

# The Under-Appreciated Climate Factor in CEAP

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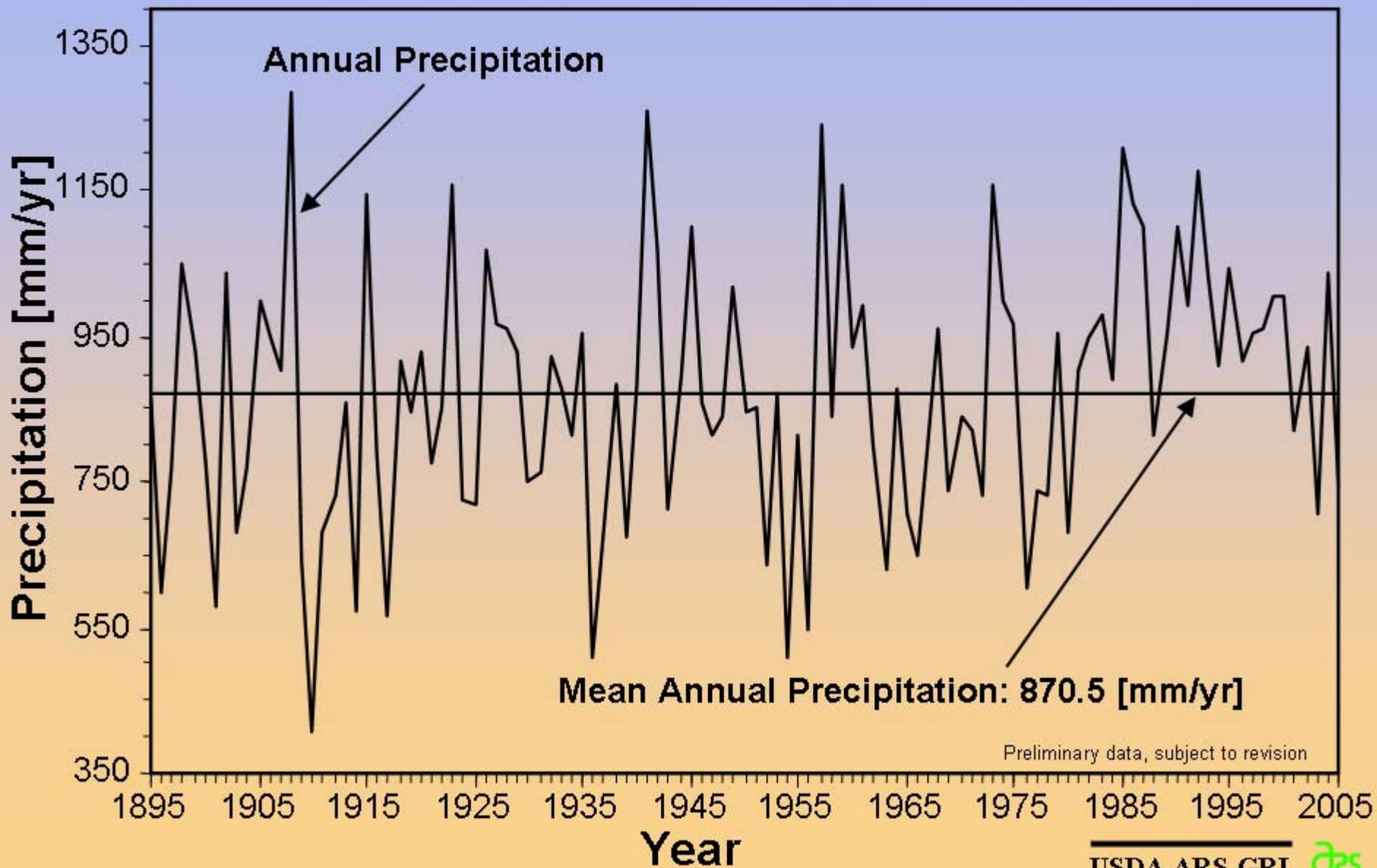




