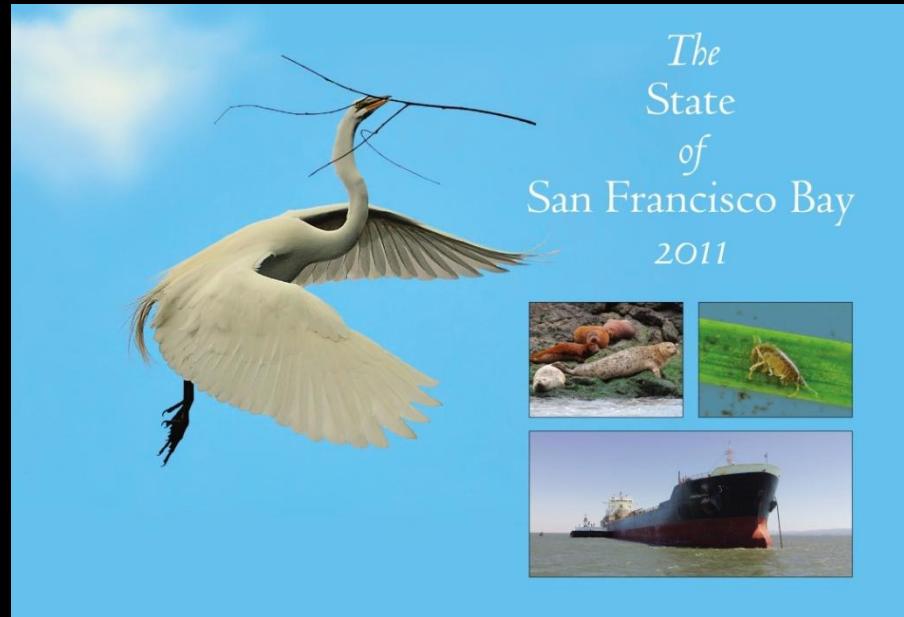


Indicators of Ecologically Sustainable Water Management for the San Francisco Estuary

Christina Swanson
Natural Resources Defense Council

Sustainability Initiatives for Managing California's Natural Resources
Sustainable Water Resources Roundtable
UC Davis, December 6-8, 2011



California's Water Supply

- ~60% from surface waters



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- Sacramento-San Joaquin Watershed supplies >25 million people



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- ~90% freshwater inflow to San Francisco Estuary



California's Water Supply

- ~60% from surface waters
- Sacramento-San Joaquin Watershed supplies >25 million people
- ~90% freshwater inflow to San Francisco Estuary
- Sustainable supply requires stewardship of ecosystems and biological resources



An aerial photograph of a river valley. The river flows from the bottom left towards the top right, with several large reservoirs along its path. On the right side, there are signs of human activity, including a small town and industrial structures. A large blue arrow points from the text box towards these developments.

Dams,
Diversions
& Exports

Indicators for Ecologically Sustainable Water Management

- Flow Alteration
- Habitat Quality and Quantity
- Ecological Processes



Data Sources 1930-2010

Dayflow

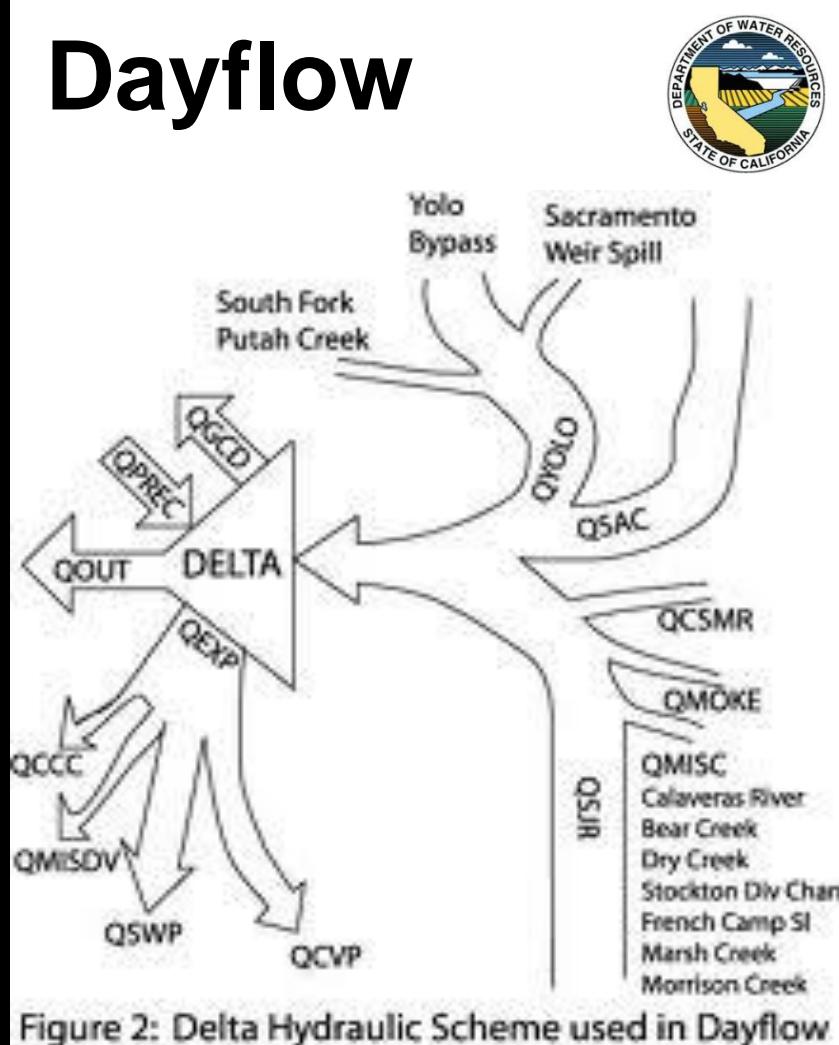
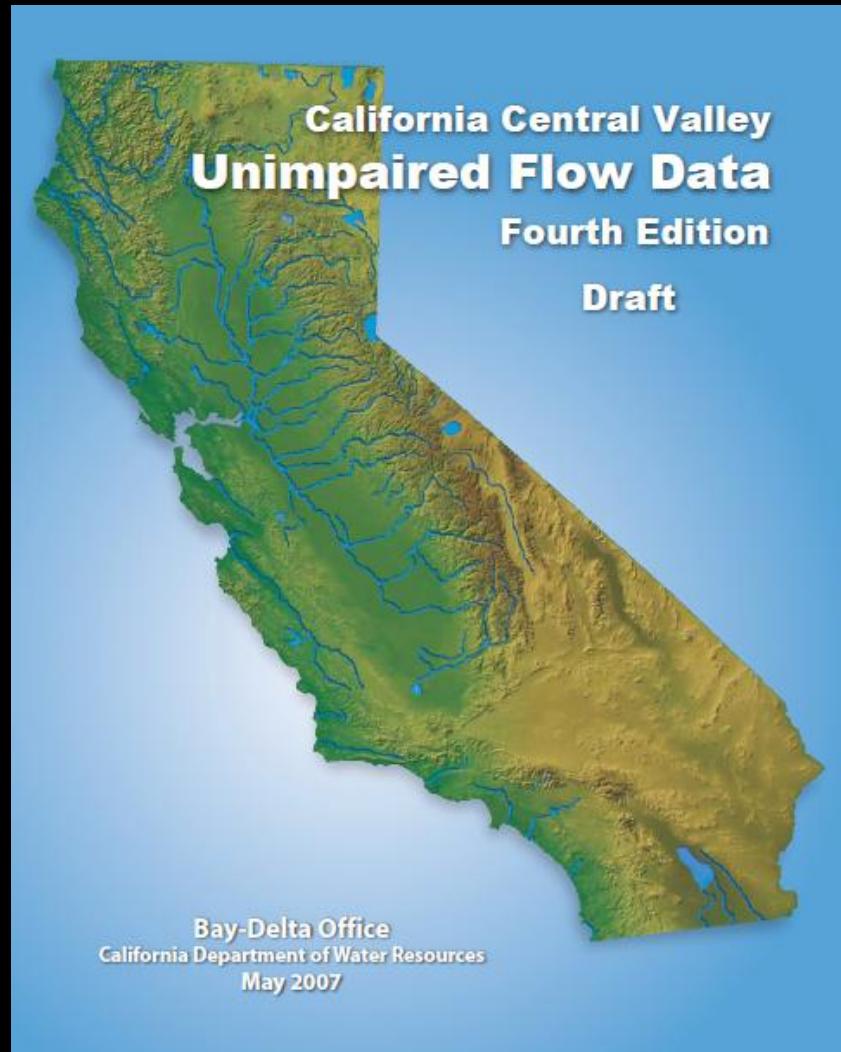


