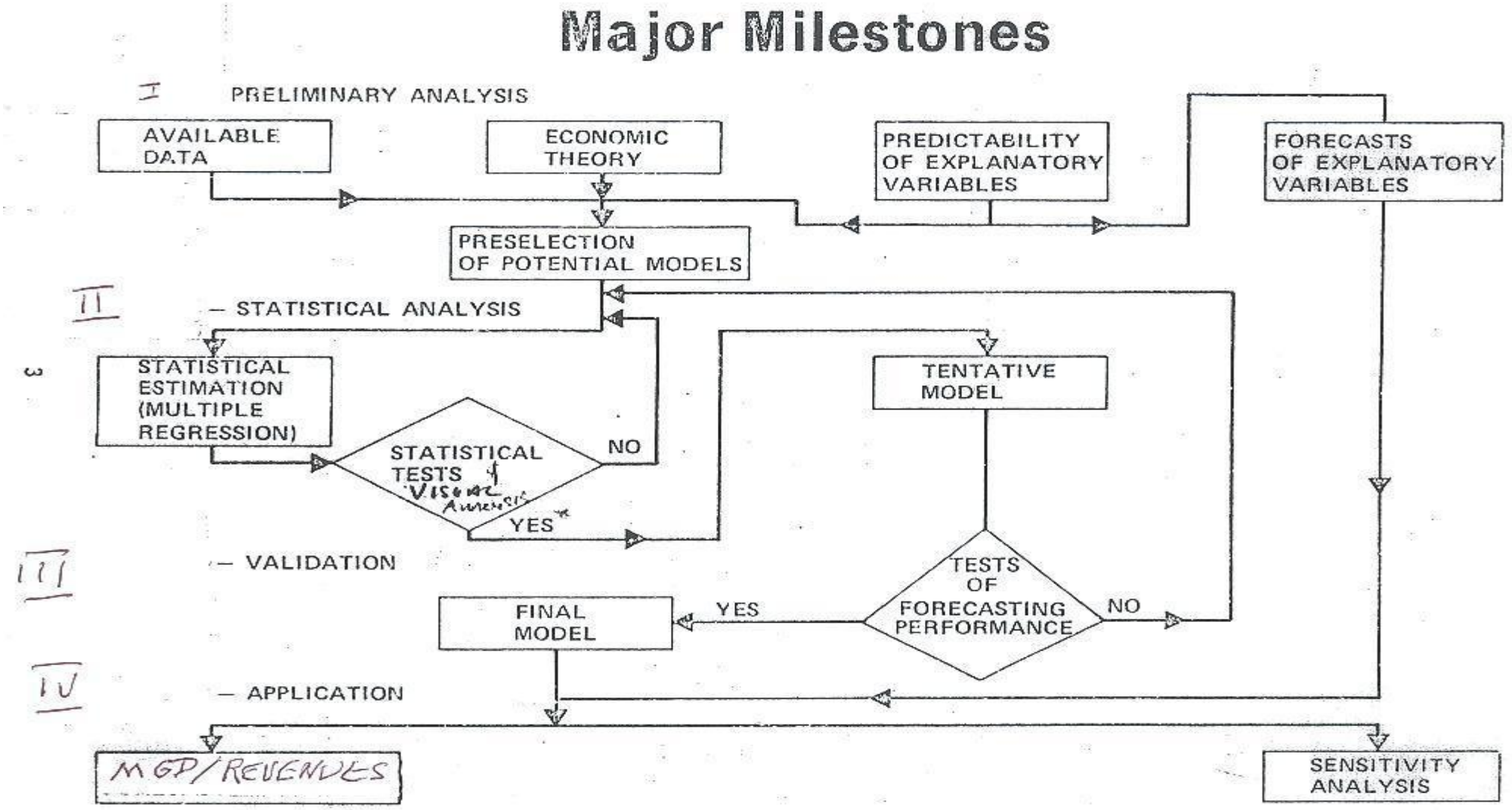
Hetch Hetch Extractions
@
Different River Flows
@
Percent of Total System Deliveries