A photograph of a field with a weather station and a rain gauge. The weather station is a white box on a metal pole with a wind vane on top. The rain gauge is a white funnel-shaped device on a metal pole. The field is green and has some trees in the background.
$$\bar{Q}_s = 1/n \Sigma Q_s^i$$

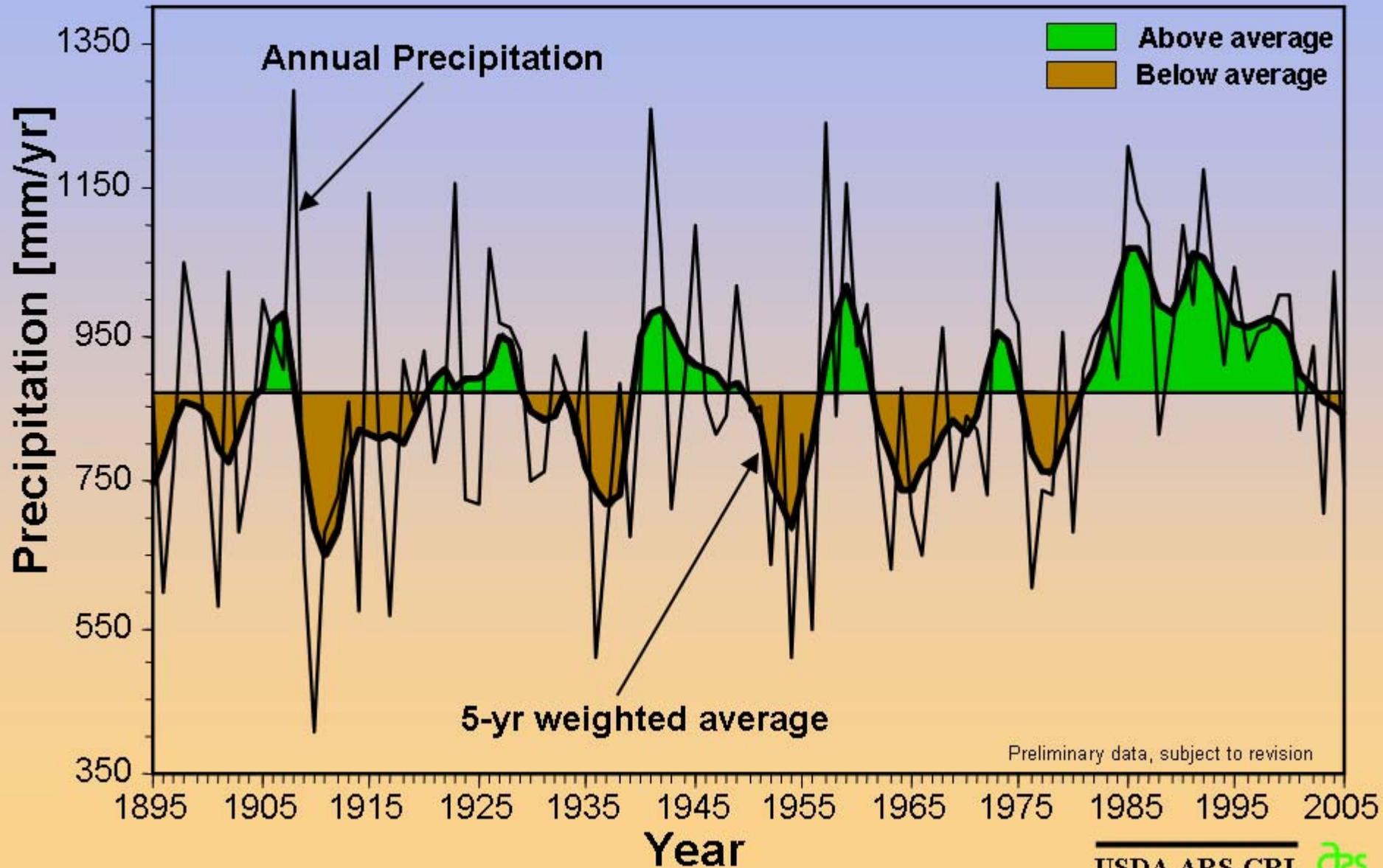
# Annual Precipitation

## Central Oklahoma region; 1895-2005



# Annual Precipitation and Persistent Variations

## Central