Figure 2: Delta Hydraulic Scheme used in Dayflow



Data Sources 1930-2010

Dayflow

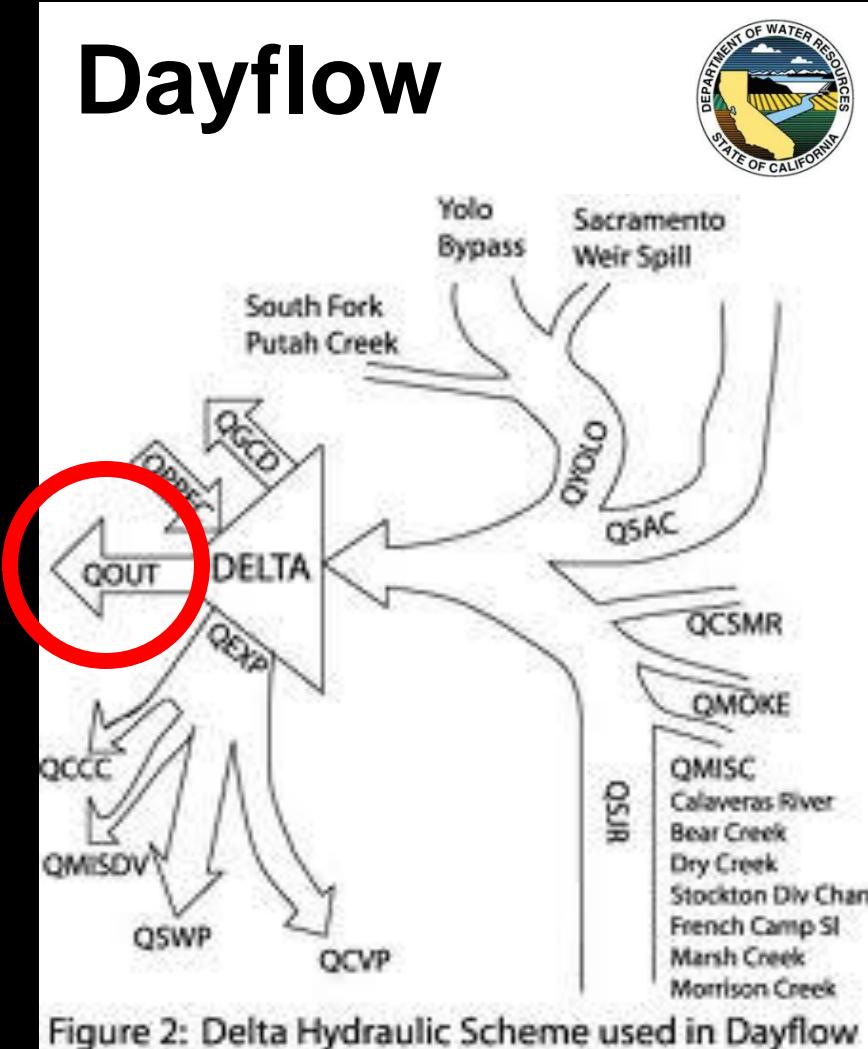
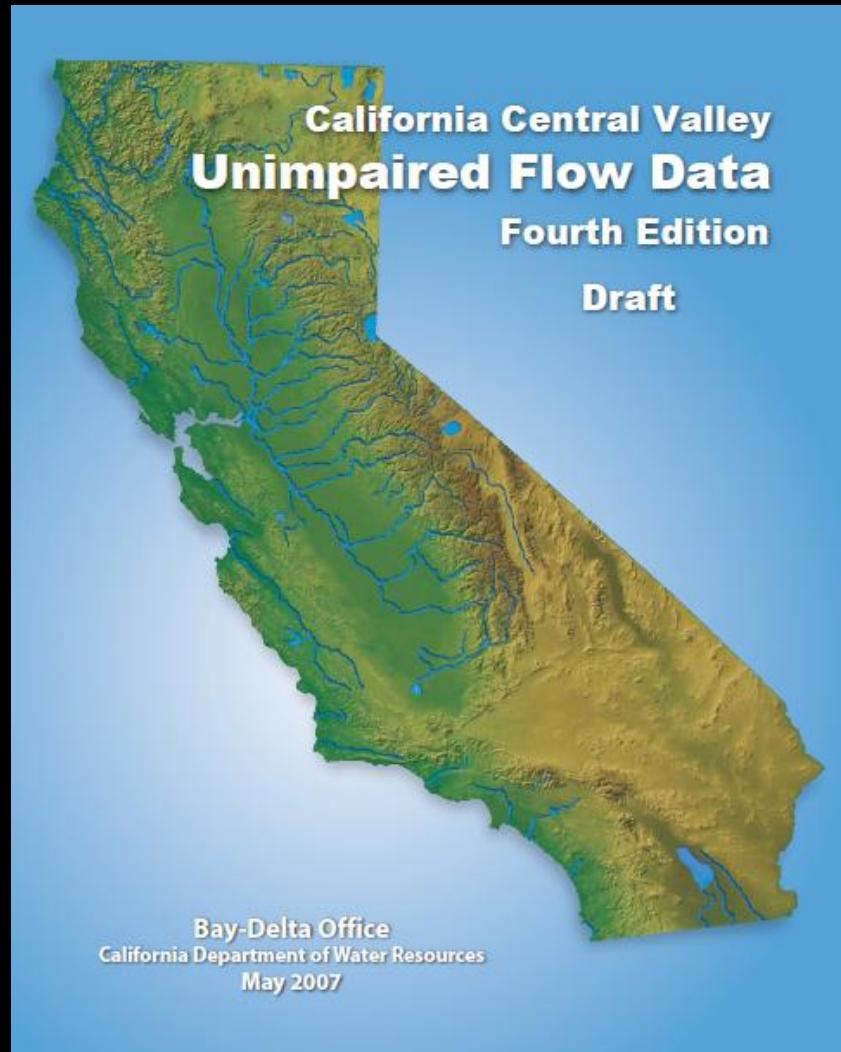
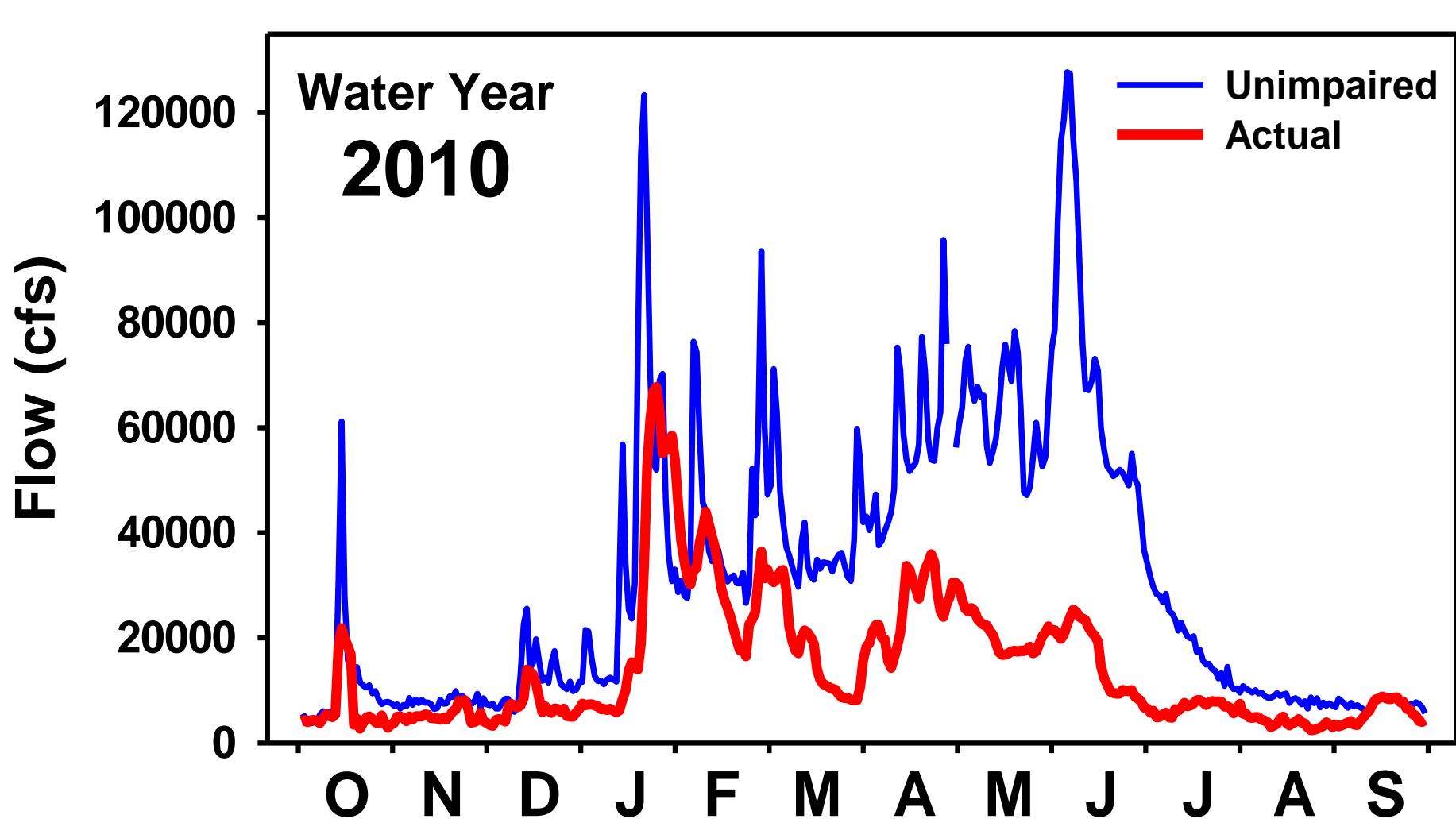