Percent of Total TR flows as a result of different delivery assumptions and percent local supplies

SFPUC SYSTEM DELIVERIES MGD	80% FROM TR @ 1.8 MAFY	85% FROM TR @ 1.8 MAFY	80% FROM TR @ 1.1 MAFY	85% FROM TR @ 1.1MAFY
230	11.45%	12.17%	18.74%	19.91%
240	11.95	12.69	19.55	20.77
250	12.45	13.22	20.37	21.64
265	13.19	14.02	21.59	22.94
300	14.94	15.87	24.44	25.97
310	15.43	16.40	25.25	26.83
BAWSCA				
184	9.16	9.73	14.99	15.93
210	10.45	11.11	17.11	18.18

Econometric Forecasting



Hetch Hetchy Reservoirs

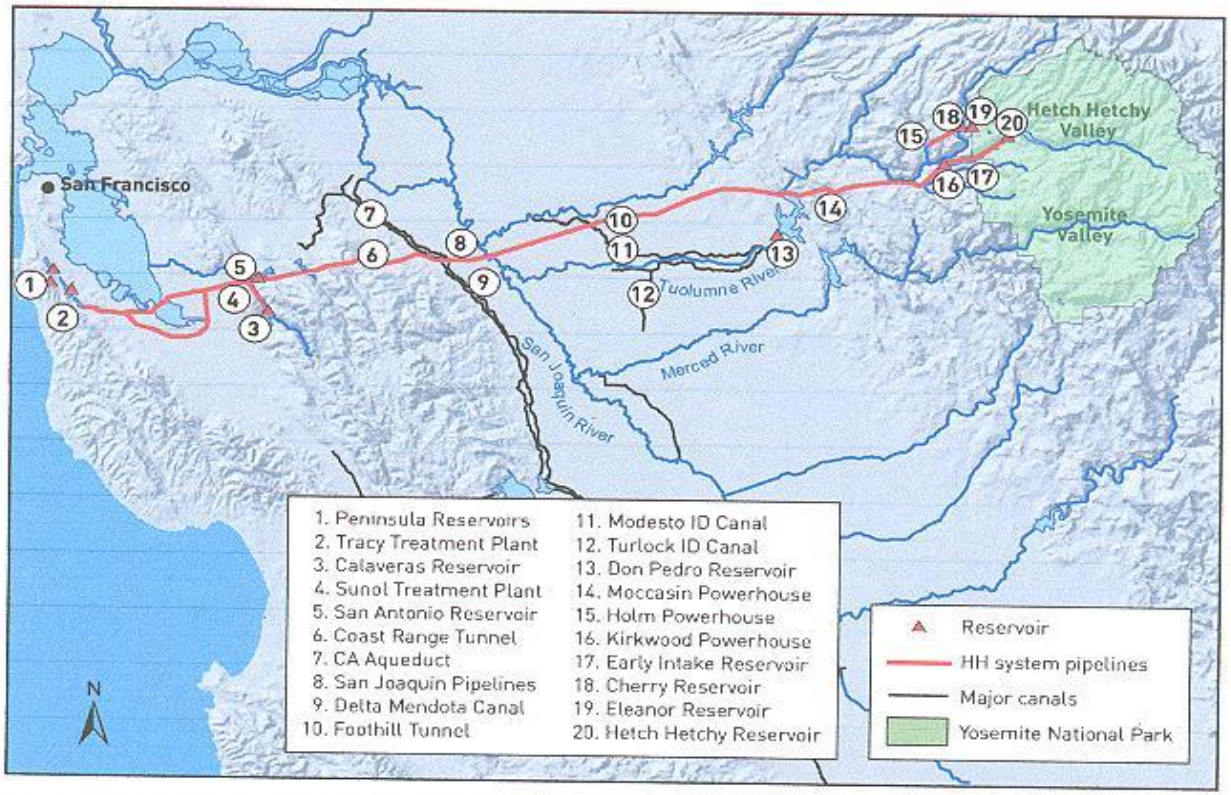
Principle Tuolumne River and SFPUC reservoirs

