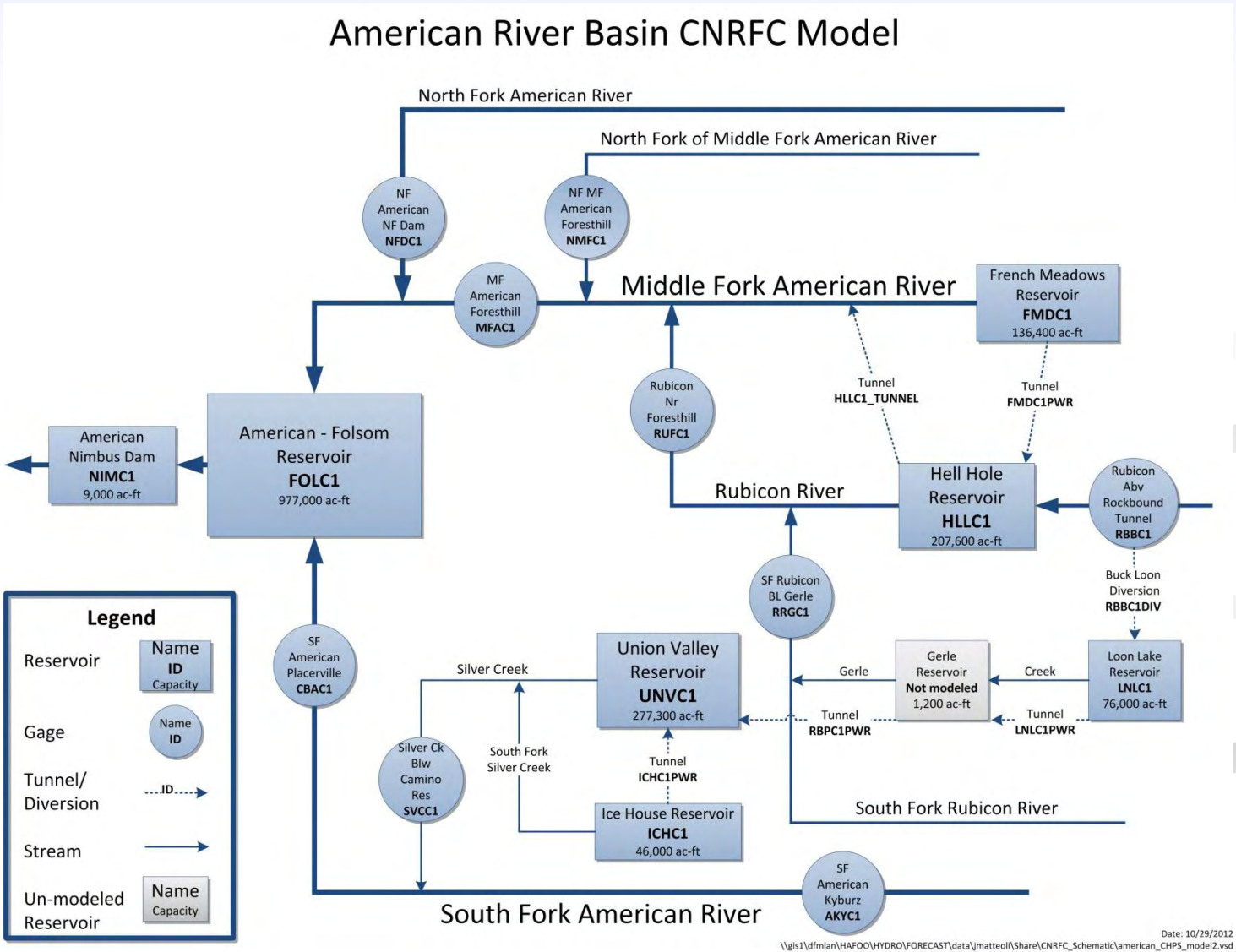
Overview

- Modeling Overview
- Scaling Historical Precipitation to Match PMF
- Historical Precipitation & PMP Comparison
- Conclusions