Figure 2: Delta Hydraulic Scheme used in Dayflow



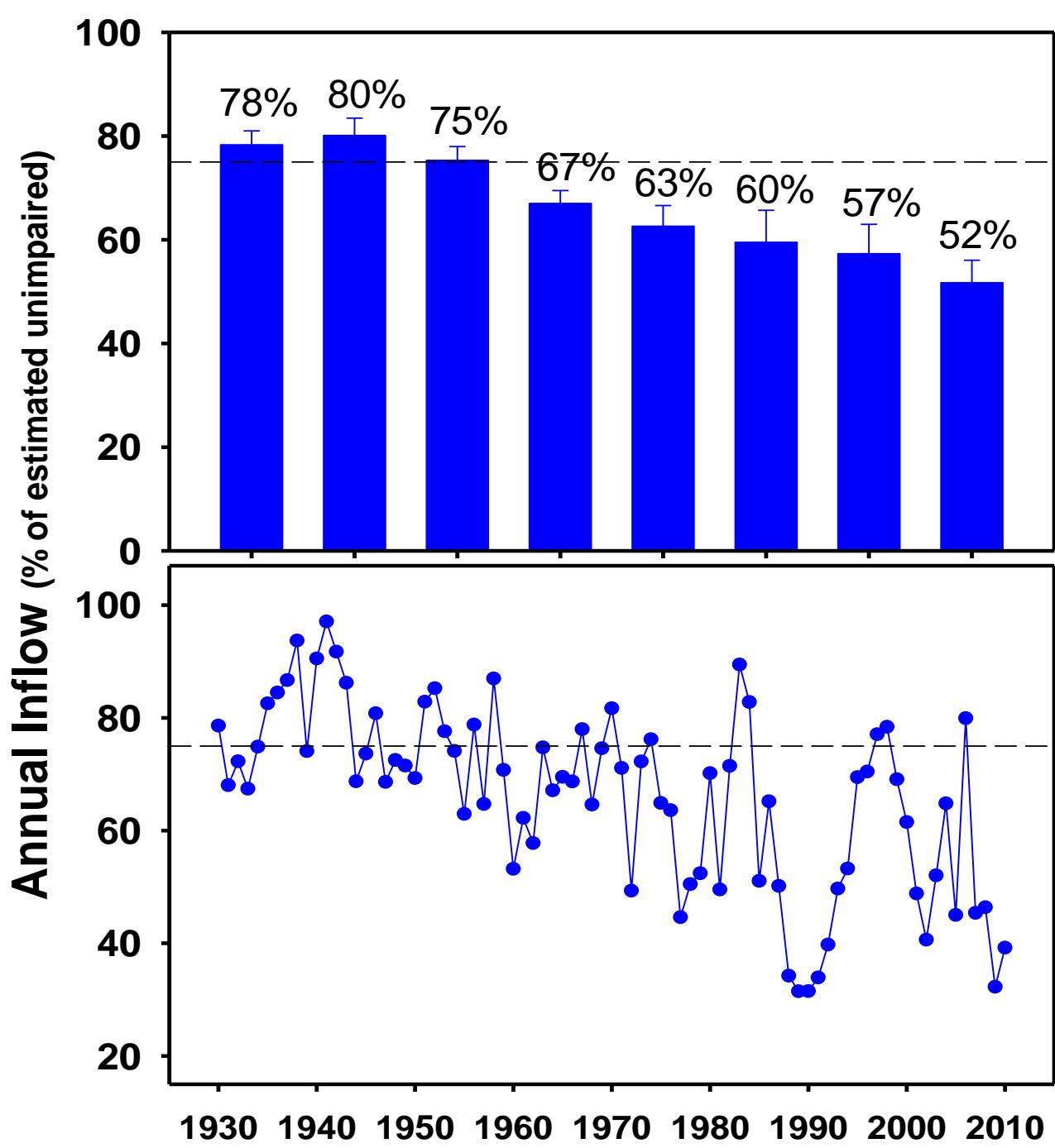
Flow Alteration

Actual v Unimpaired



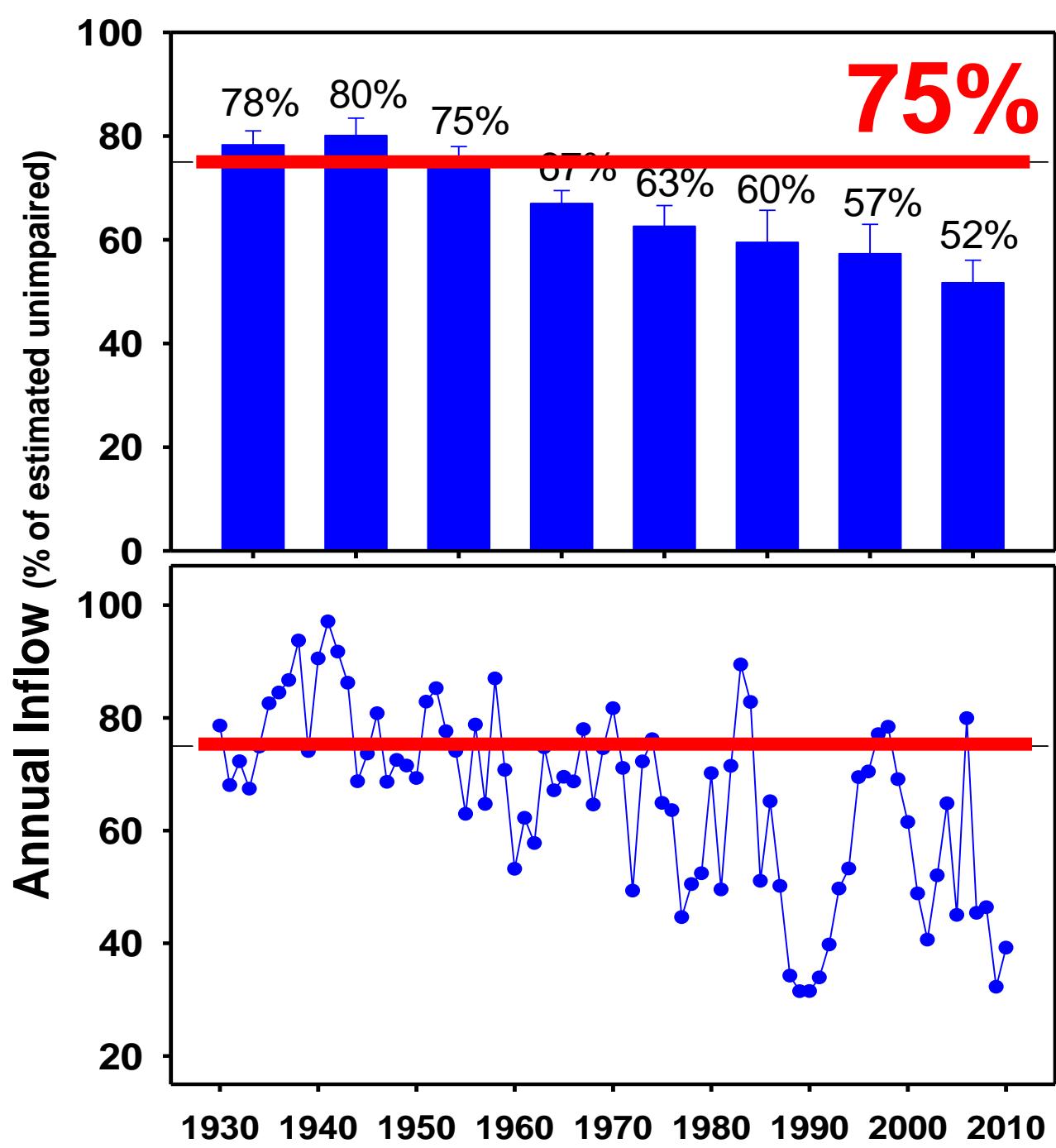
Flow Alteration

- Annual Inflow



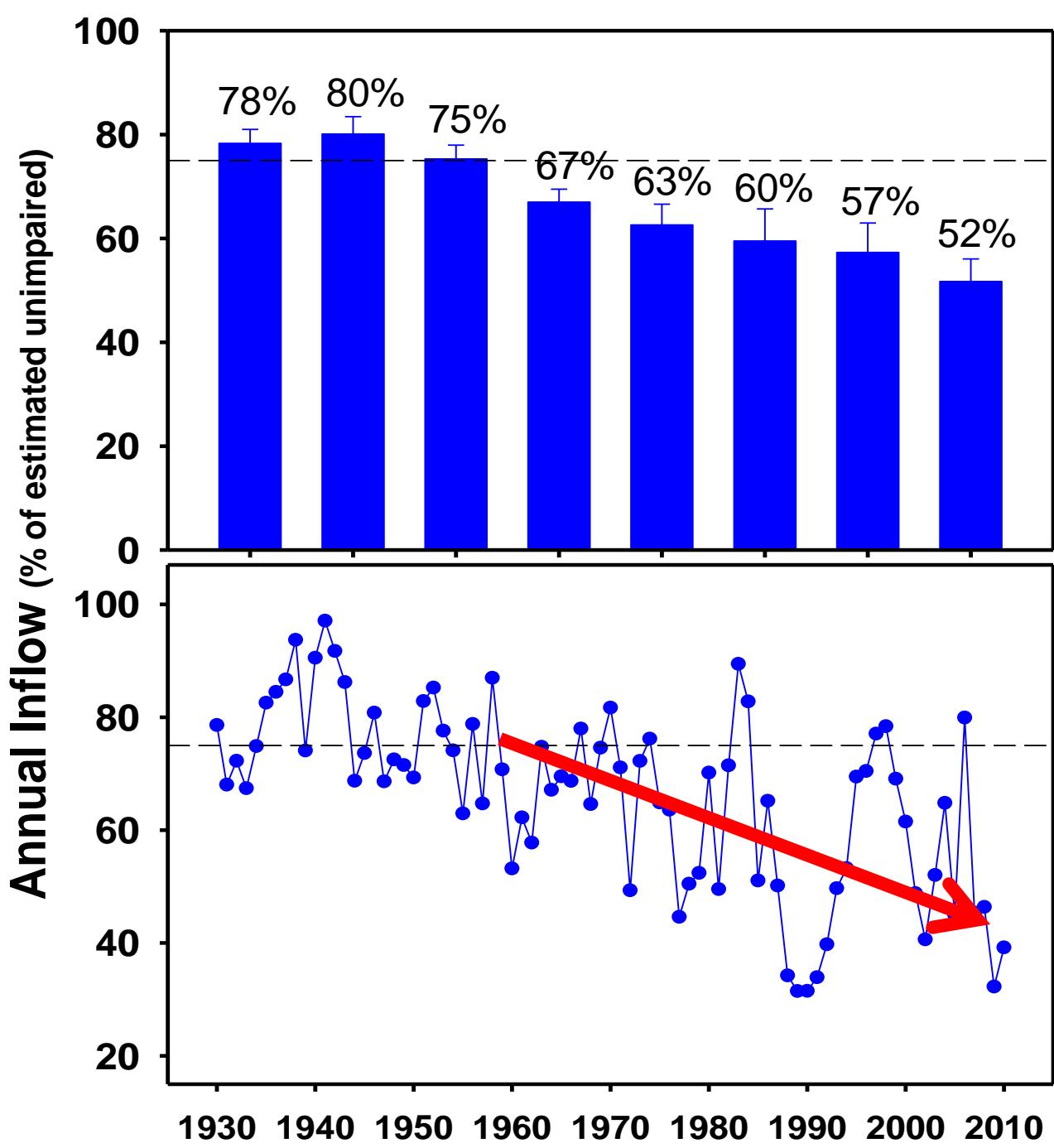
Flow Alteration

- Annual Inflow



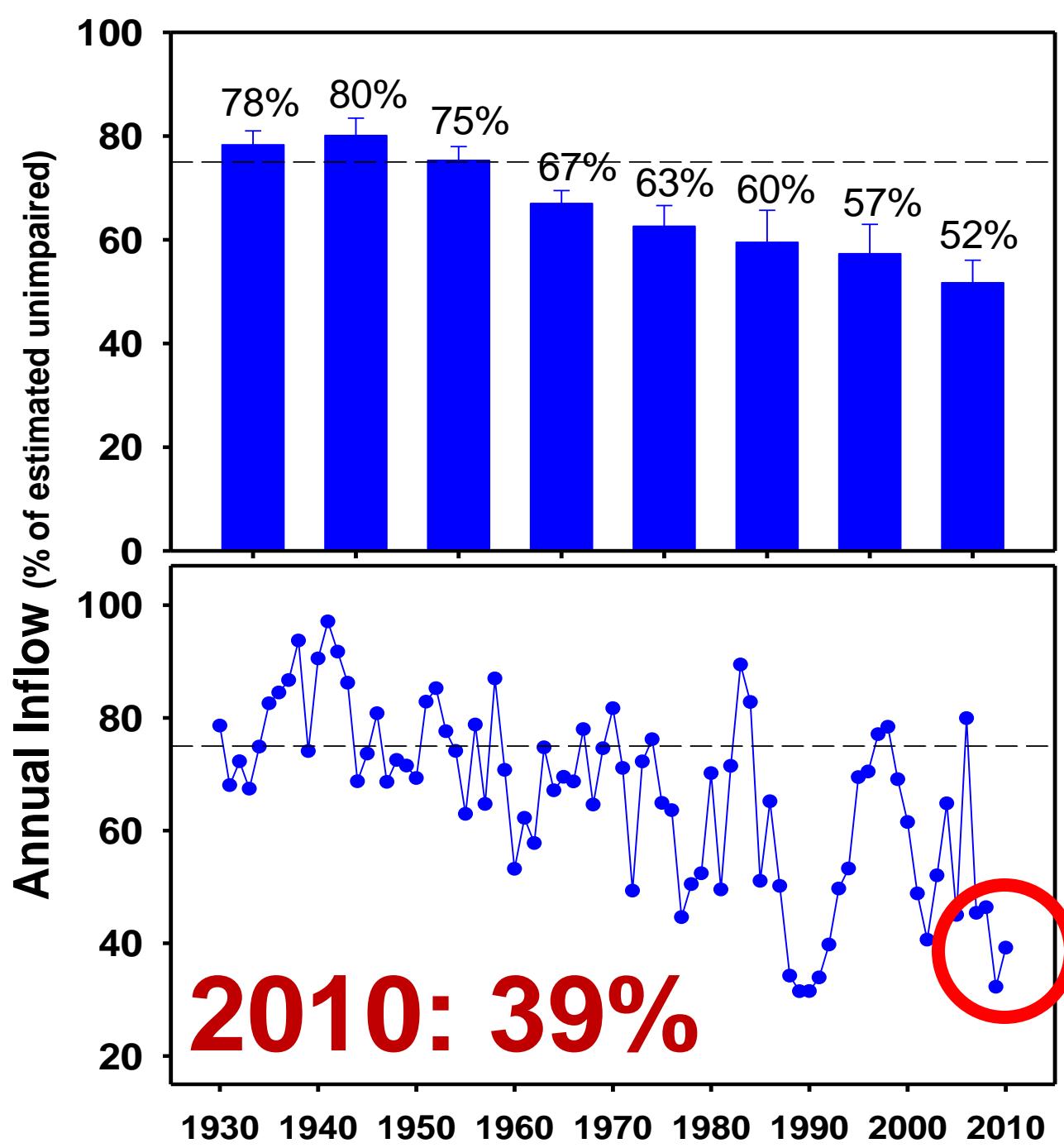