Oklahoma region; 1895-2005

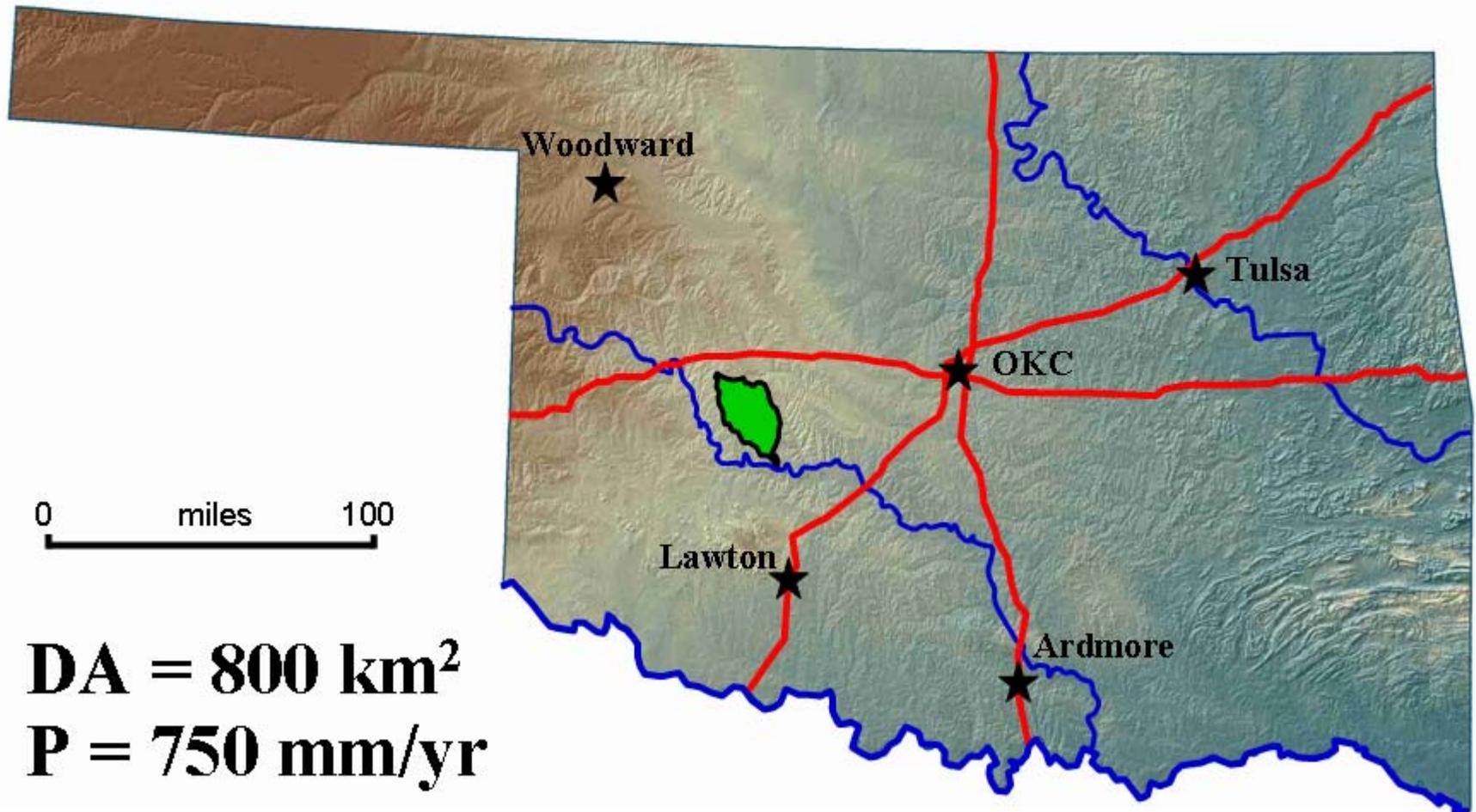


# **Are these persistent, multi-year precipitation variations relevant for CEAP?**

**The Fort Cobb experience**

# Fort Cobb Reservoir Watershed

## A CEAP-WAS