Region reservoir	Storage capacity (thousand acre-feet)
Bay Area	
Pilarcitos	3
San Andreas	19
San Antonio	51
Crystal Springs	69
Calaveras	97
Upper Tuolumne	
Eleanor	27
Cherry	273
Hetch Hetchy	360
Lower Tuolumne	
Don Pedro[2] (SF Water Bank)	634
Don Pedro (MID/TID Portion)	1395
SFPUC Total	**1533**

- SFPUC-HH depends on dams to ensure year around supply availability.
- SFPUC own the rights to 740,000 acre-feet storage in Don Pedro. Uses it as a bank to divert upstream river flows.
- State Division of Dams Safety has declared Calaveras (97,000 AF) unsafe and restricts it to 1/3rd rated capacity.
- Total SF BA = 239 AF; Upper TR =660 AF, and Don Pedro 1395

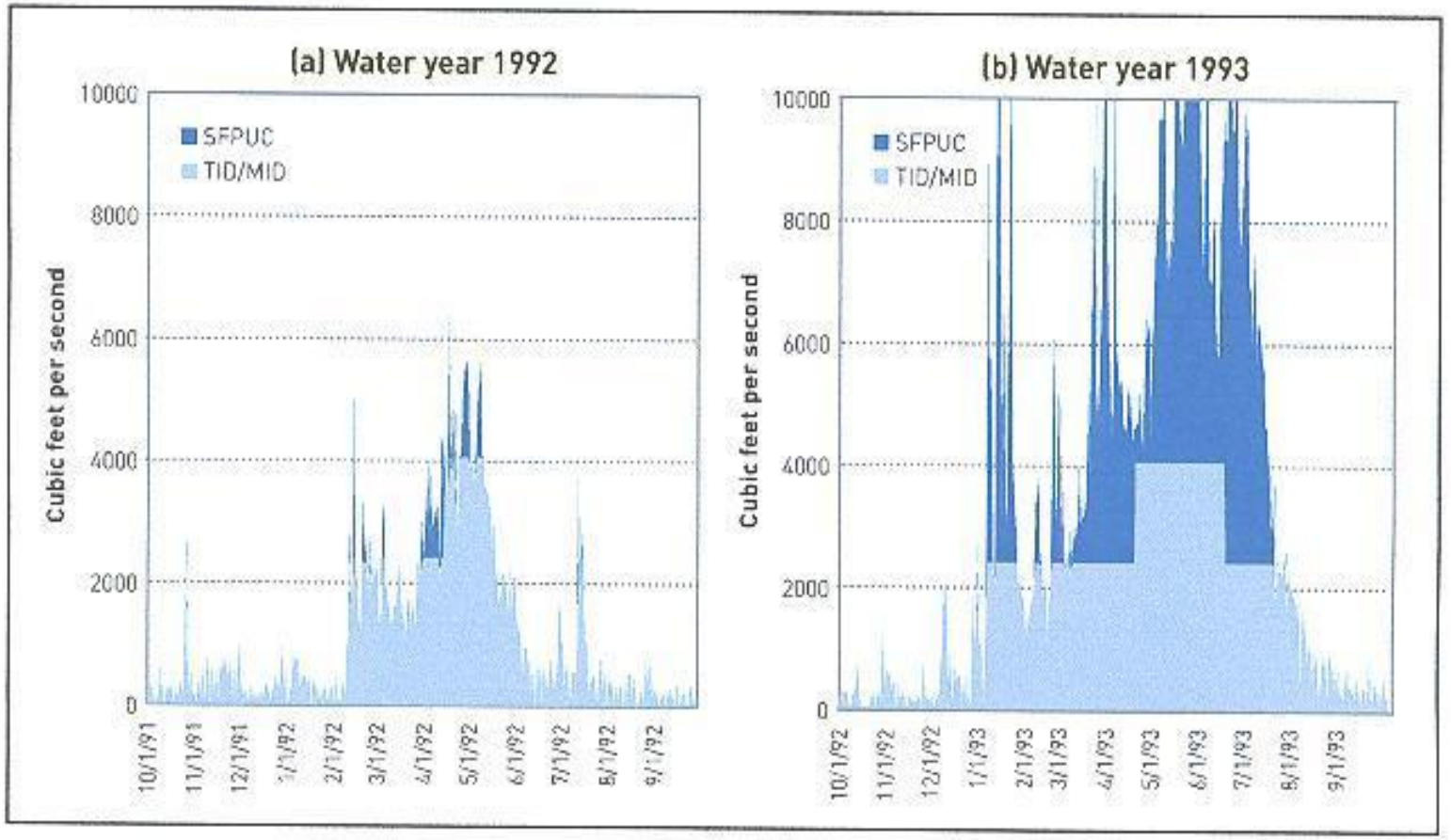
The Hetch Hetchy System

Overview of SFPUC water system and other Tuolumne River facilities



Hetch Hetchy Reservoir is part of an extensive system that includes several reservoirs, water treatment plants, hydropower facilities and a 160-mile series of pipelines and tunnels that carries Tuolumne River water from the Sierra Nevada to the Bay Area. Hetch Hetchy Reservoir holds less than 25% of the system's total storage capacity.

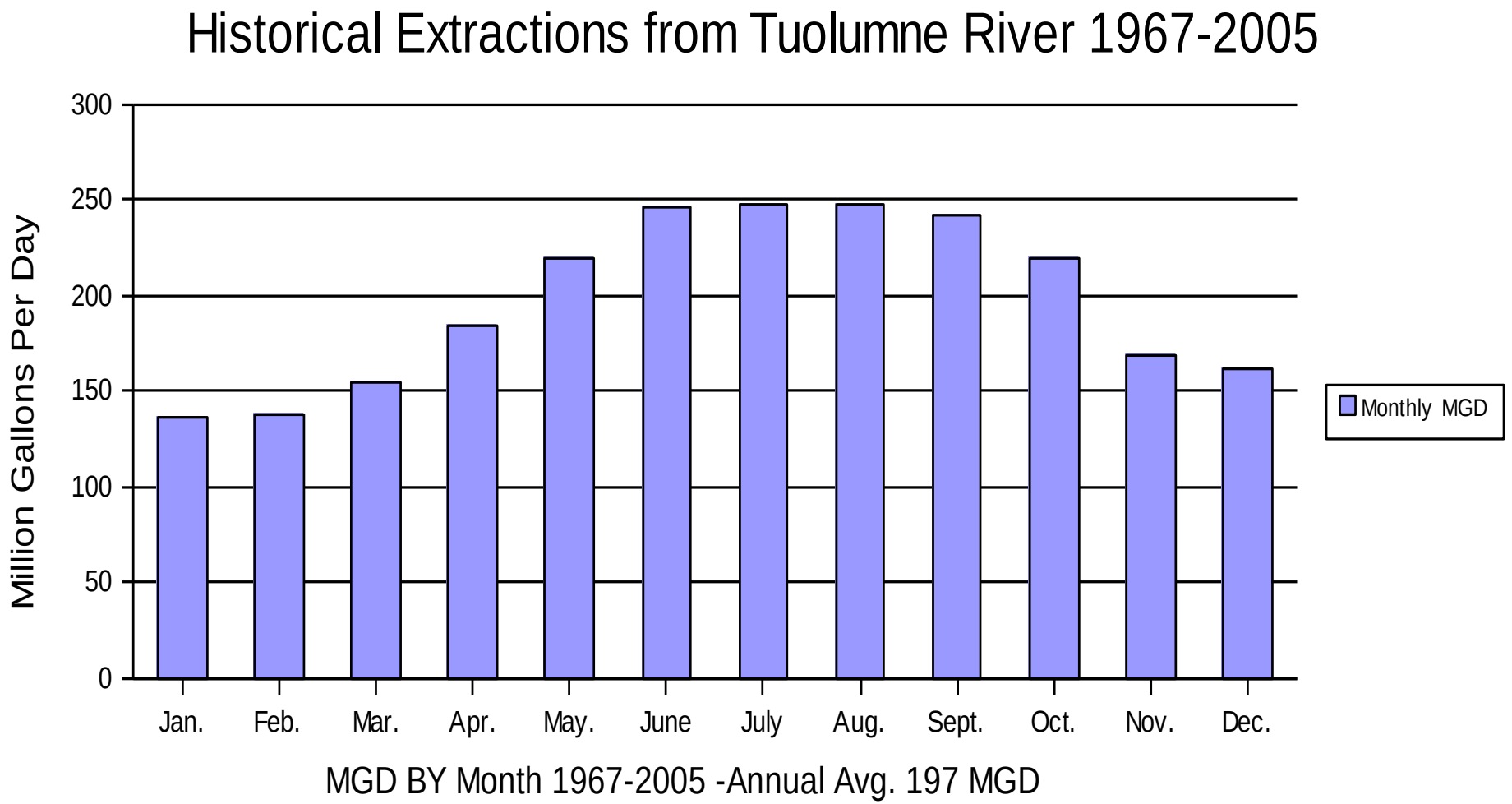
Tuolumne River water rights distribution SFPUC – extractions drought year (1992) and non-drought year (1993)