Flow Alteration

- Annual Inflow



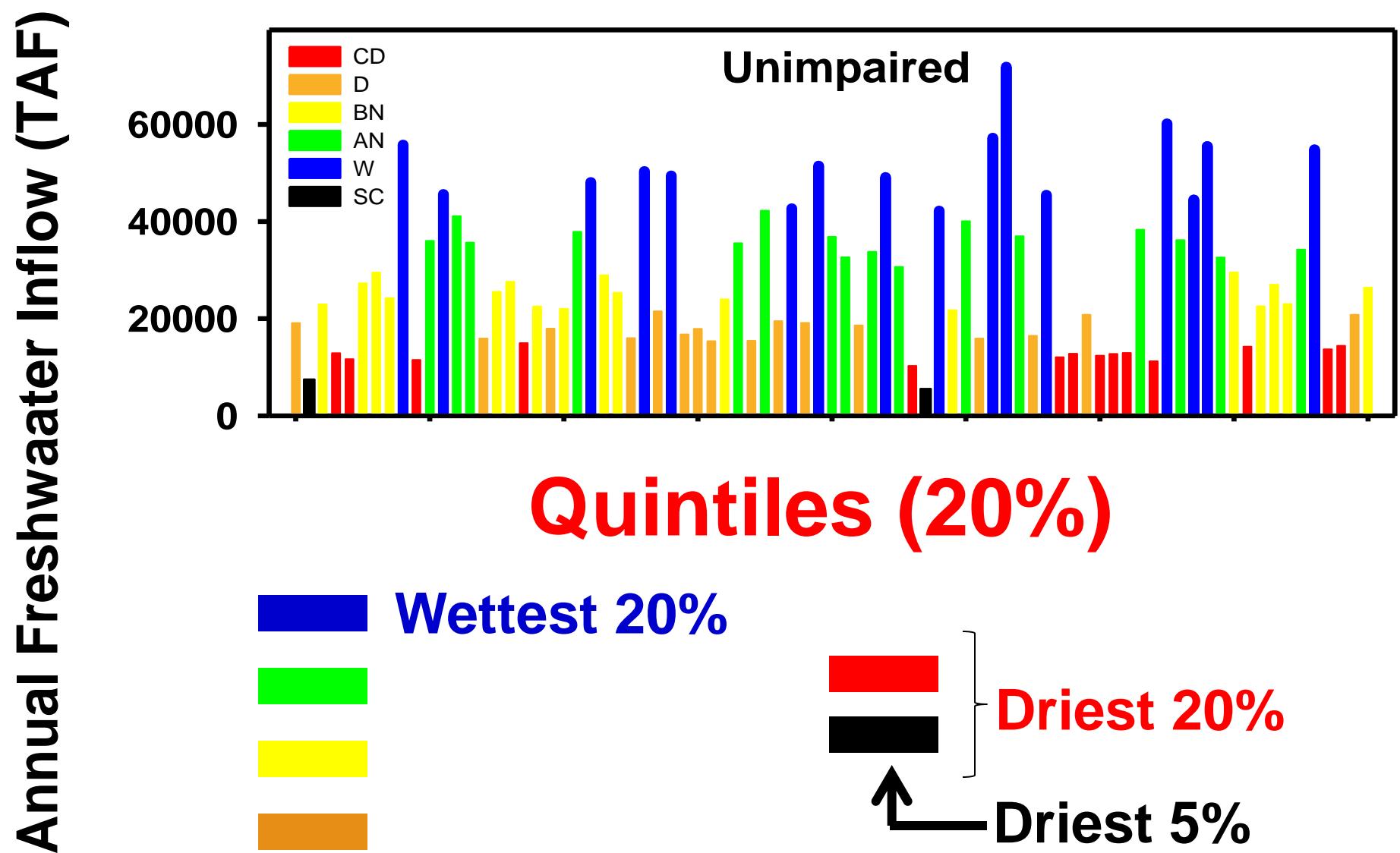
Flow Alteration

- Annual Inflow

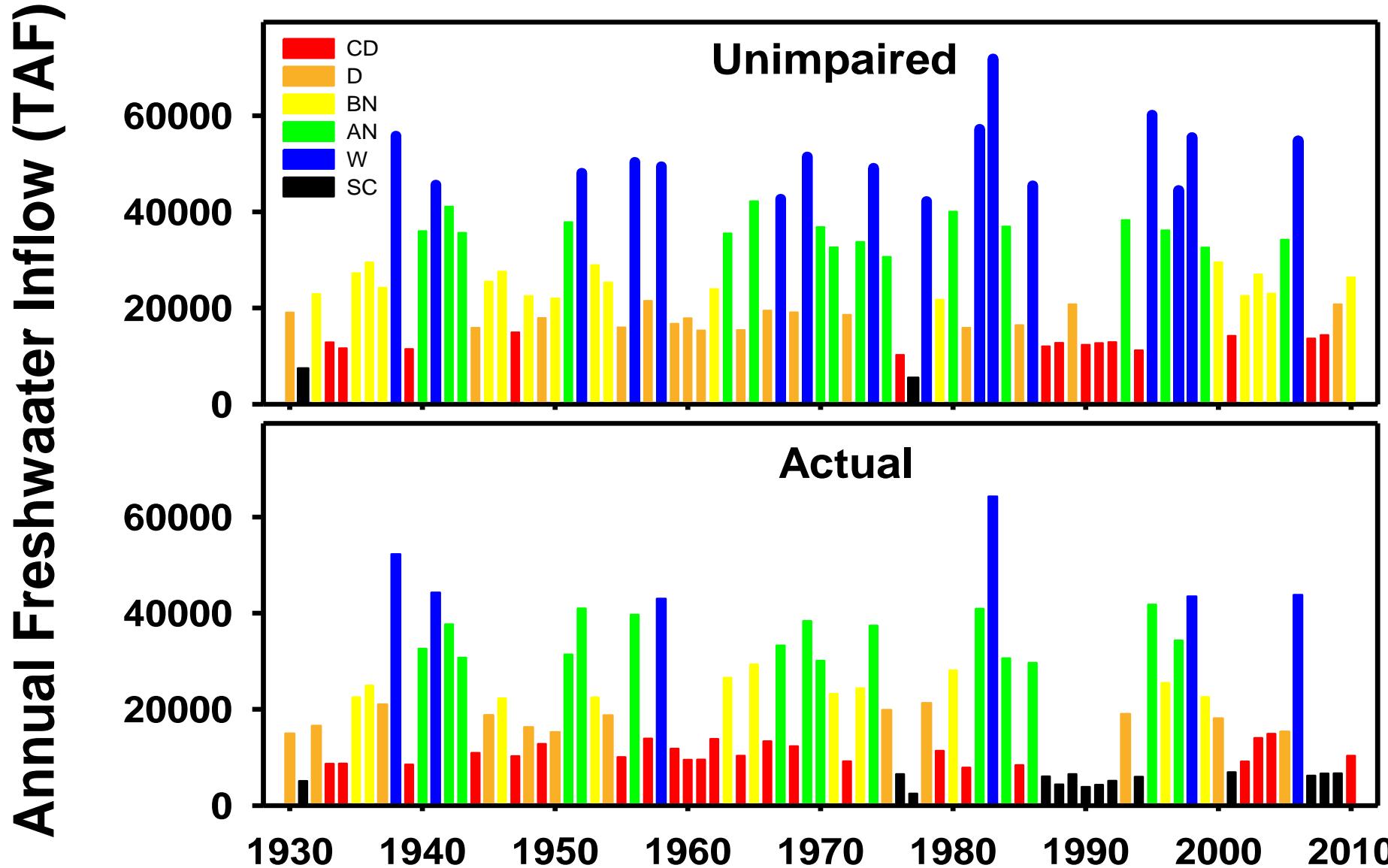


Flow Alteration

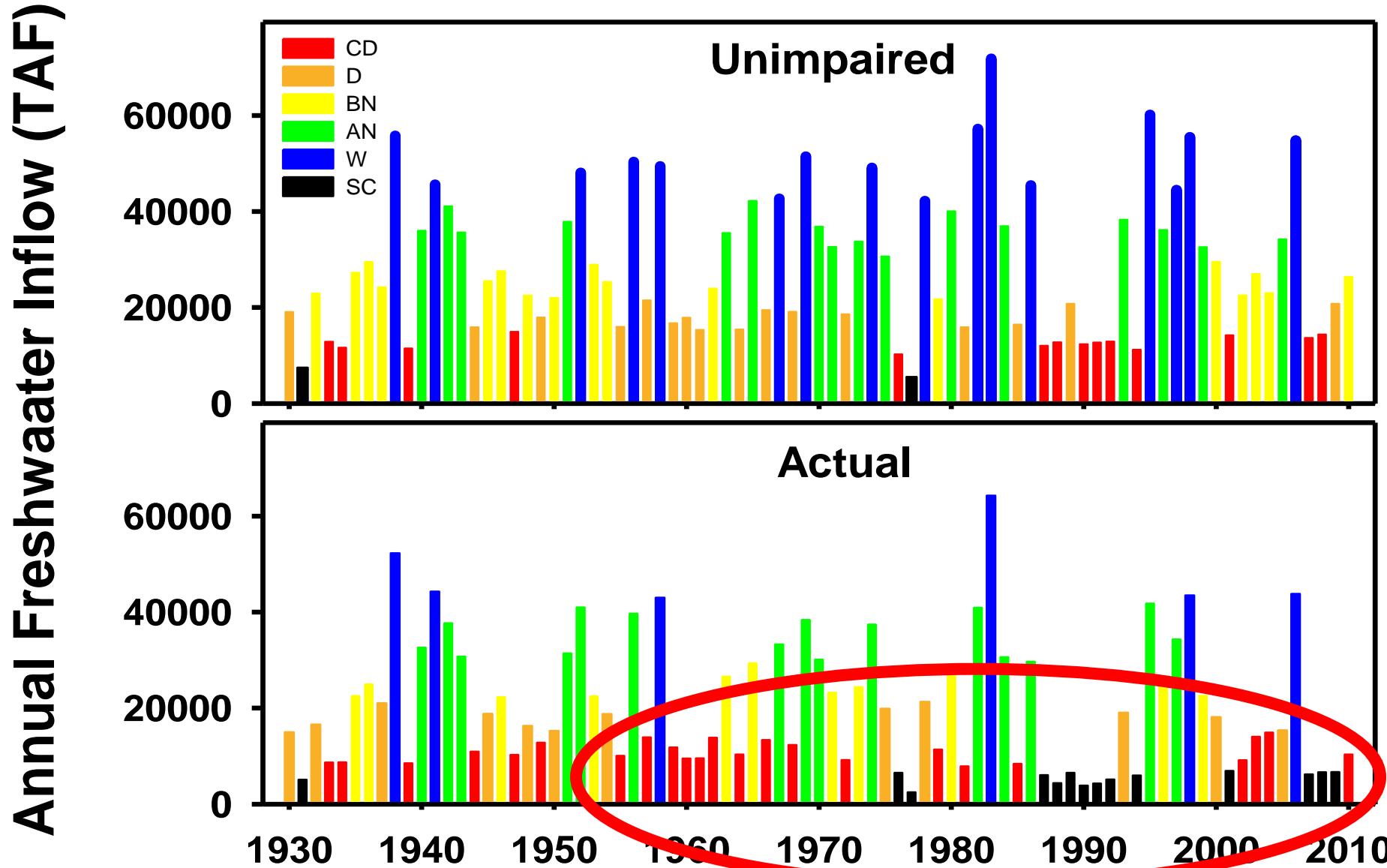
• Dry Year Frequency



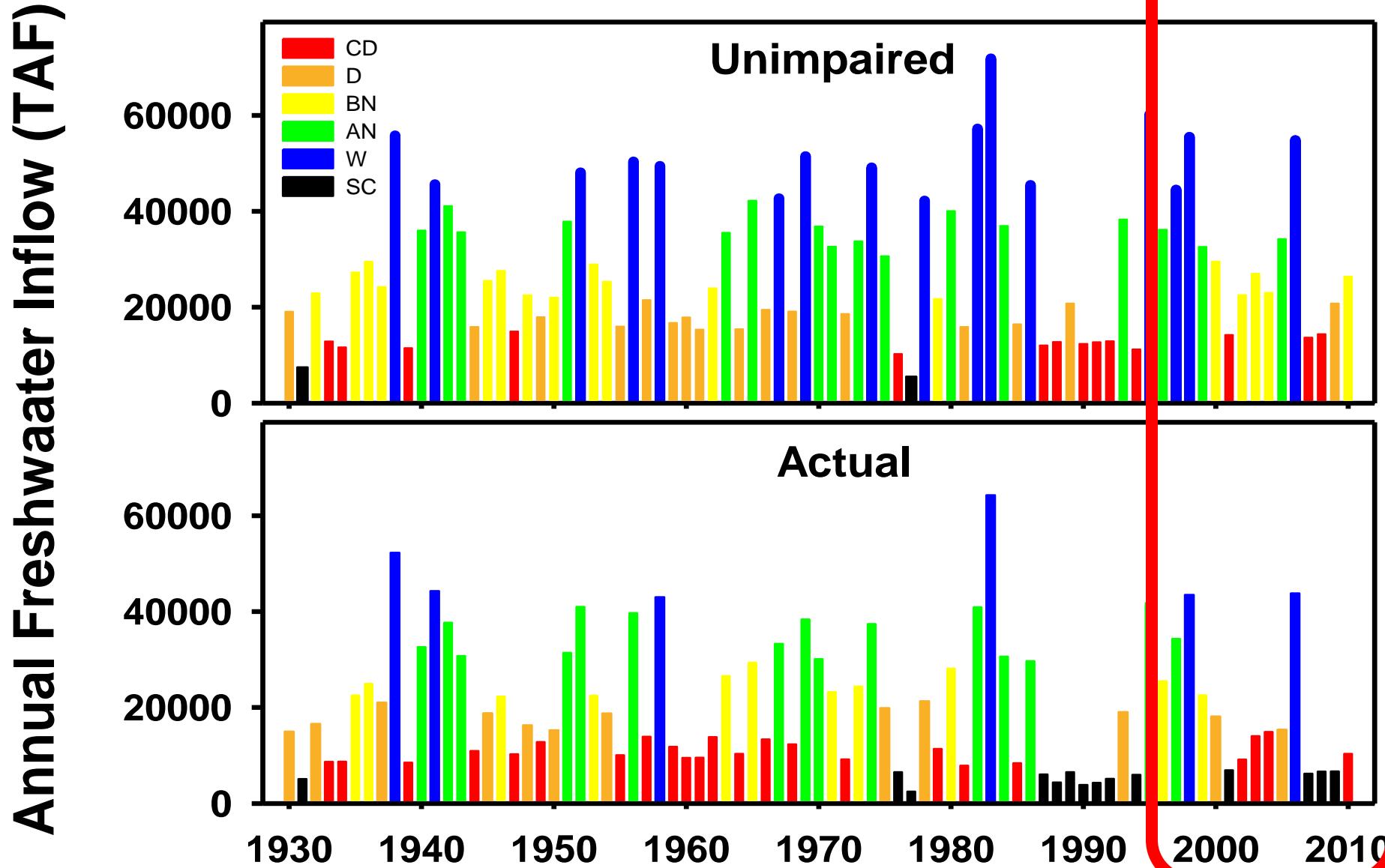
Flow Alteration • Dry Year Frequency