American Basin 2012

15 Watersheds & 24 Subareas

American Modeling Schematic



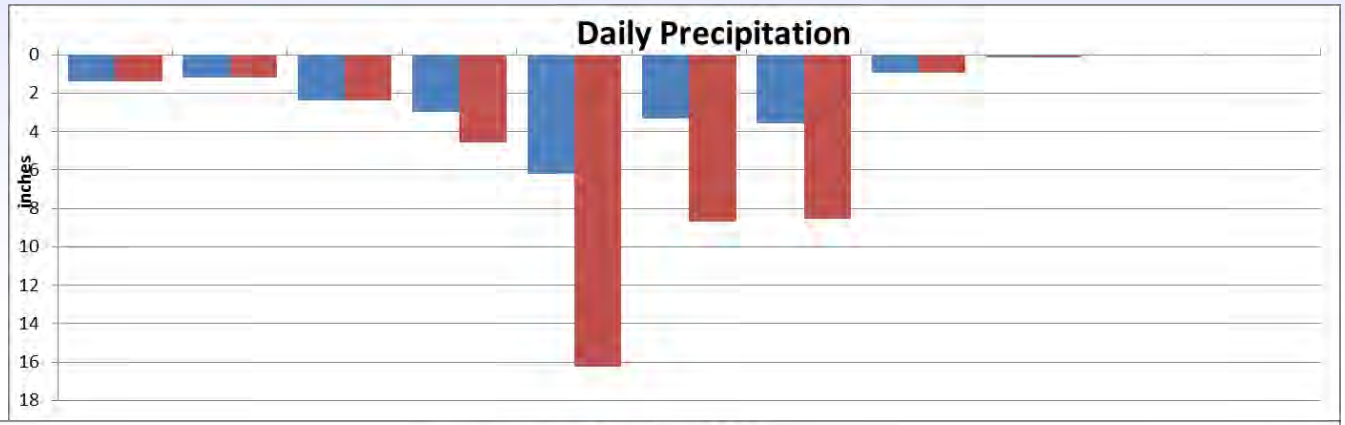
Models

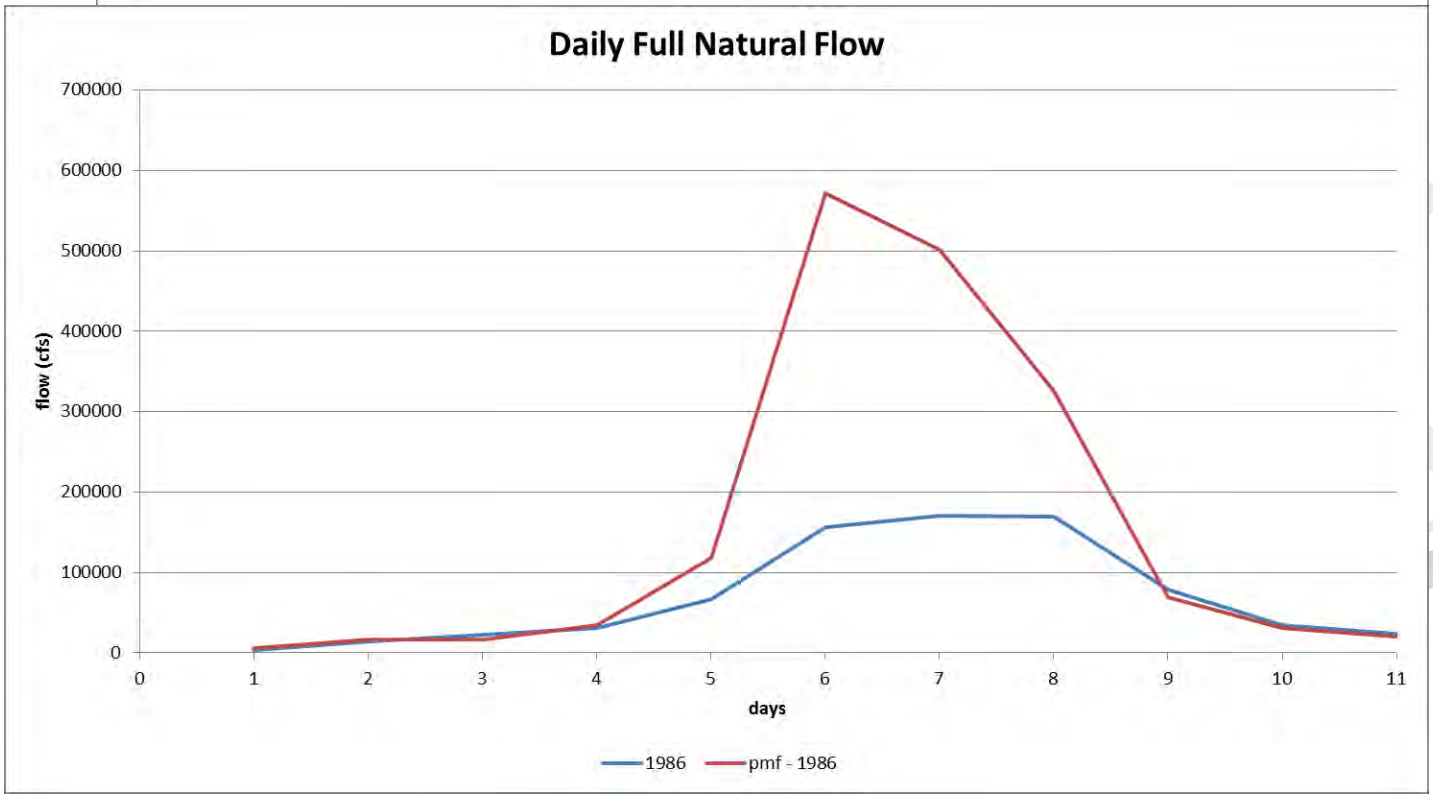
- Sacramento Soil Moisture Accounting Model (SAC-SMA)
- SNOW-17
- 6-hr time step computation

