

**Incorporation of Long-Range Climate
Variability Forecasts in Colorado River
Operations ?**

By

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Attachment 6
TWG 11/4-5/97

**“The Role of Climate Variability and
Forecasts in Adaptive Management of the
Colorado River: Balancing the Resource
Objectives of the Lower and Upper Basin
at Glen Canyon Dam”**

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NOAA Funded Study For 1998

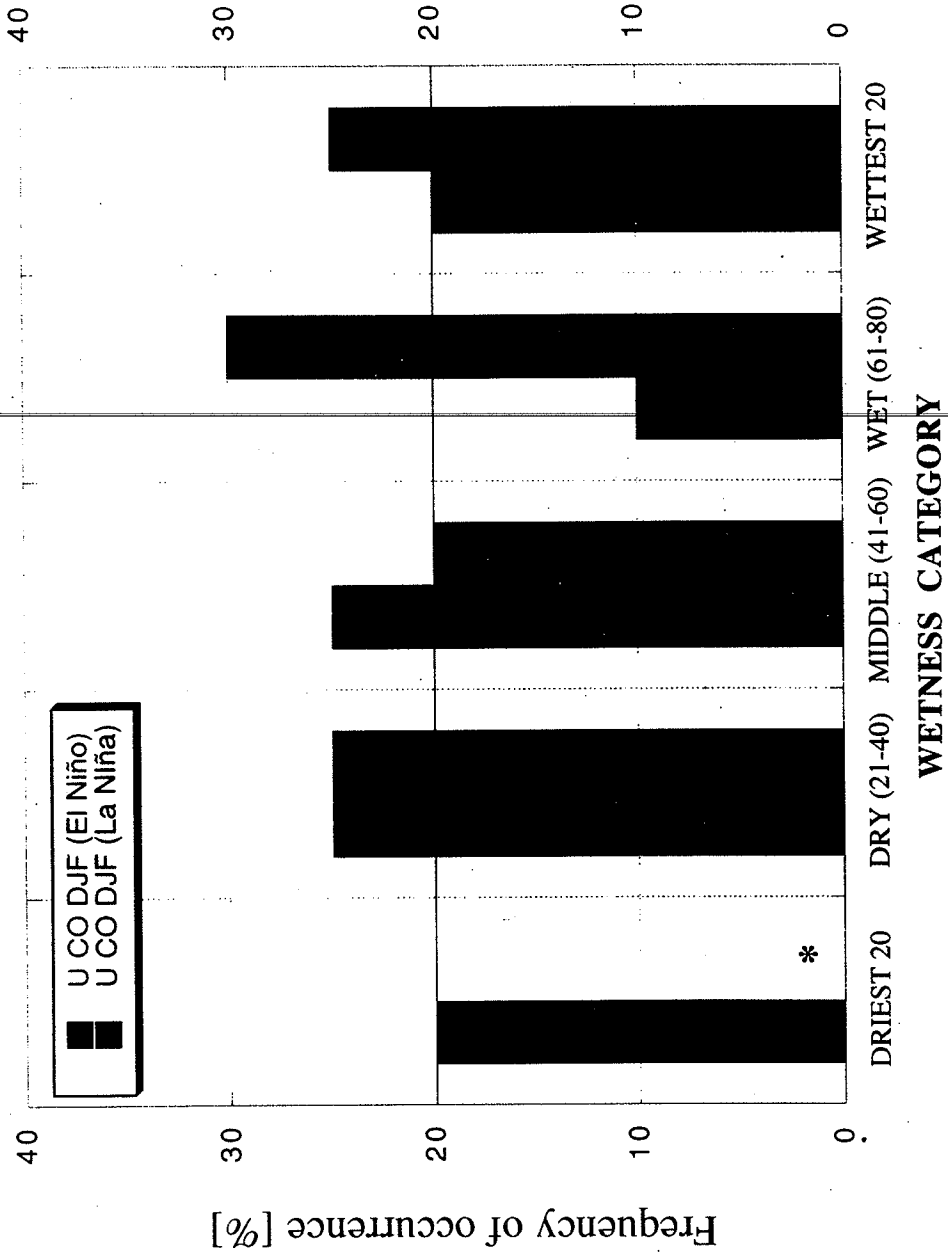
Preliminary Conclusions:

- Complex Spatial and Temporal Relations Between Climate Variability and Colorado River Hydrology
- Implications of Late-Spring High Wetness Following Normal Winters?
- Importance of Back-to-Back Eastern Pacific Ocean Warm/Cool Anomalies?