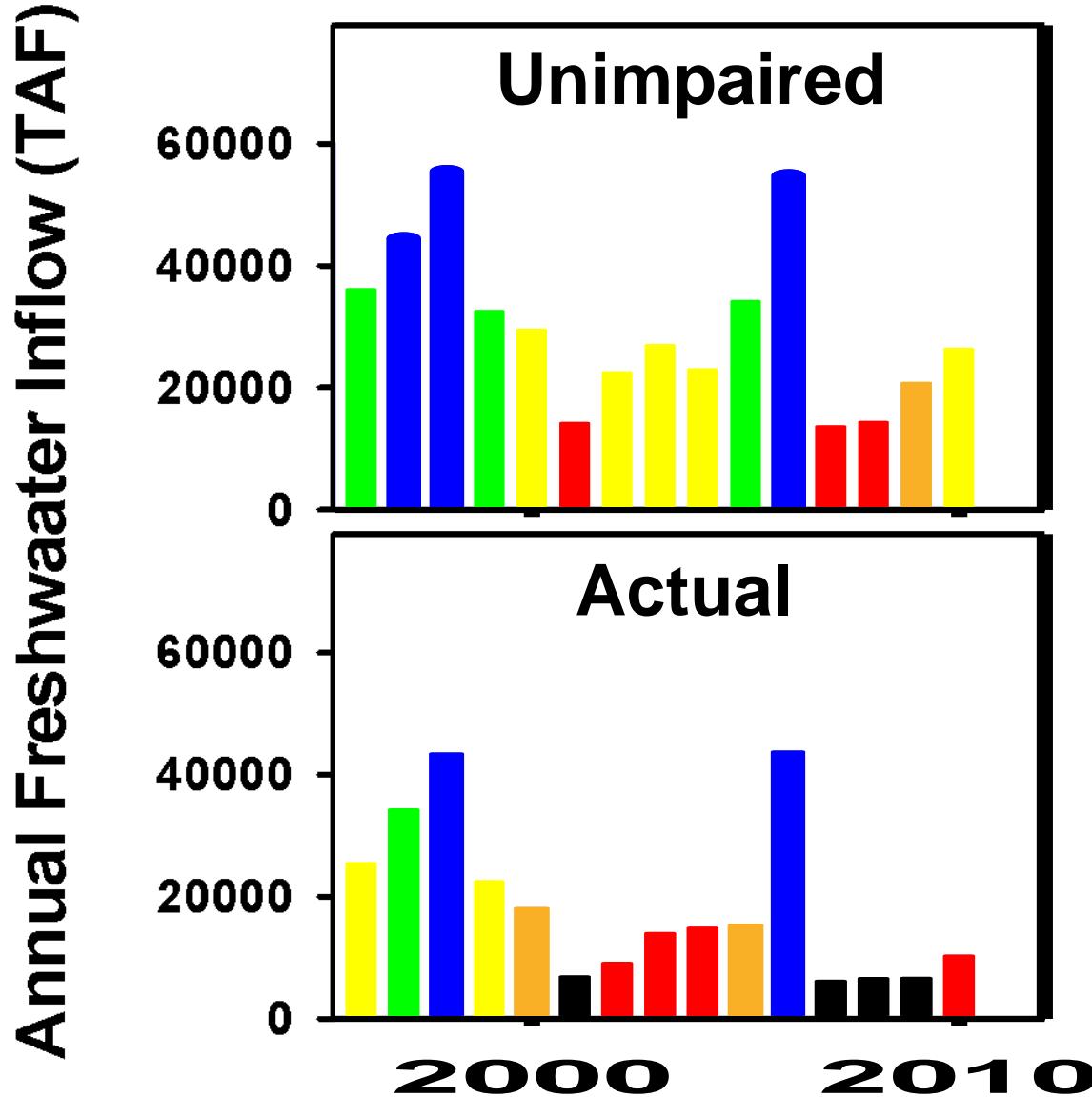
Flow Alteration • Dry Year Frequency



Flow Alteration • Dry Year Frequency



Flow Alteration • Dry Year Frequency



2001-2010

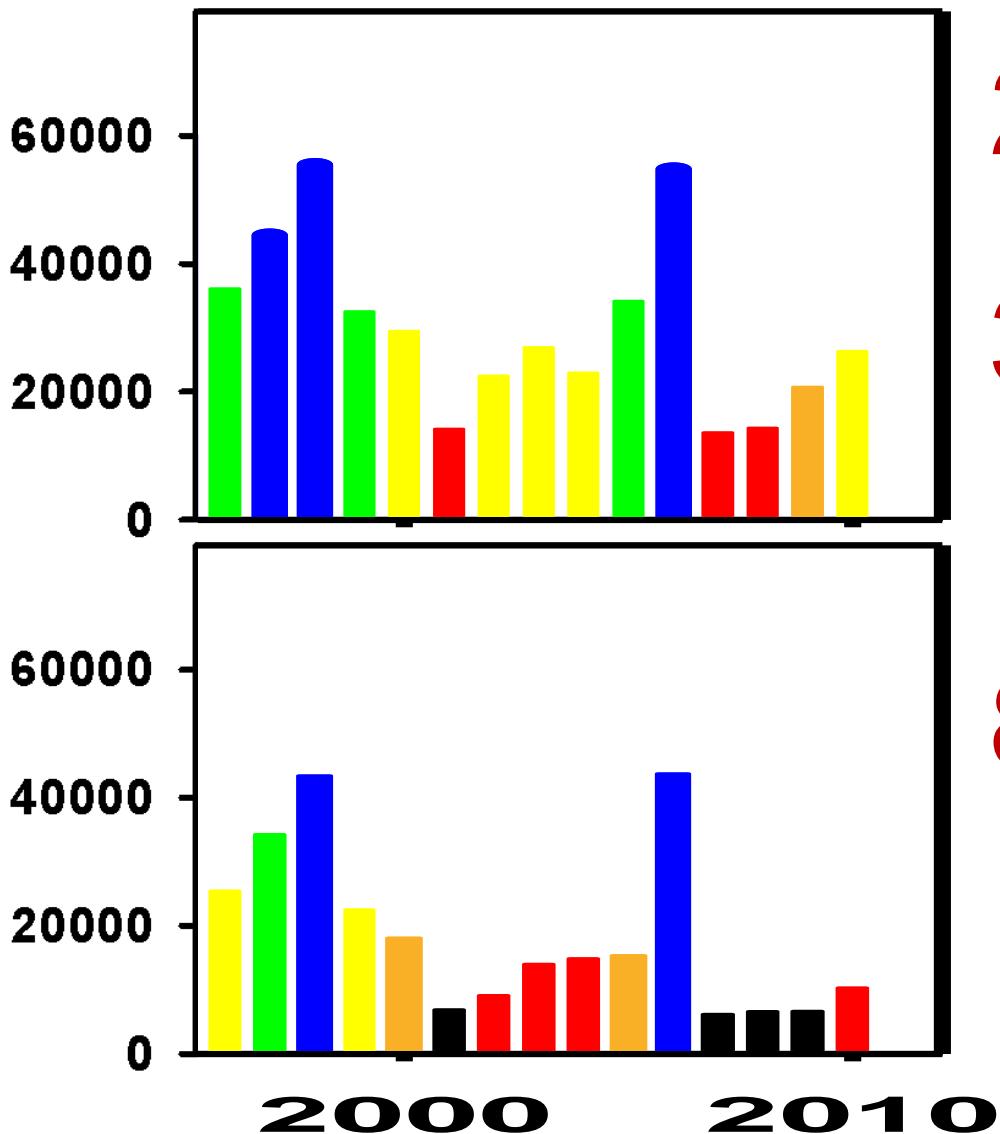
30%

80%

Flow Alteration

• Dry Year Frequency

Annual Freshwater Inflow (TAF)



2001-2010

30%

80%

“Chronic
Drought”