Historical Precipitation Scaling

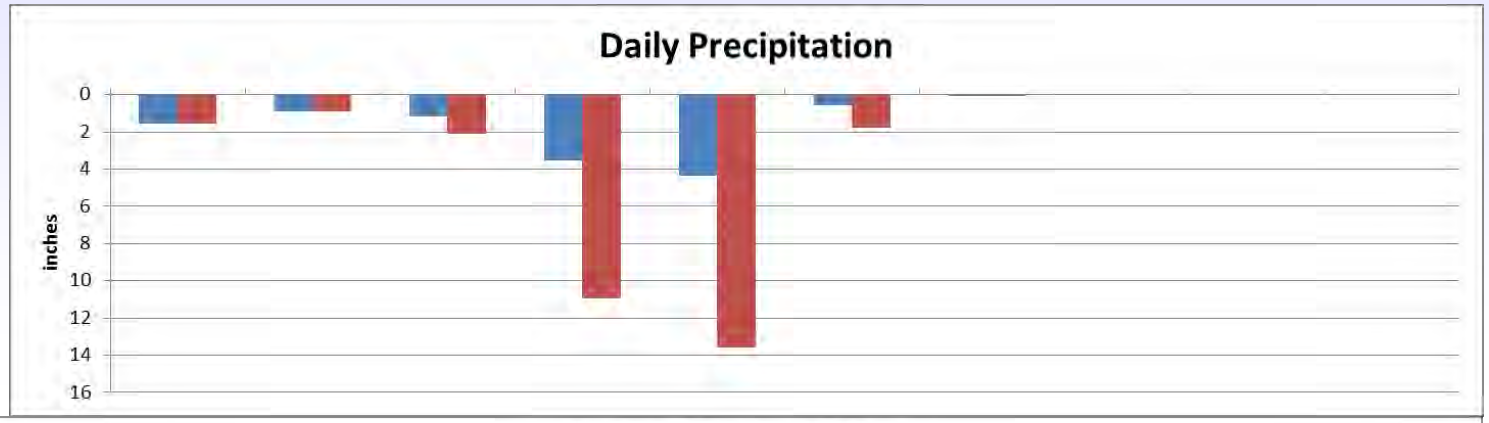
- Started with historic flood watershed conditions
- Iteratively scaled up precipitation uniformly
- Iterated until 3-day inflow volume matched PMF 3-day inflow volume
- Done for 1986 and 1997 events