Ongoing Work:

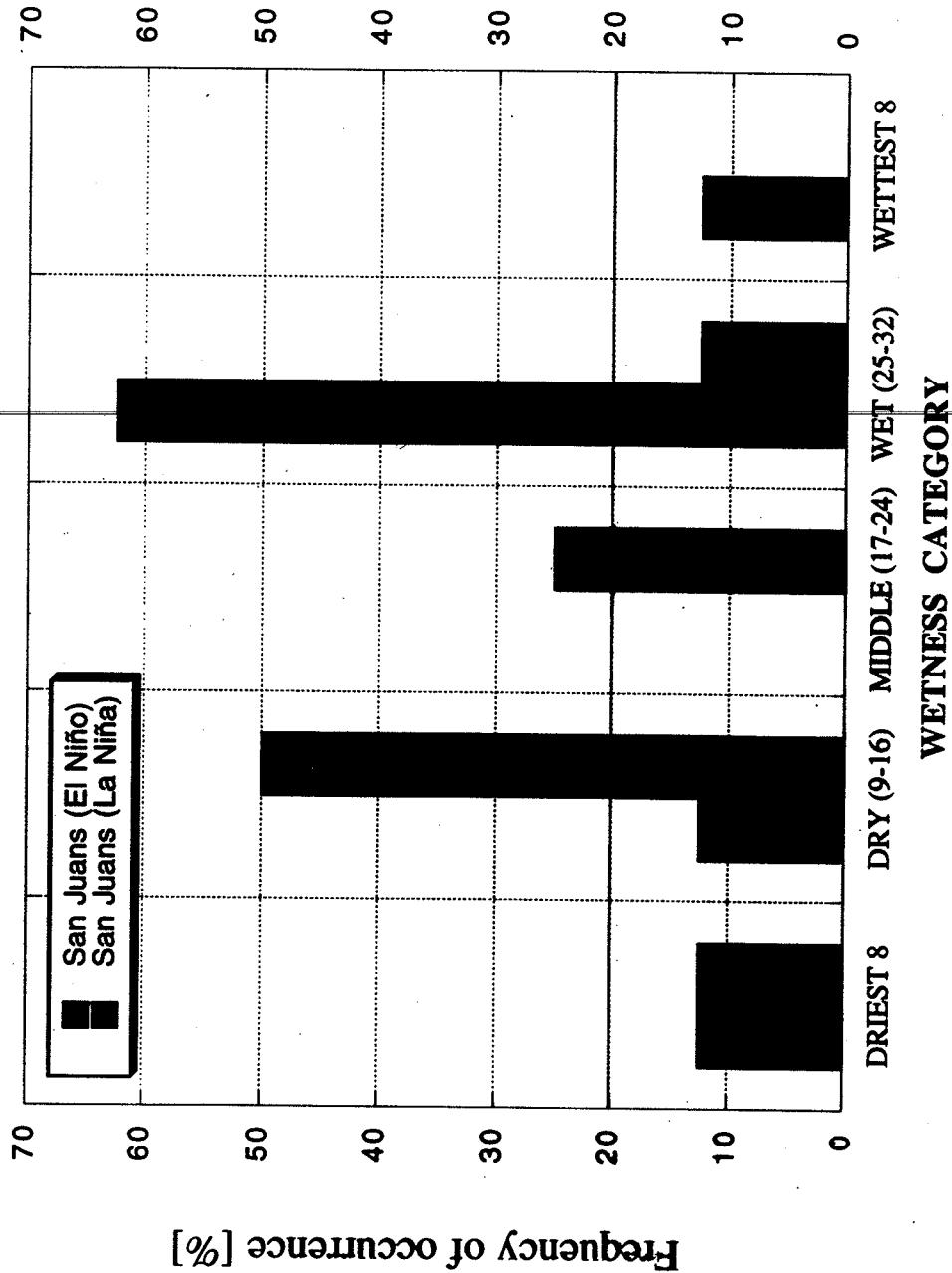
- **Historic Spatial and Seasonal Relations Between Upper CR Inflows and Anomolies (seasonal-decadal time scales)**
- **Assess Present and Potential Uses of Climate Information in Adaptive Management of Colorado River Resources**
- **Compare Lessons - Managing Climatic Risk in Colorado and Columbia Rivers**

Upper Colorado Winter Precip (1896-1995)