Habitat

Open Water Estuarine



Habitat

Open Water Estuarine



Habitat

Open Water
Estuarine

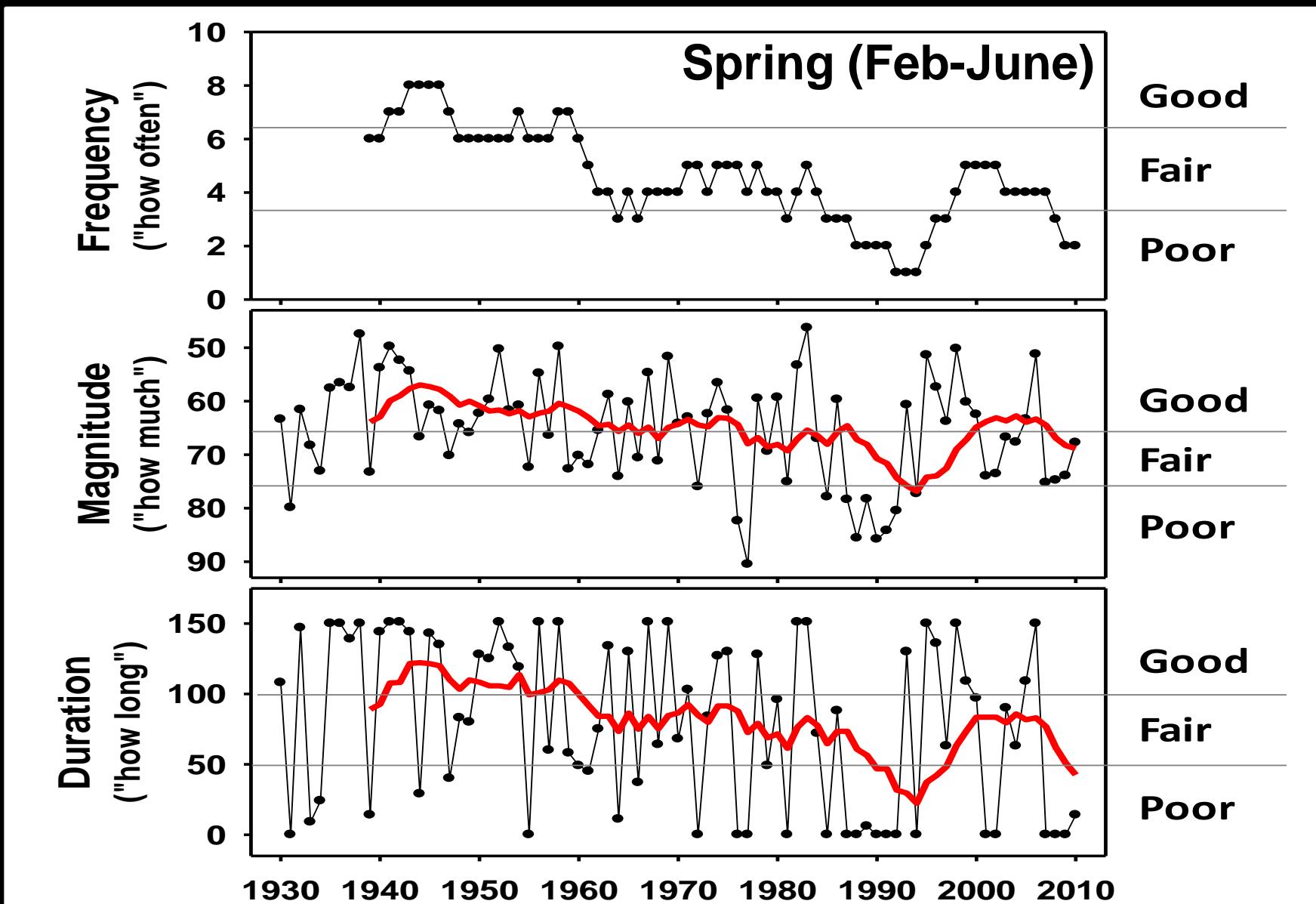


- Frequency
- Magnitude
- Duration



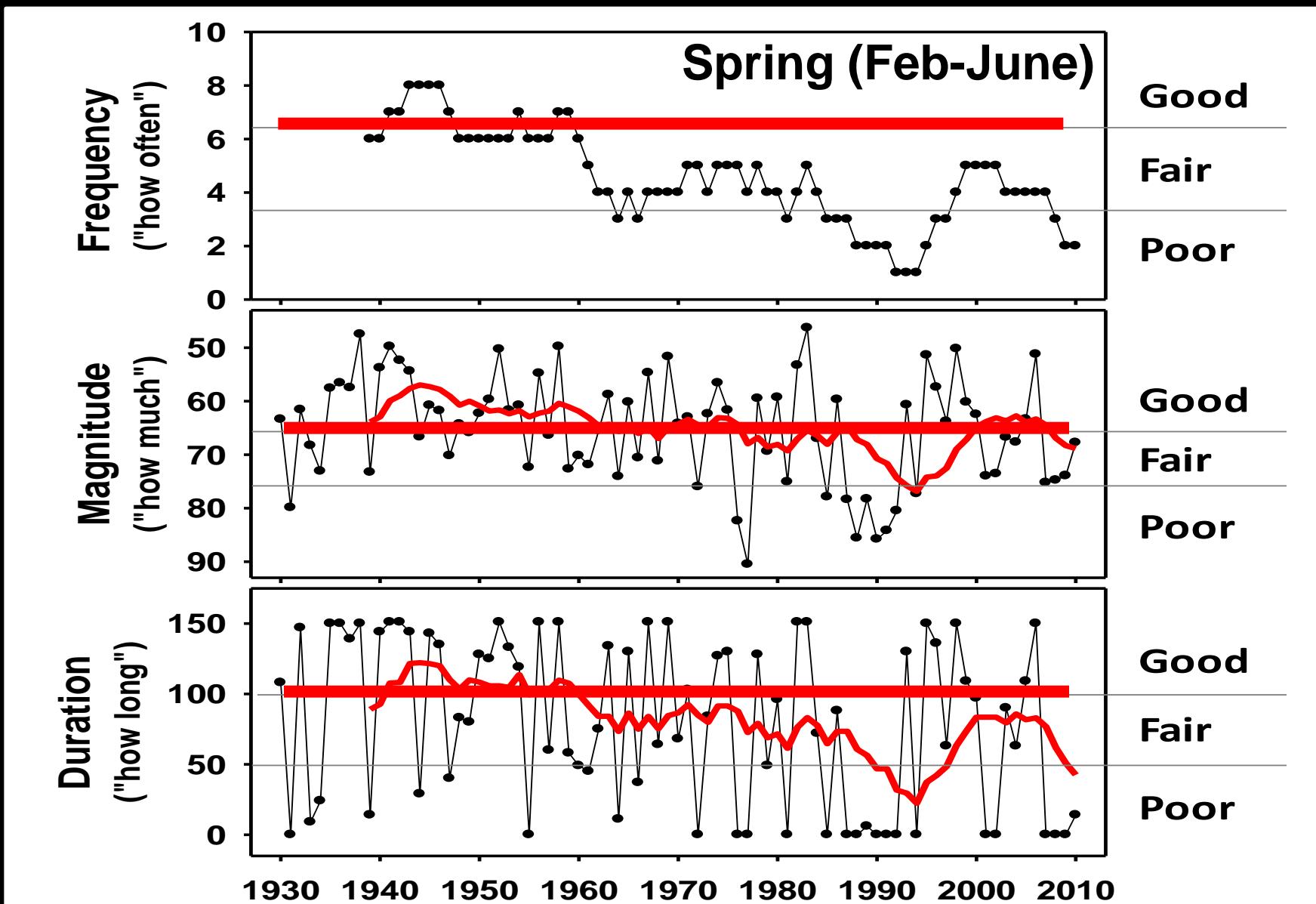
Habitat

- Open Water Estuarine Habitat



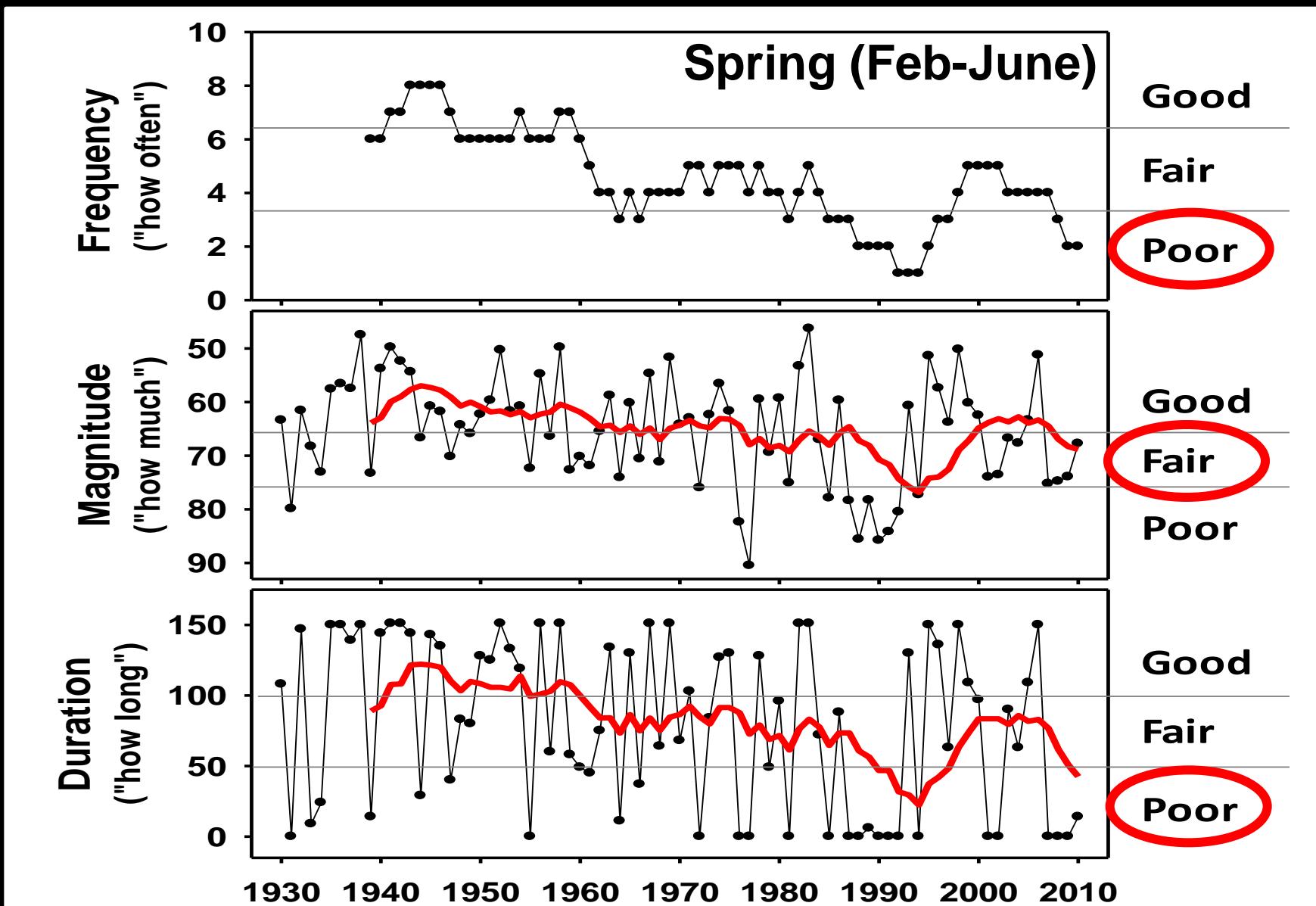
Habitat

- Open Water Estuarine Habitat

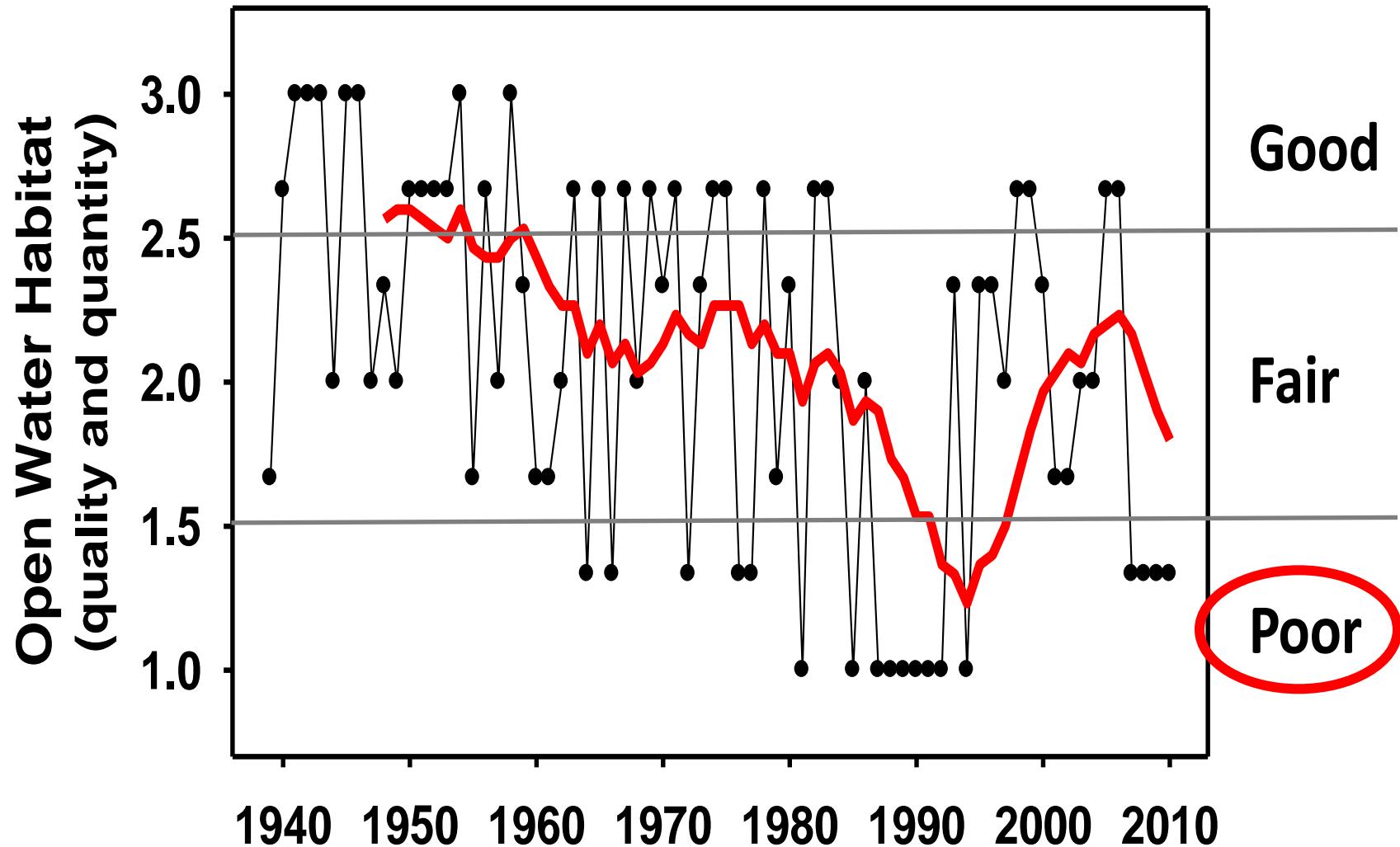


Habitat

- Open Water Estuarine Habitat



Habitat • Open Water Estuarine Habitat



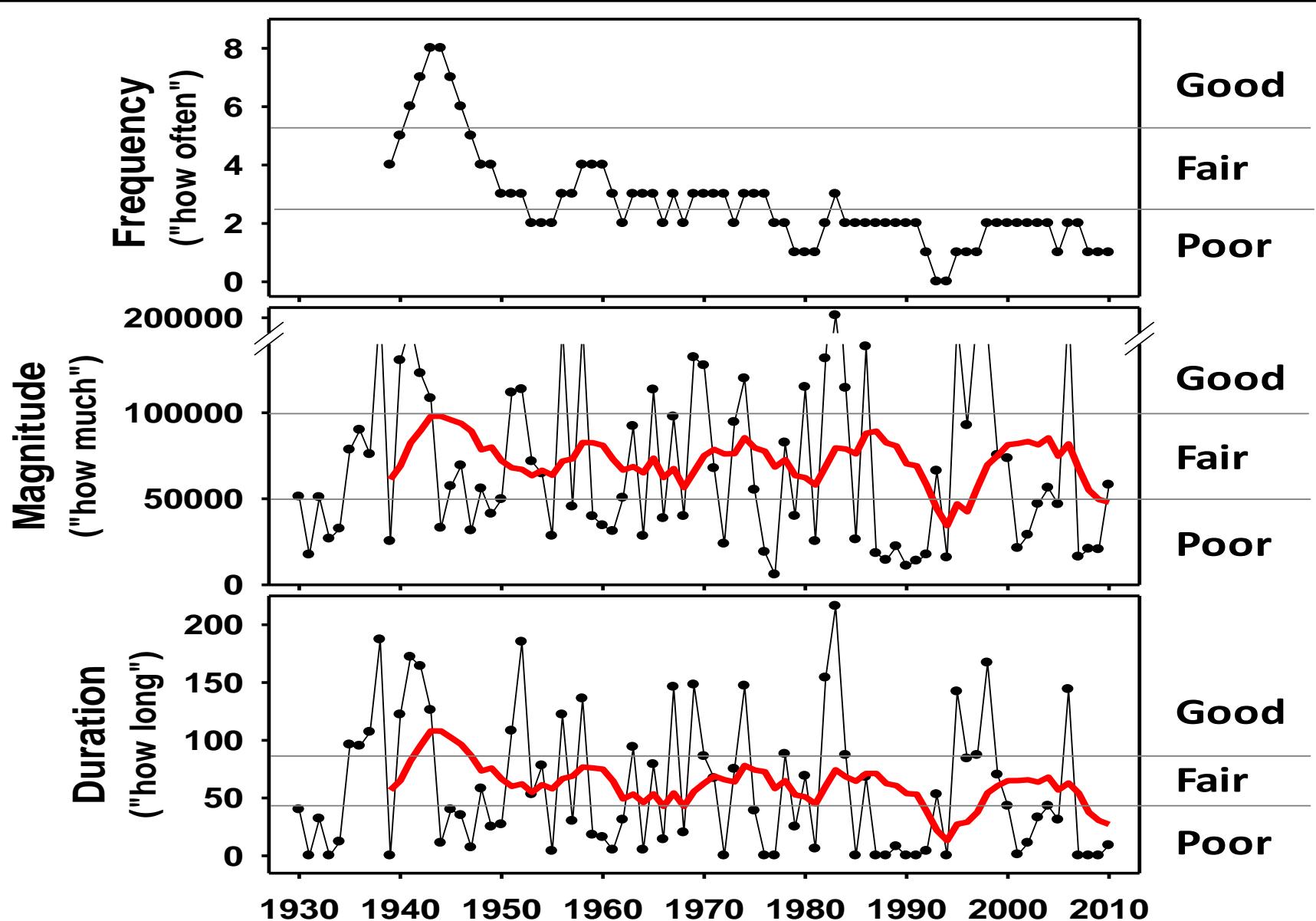