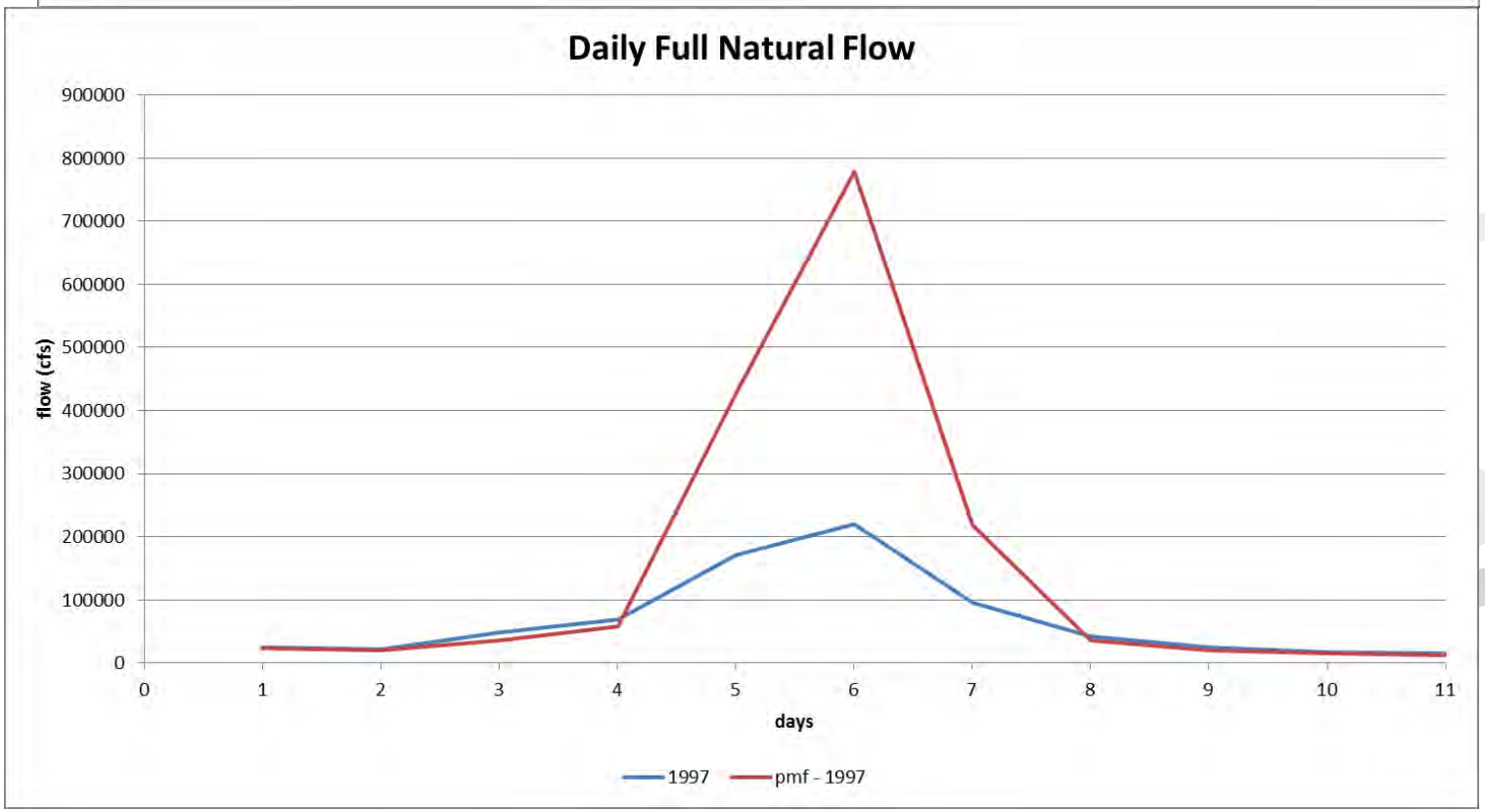
1986 Precipitation Scaling





1997 Precipitation Scaling





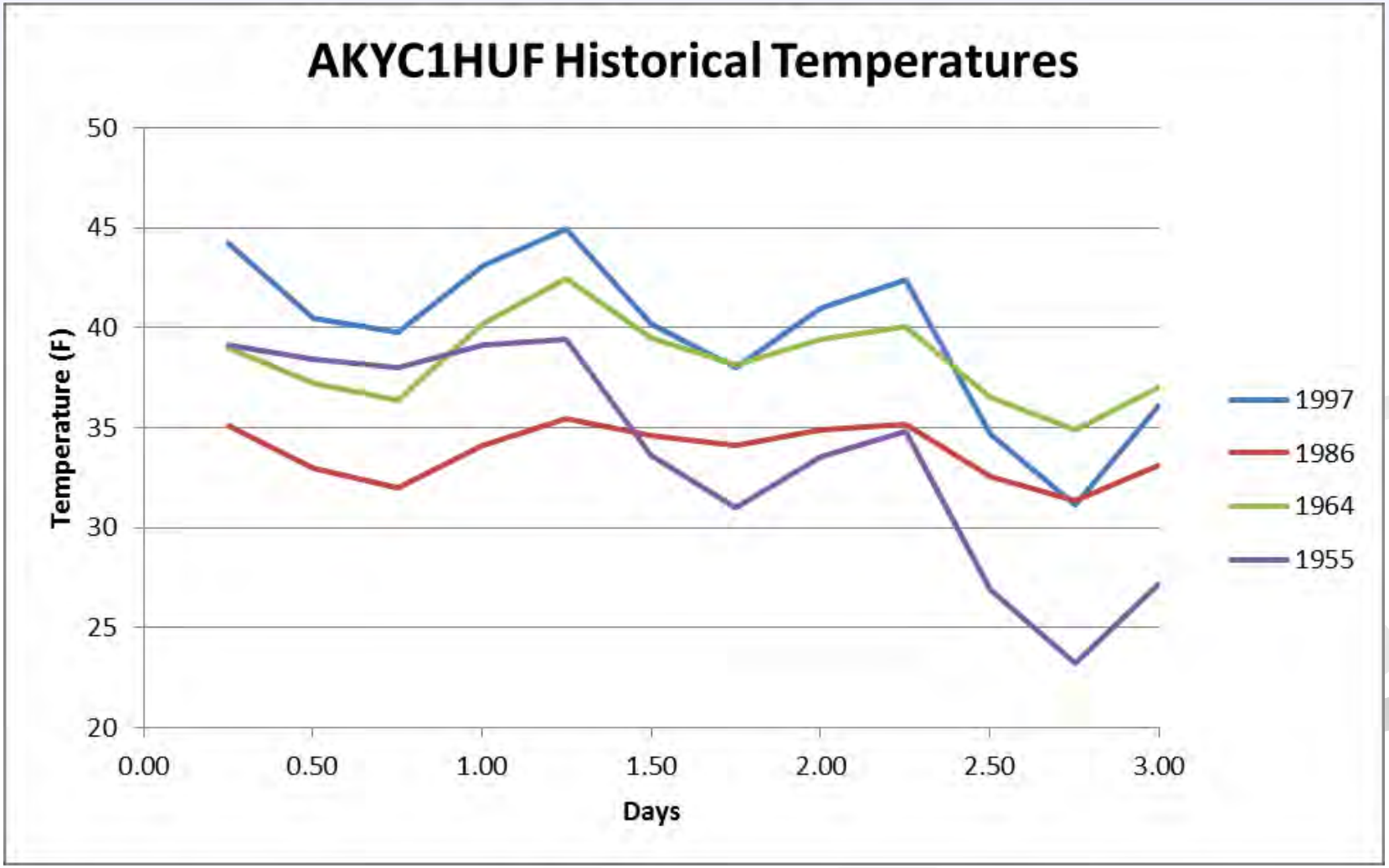
Result Comparison

	USACE	CNRFC Model	
	PMP	1997 Scaled	1986 Scaled
3-day precip (in)	29.6	28.2	35.6
3-day rain +melt (in)	32.5	30.7	31.2
melt (in)	2.9	2.6	no net melt
peak inflow (cfs)	906,000	892000	710000
max 1 day inflow (cfs)	698,000	818000	640000
max 3 day inflow (cfs)	472,000	470000	472000
scaling factor	N/A	3.1	2.6

Historical Precipitation

- **1997**
  - 3-day precipitation total = 9 inches
  - Raining throughout entire watershed
- 1986
  - 3-day precipitation total = 13.5 inches
  - Snowing in upper portions of watershed

Historical Temperatures
(*Kyburz Upper Watershed*)



Result Comparison

	USACE	CNRFC Model		
	PMP	1997 Scaled	1986 Scaled	1986 all rain
3-day precip (in)	29.6	28.2	35.6	29.3
3-day rain +melt (in)	32.5	30.7	31.2	31.02
melt (in)	2.9	2.6	no net melt	1.72
peak inflow (cfs)	906,000	892000	710000	675000
max 1 day inflow (cfs)	698,000	818000	640000	632000
max 3 day inflow (cfs)	472,000	470000	472000	470000
scaling factor	N/A	3.1	2.6	2.16