For Bay Area water users, the extremes of the Tuolumne's natural hydrology are exacerbated by the SFPUC's "junior" water rights. 1992 was not only a dry year, it marked the sixth straight year of drought. Fortunately, in 1993, heavy rains and snowfall returned to the Tuolumne River watershed.

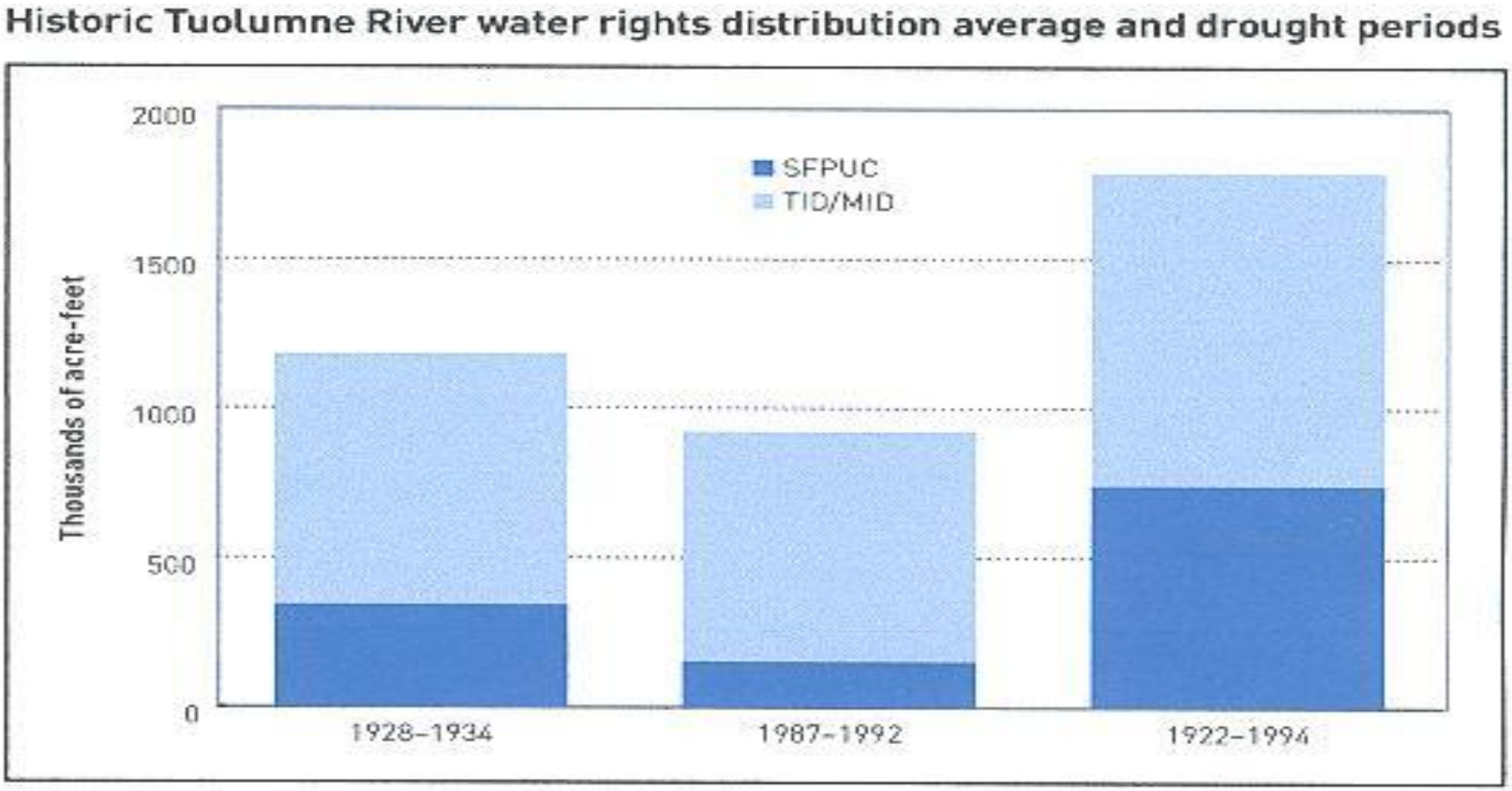
Source: California Department of Water Resources