Ecological Processes: Flood Flows

- Frequency, Magnitude, and Duration



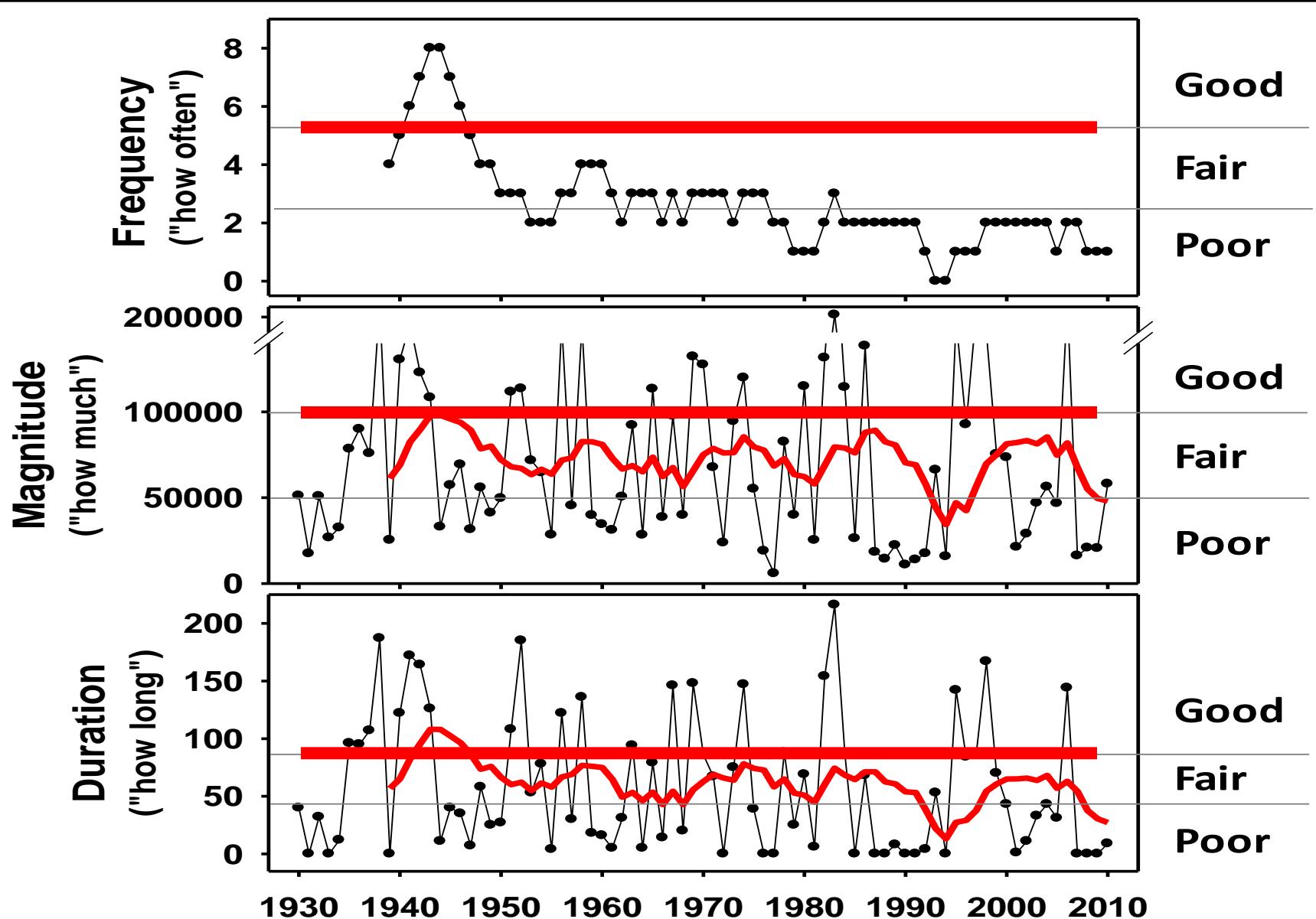
Ecological Processes

• Flood Flows



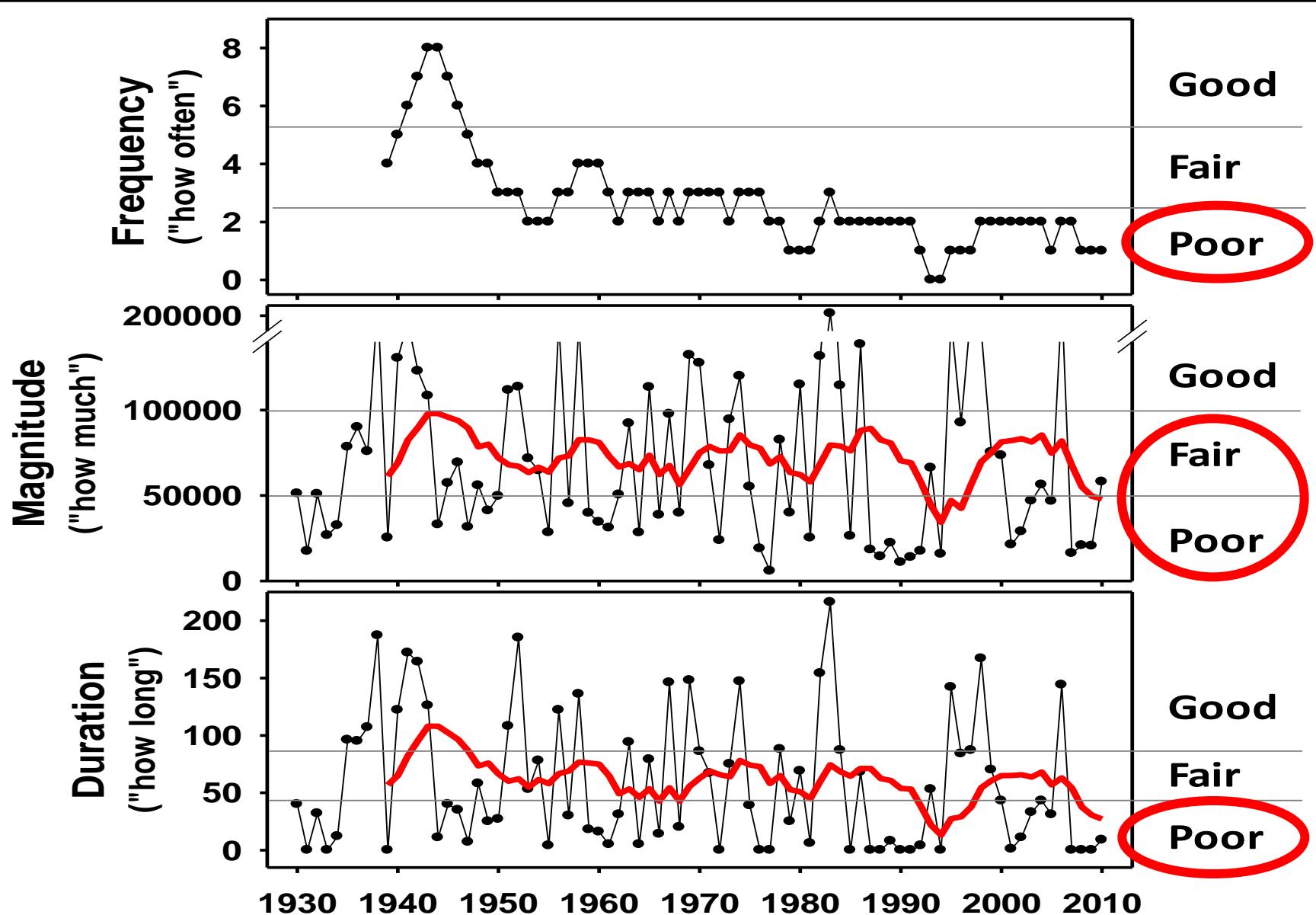
Ecological Processes

• Flood Flows



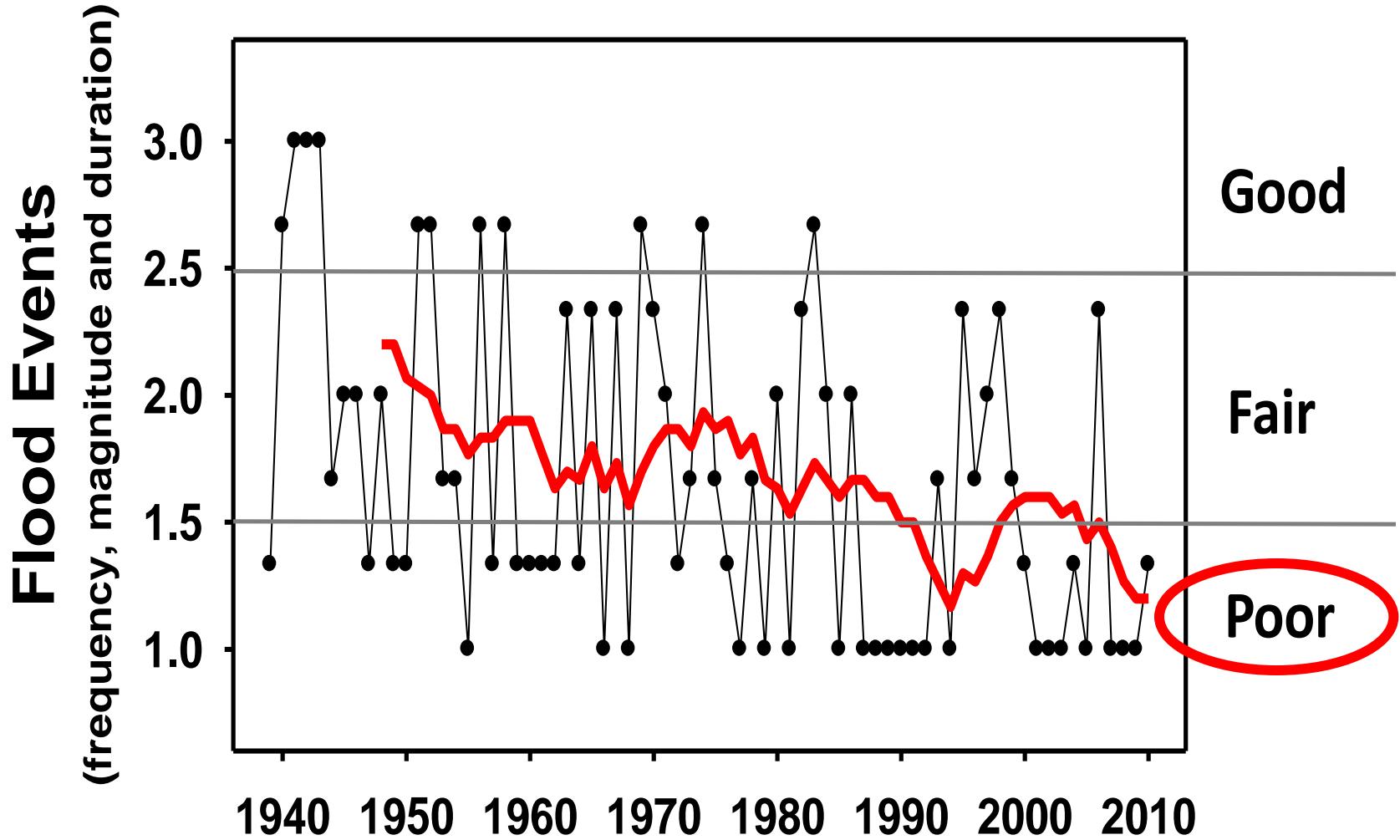
Ecological Processes

• Flood Flows



Ecological Processes

• Flood Flows



The Power of Measurement

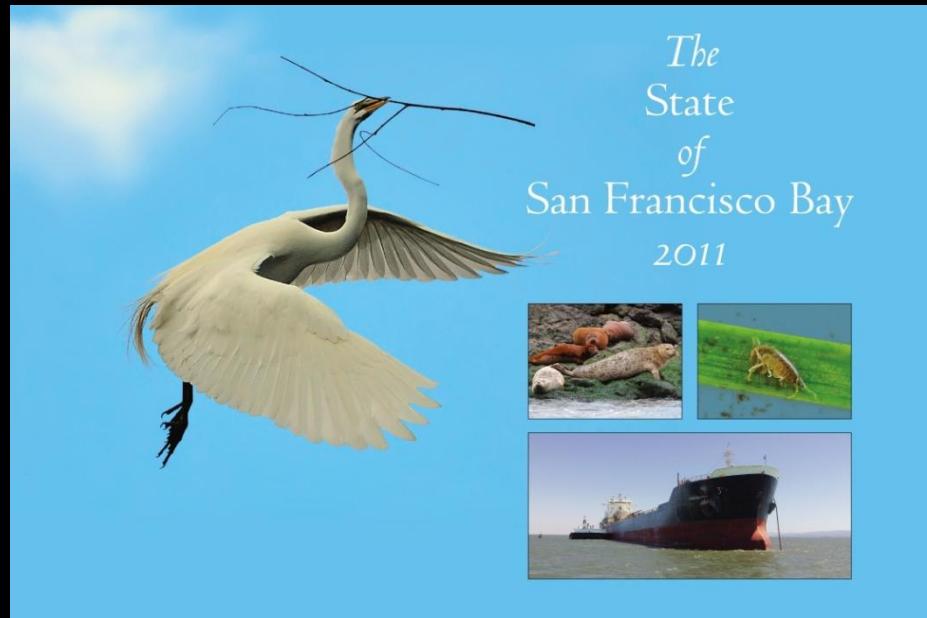
- Understanding
- Evaluation
- Management
- Accountability