Historical Precipitation

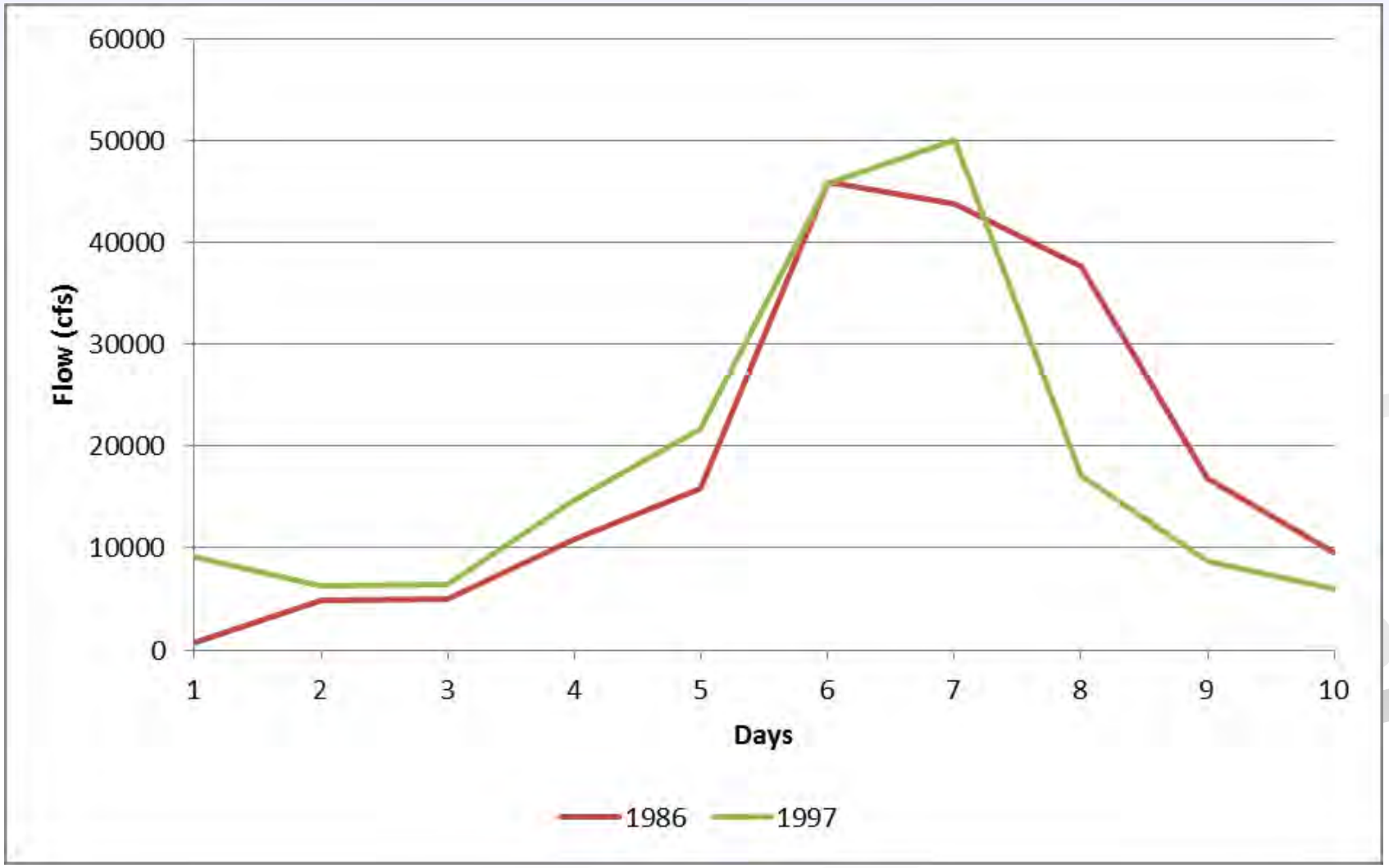
Entire Basin Average Precipitation (in)		
Duration	**1986**	**1997**
72 hour	13.6	9.0
48 hour	9.9	8.1
24 hour	6.2	5.6
12 hour	3.3	2.9

Precipitation Above 5000 ft		
Duration	**1986**	**1997**
72 hour	44%	48%
48 hour	46%	48%
24 hour	45%	46%
12 hour	45%	47%