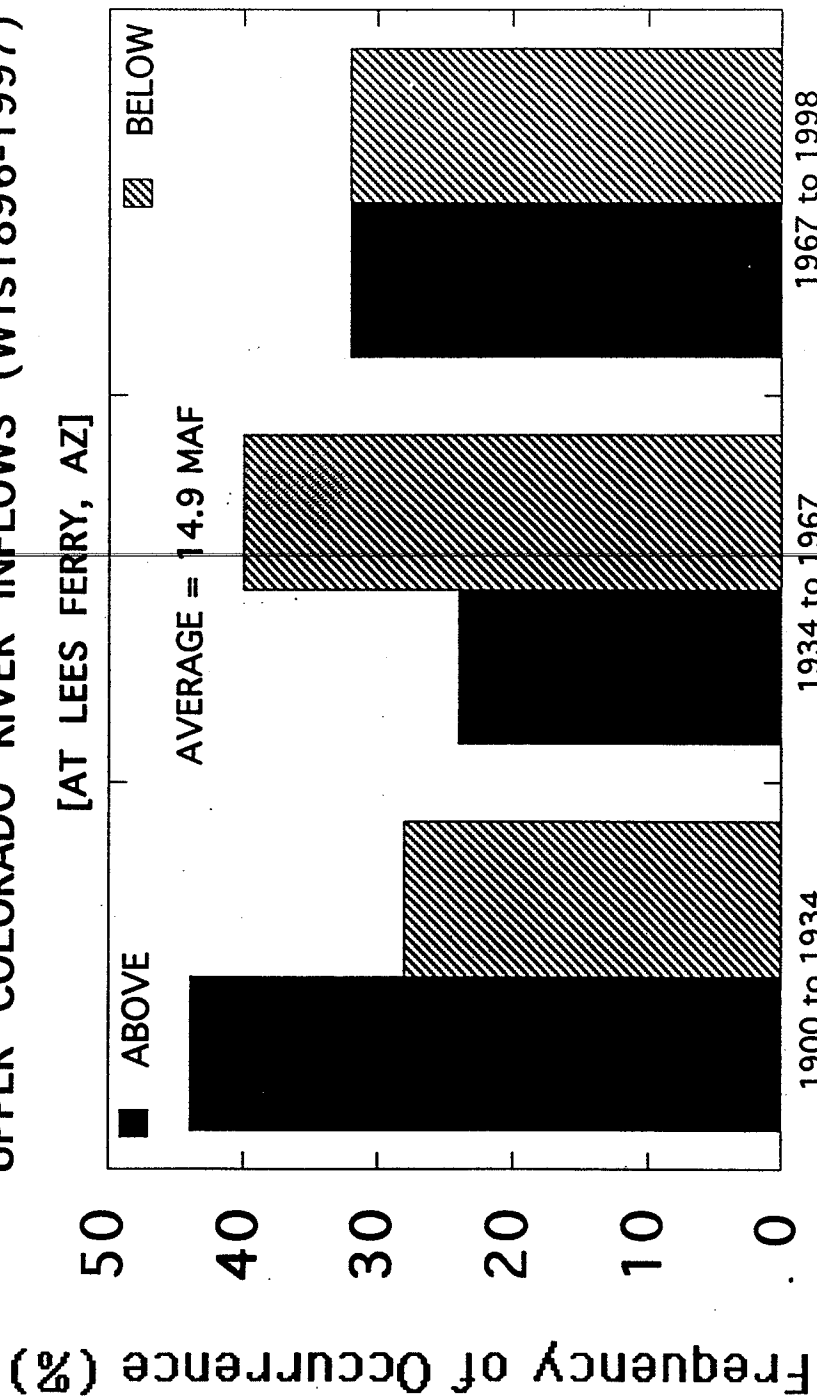
Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

San Juans Snowpack (1 April 48-87)



Source: U.S. Climate Division data in comparison with the winter-time Tahiti-Darwin SOI (analysis by Klaus Wolter, Climate Diagnostics Center)