Historical System Extractions from the Tuolumne River 1967-2005



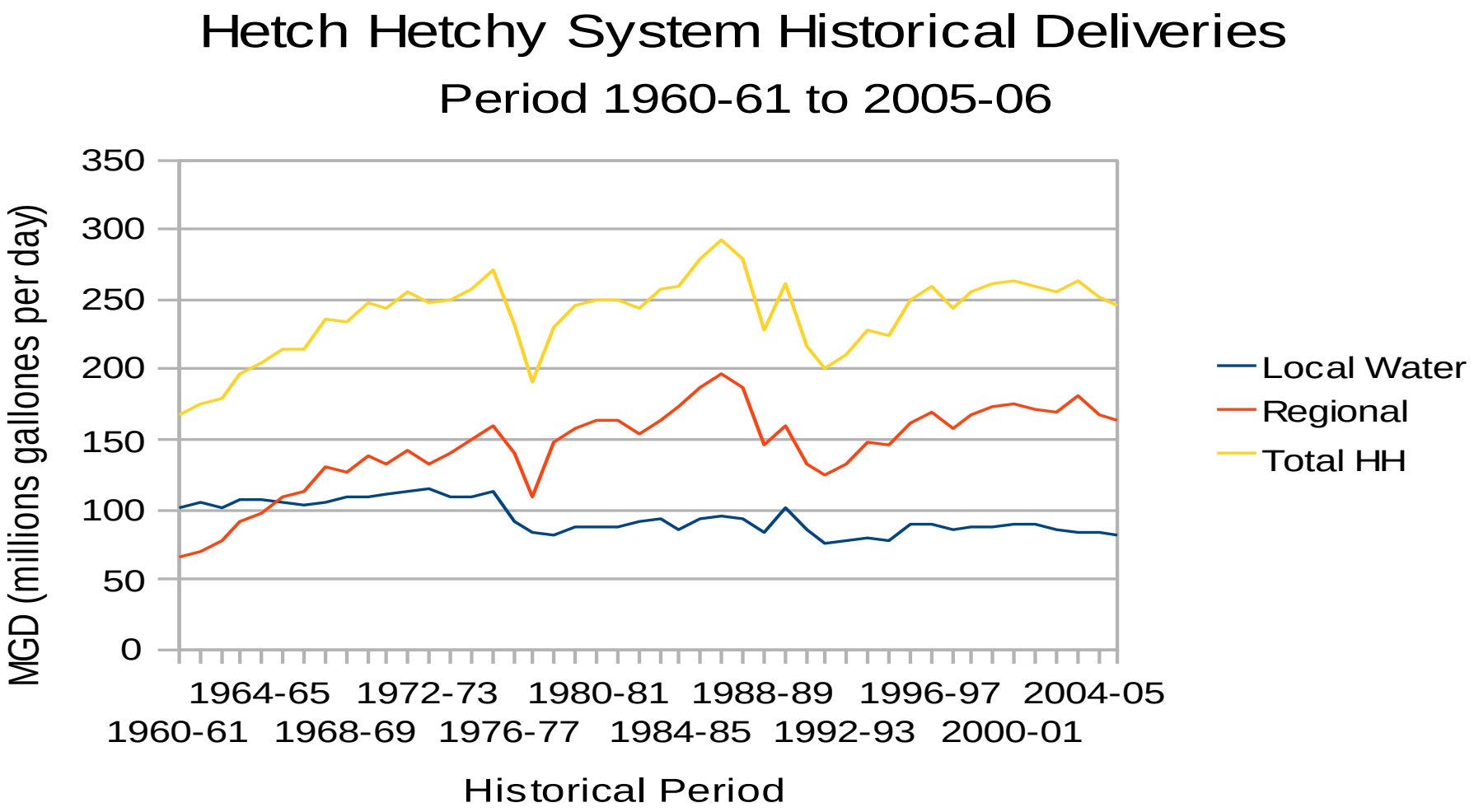
The rate of the flow in streams and rivers is typically measured in **cubic feet per second (cfs).** One cubic foot is about 7.5 gallons; one cfs is equivalent to 724 acre-feet per year.