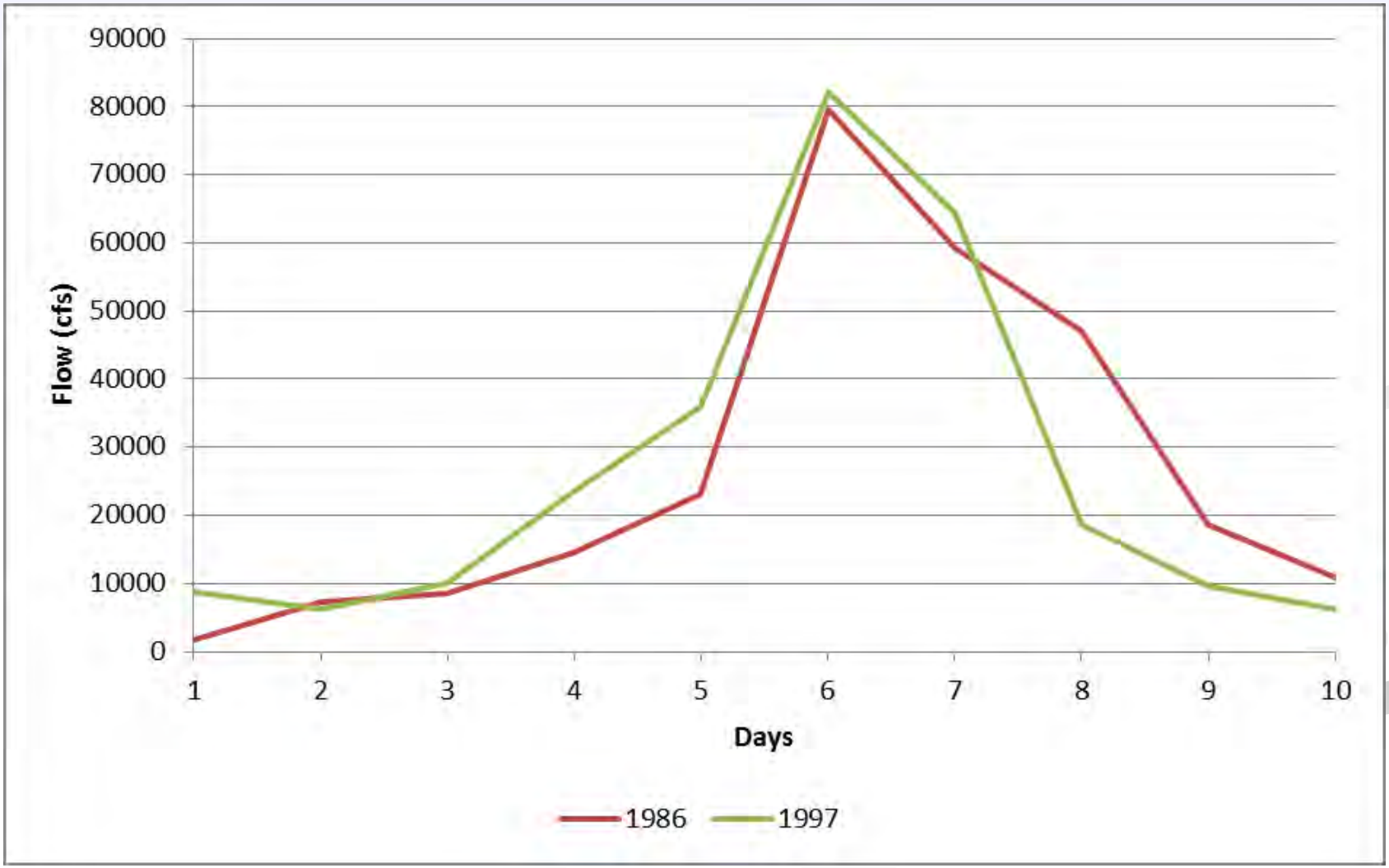
Historical Precipitation

Precipitation Distribution		
Area	**1986**	**1997**
North Fork	21.2%	22.6%
Middle Fork	30.0%	27.5%
South Fork	34.7%	36.7%
Folsom Local	14.2%	13.2%

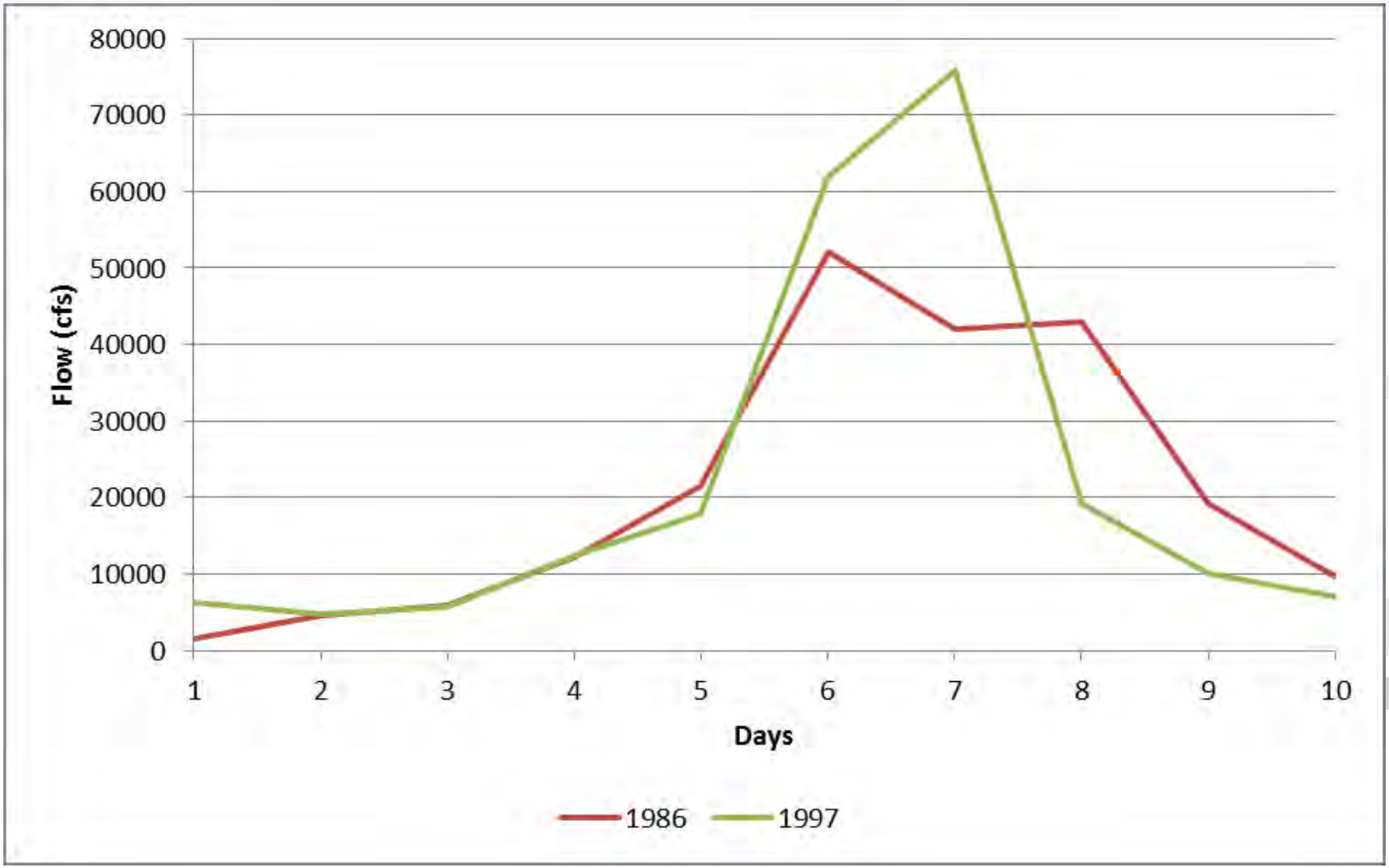
Historic Event Full Natural Flows
(North Fork at North Fork Dam)