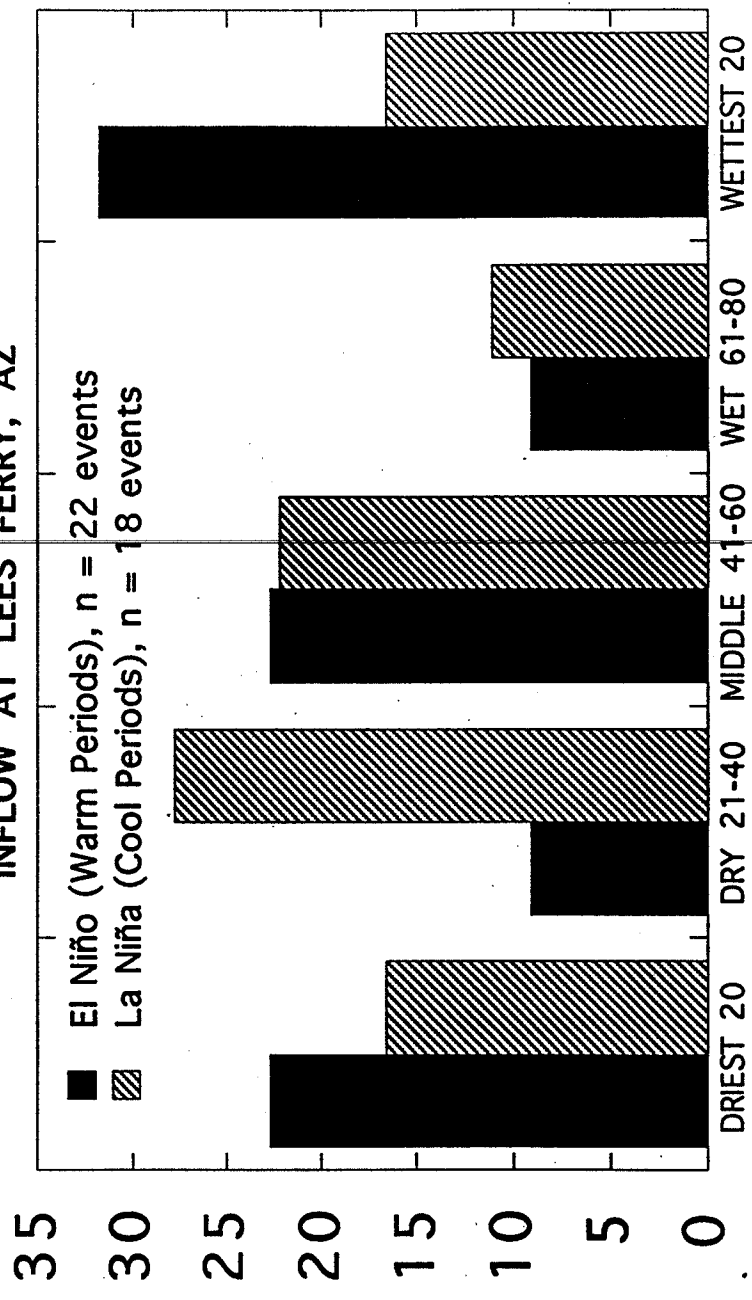
**20TH-CENTURY TIMING OF ABOVE AND BELOW-NORMAL,
UPPER COLORADO RIVER INFLOWS (WYS1896-1997)**