Historic Tuolumne River water rights distribution average and drought periods



Between 1987 and 1992, the SFPUC's average annual water-rights accrual was 151,000 acre-feet, about half of its current water-delivery objective.

Hetch Hetchy Historical Deliveries



Tuolumne River (TR)

- One of the largest rivers in California's Sierra-Nevada Mountains. Well farmed with many uses. It has been described as a hard-working river
- Hydrology
- Average annual flows of 1.8 million acre-feet (1,607 MGD). On average every 4th year 1.1 million acre-feet. (982 MGD).
- Approximately 60% of Tuolumne River flows occur between April and June
- Three droughts over hydrologic period period 1922-1994: 1928-34, 1976-78, and 1987- 1992. In 1977 SFPUC extracted 3 MGD from TR and in 1992 61 MGD.
- 2000 – BAWSCA (BAWUA) and SFPUC estimated system reliability at 240 MGD based on system integrity and hydrologic history 1929-1999.
- Water Rights
- Bay Area and SFPUC threshold 2,416 cfs at La Grange, except mid-April to mid June TR flows must exceed 4,066 cfs. Irrigation districts have “senior” riparian rights get base flows. SFPUC has “junior” water rights.
- Global warming? Earlier takes?

Brian Browne
Presentation 3/27/08

- Water supply availability
- System Reliability
- Demand forecasting

Actually - Focus on Hetch Hetchy's supplies from current pristine sources. System reliability is defined as a function of system integrity and hydrologic conditions (usually based on long-term historical data). System integrity is a function of the stability of the existing structure and type and timing of the ongoing capital improvement and R&R programs (CIP/WSIP) being implemented.

Demand forecasting using a combination of economic theory, mathematics, and statistics AKA econometrics. Subsumes quantity demand responses to changing prices (elasticities), etc. This approach is different from end-use forecasting in that price has a more determining role in allocating available resources.