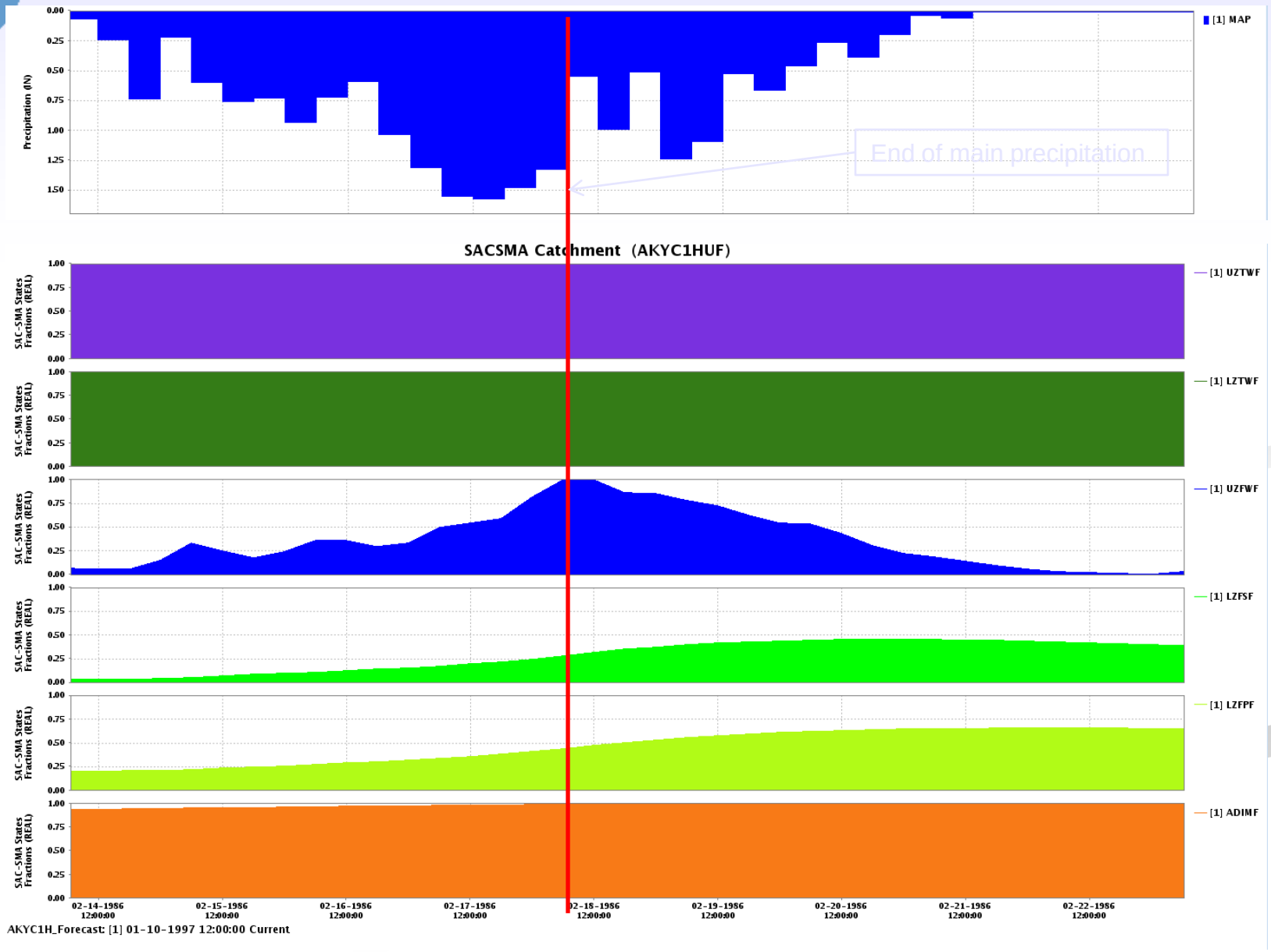
Historic Event Full Natural Flows
(Middle Fork at Foresthill)