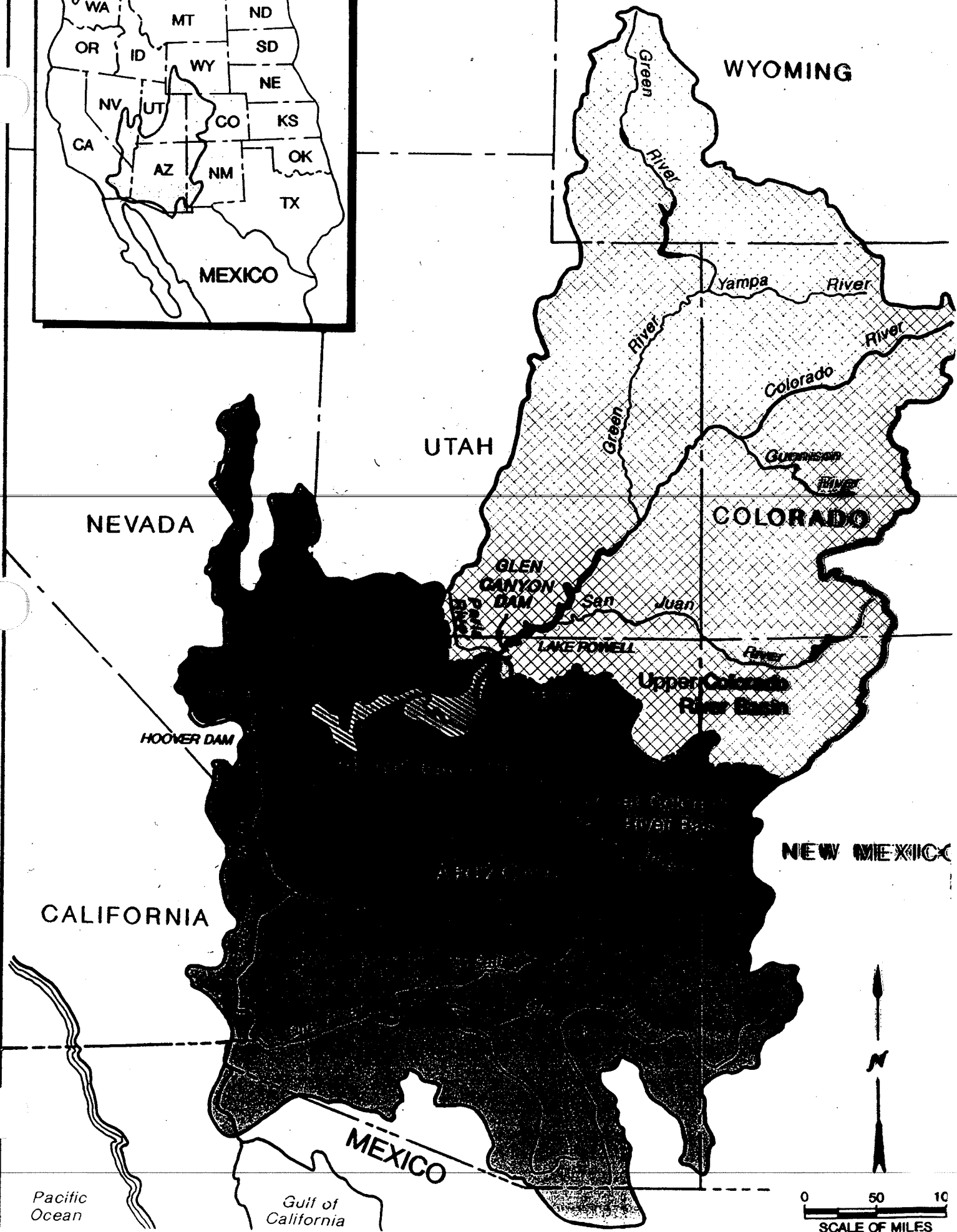
Source: Bureau of Reclamation data segregated by the first, second, and third parts of the 20th century (Analysis by T.S. Melis, Grand Canyon Monitoring and Research Center)

**UPPER COLORADO RIVER RUNOFF (WYs1896-1996)
INFLOW AT LEES FERRY, AZ**

Frequency of Occurrence (%)



Source: Bureau of Reclamation data in comparison with the winter-time Tahiti-Darwin SOI (Analysis by T.S. Melis, Grand Canyon Monitoring and Research Center)



NEVADA

UTAH

WYOMING

COLORADO

NEW MEXICO

CALIFORNIA

MEXICO

Pacific Ocean

Gulf of California



Northwest Power Planning Act (NPA, 1980)

- recognized the importance of both private and public utilities and the need for cooperation
 - emphasized conservation and efficient use of power
 - called for the involvement of state and local governments, in regional power planning
 - revision of "lowest possible rates" mandate to ensure that environmental costs of hydroelectric power would be paid for by electricity users
-

Adaptive management

(Holling et al. 1978; Walters 1986; Lee 1993)

- Policies are experiments that should be designed to produce usable lessons
- Operates on scales compatible with natural processes, is cognizant of nature's time frames, recognizes social and economic viability within functioning ecosystems
- Realized through effective partnerships among private, local, state, tribal and federal interests

**31,000 CFS TEST-FLOW RELEASE
GLEN CANYON DAM, [NOVEMBER 3-5, 1997]**

GCMRC Funded Monitoring and Research Tasks:

During Test:

- Streamflow, Suspended-Sediment Concentration and Grain Size Evolution (At 4 Mainstem Gages, USGS)
- Estimate of Eddy/Sandbar Depositional Rates (GCMRC and NAU)
- Channel-Bed Grain Size Evolution (USGS)
- Aerial Videography of Mainstem Corridor (BuRec)

Post Test:

- Sandbar Topographic Evolution (NAU Sites)
* [Including Impacts on Channel-Margin Bars]
- Sandbar Sedimentology (USGS, USU, and NAU)
- Fish Stranding Impacts (Glen Canyon)
- Kanab Ambersnail Impacts (Vasey's Paradise)