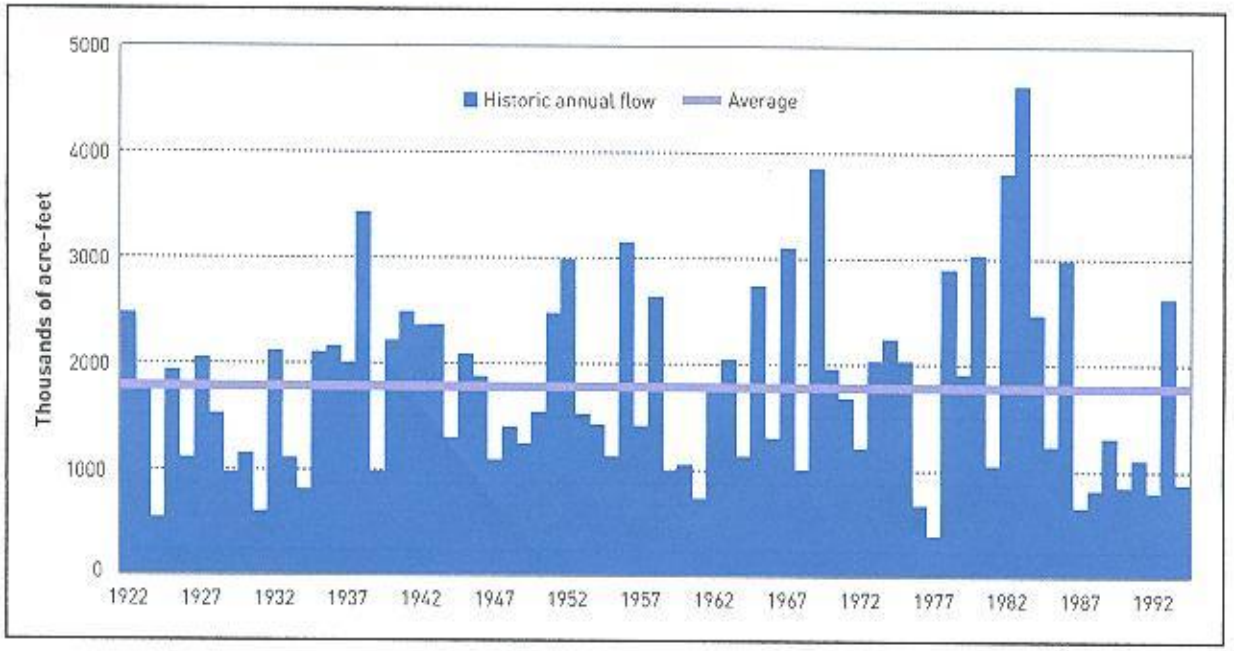
This is a work-in-progress

Why in a few words?

- Overestimating supply availability from current pristine sources could lead to problems such as having to rethink the current “pre-negotiating principle” that the 1984 MWSA commitment to BAWSCA of 184 MGD must be back on the negotiating table for 2009 and not an immovable feast day. 184 MGD to BAWSCA does not appear feasible.
- It appears that San Francisco must adopt a meet San Francisco's water requirements first then on a “best effort” basis provide the remaining excess supplies to the peninsula.
- Water availability is the denominator in estimating $/unit water. If the denominator is less that projected the quotient, albeit water rates will be higher. AKA rate shock.
- Expanding the HH system to use other source supplies will increase the cost function and lower the quality index.
- State law mandates that water must be available to proceed with urban developments. This has become a big factor in S. Calif. Development constraints. We will not remain immune to this state mandated constraint in N. Calif.
- Price. The first law of demand – an increase in price will lead to a decrease in units consumed. The longer this price remains the greater this decrease in units consumed. If a 1 percent increase in rates leads to a greater than 1 percent decrease in units taken then total revenues will decrease. This will have many impacts, especially on the ability of the SFOUC to retire revenue bond debt from rate increases.

Historic Tuolumne Flows 1922-1994

Historic Tuolumne River flows (1922–1994)



The Tuolumne's flows, like those of most California rivers, vary widely with annual precipitation. Source: California Department of Water Resources