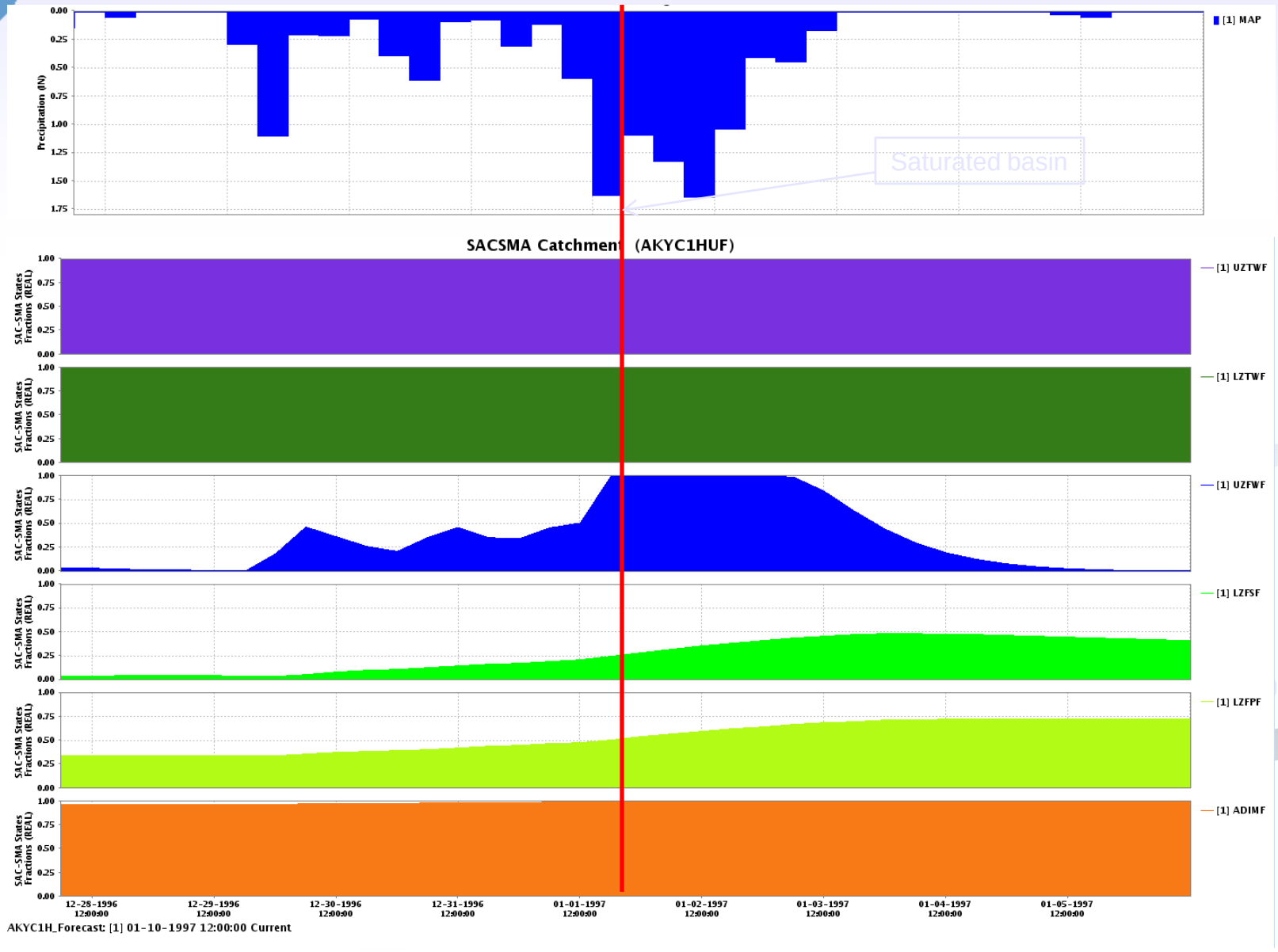
Historic Event Full Natural Flows
(South Fork at Chili Bar)



Kyburz 1986 Soils



Kyburz 1997 Soils



Conclusions

- 1986* and 1997 storm patterns require similar PMP values as USACE PMP

  * note – 1986 pattern with 1997-like temperature conditions

- Amount of precipitation needed to generate PMF dependent on a variety of factors
  - Temperatures *(large)*
  - Antecedent Conditions *(medium)*
  - Precipitation Timing *(small)*
  - Precipitation Distribution *(small)*

Conclusions

- Peak and 1-day flows vary quite a bit between 1997 and 1986

- These flow differences are due to a variety of factors
  - Precipitation Timing *(large)*
  - Precipitation Spatial Distribution *(medium)*
  - Temperatures *(small)*
  - Antecedent Conditions *(small)*