State of San Francisco Bay 2011

<http://www.sfestuary.org/StateofSFBay2011/>

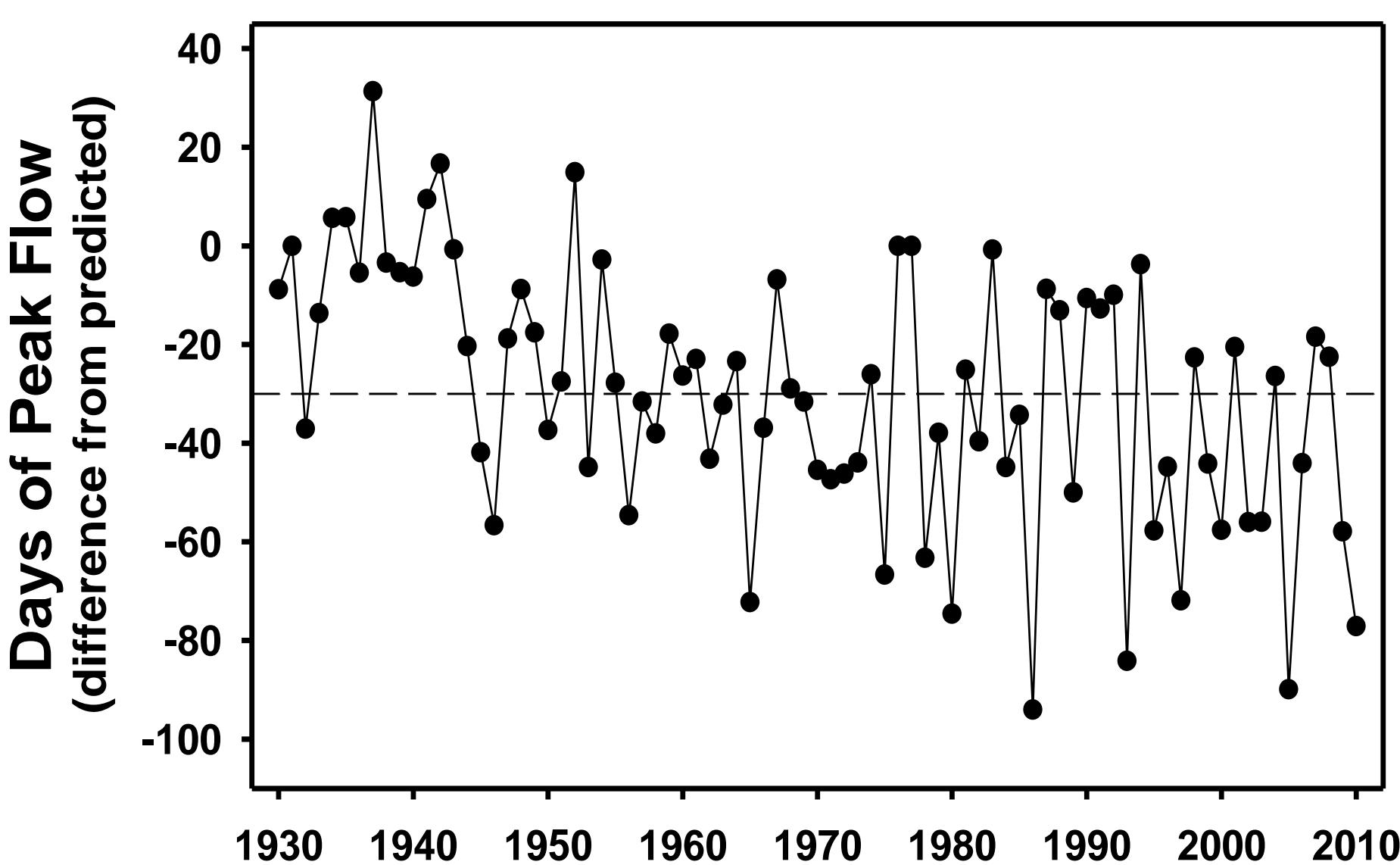
- Main report
- Technical Appendices



Christina Swanson
cswanson@nrdc.org

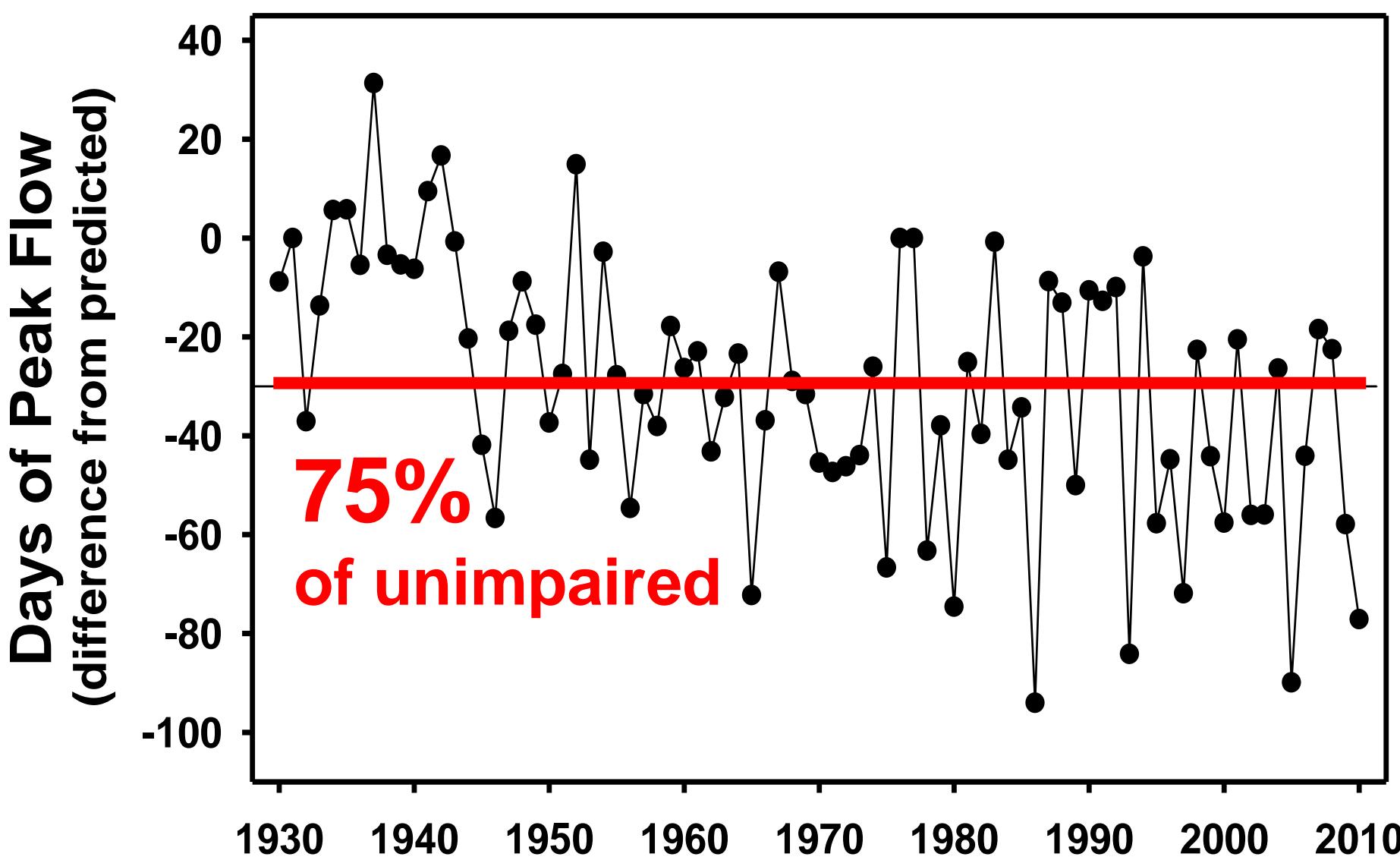
Flow Alteration

• Peak Flow



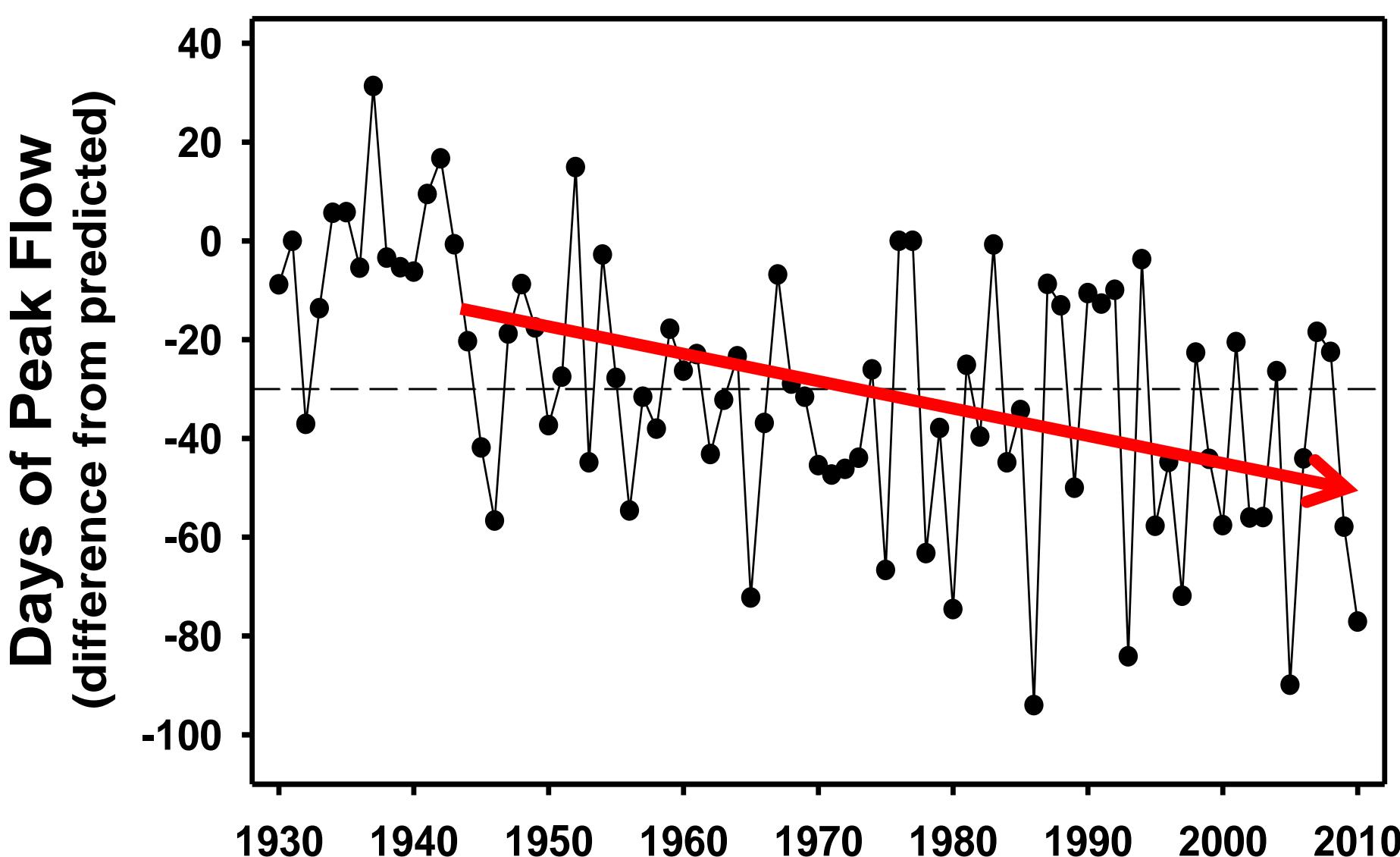
Flow Alteration

• Peak Flow



Flow Alteration

• Peak Flow



Flow Alteration

• Peak Flow