benchmark watershed

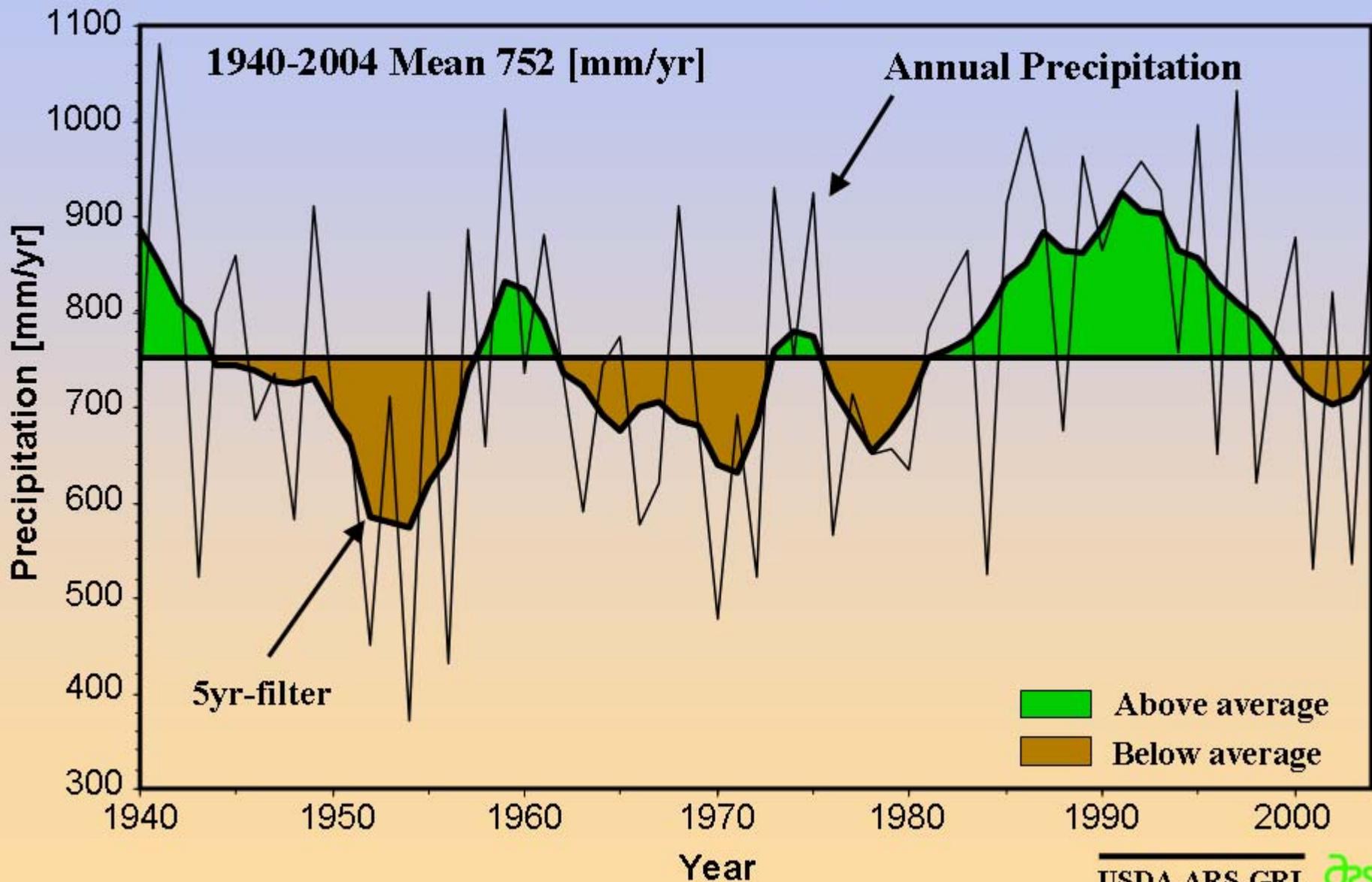


**DA = 800 km<sup>2</sup>**  
**P = 750 mm/yr**



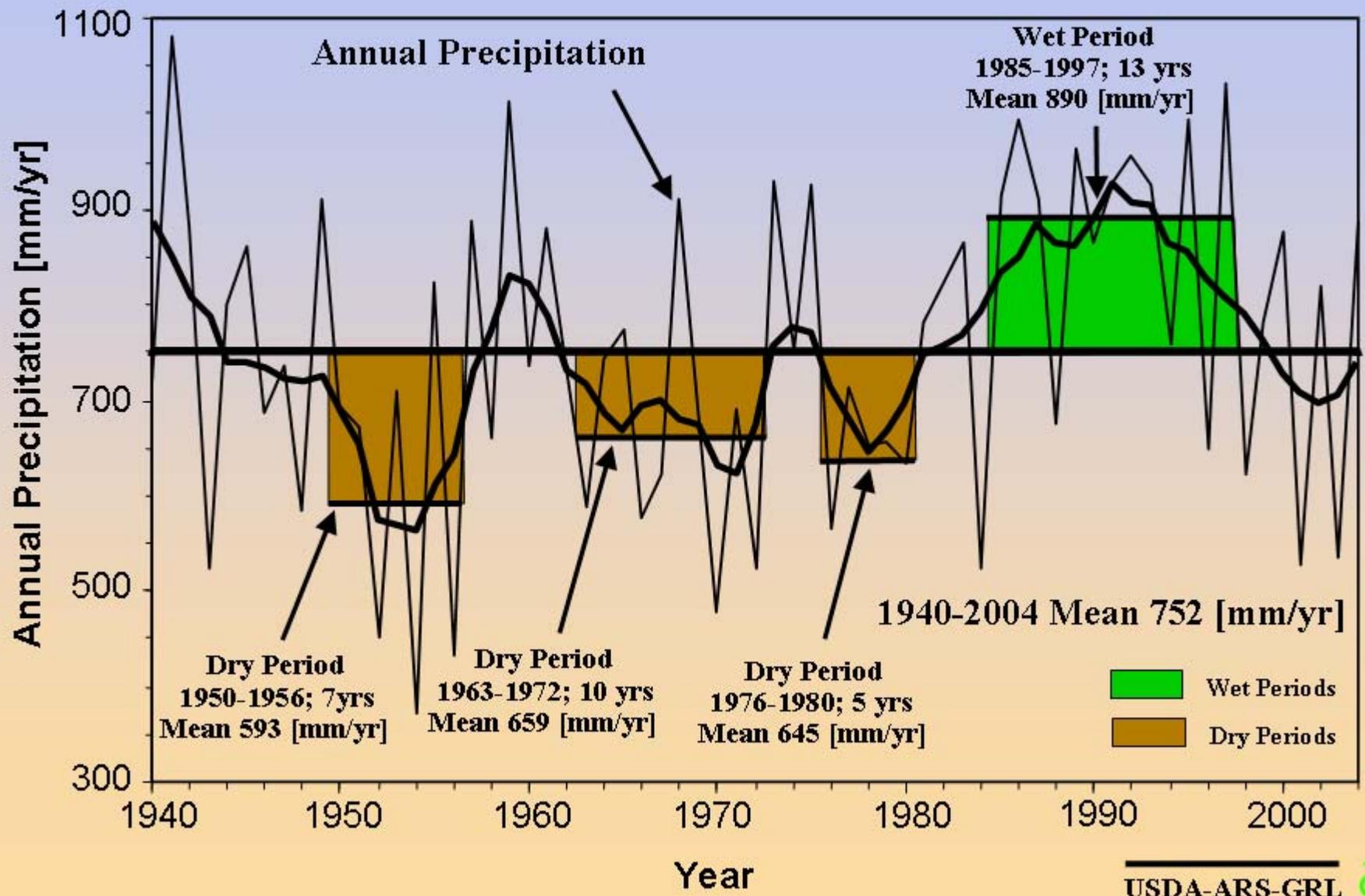
# Annual Precipitation and Variations

Fort Cobb Watershed; 1940-2004

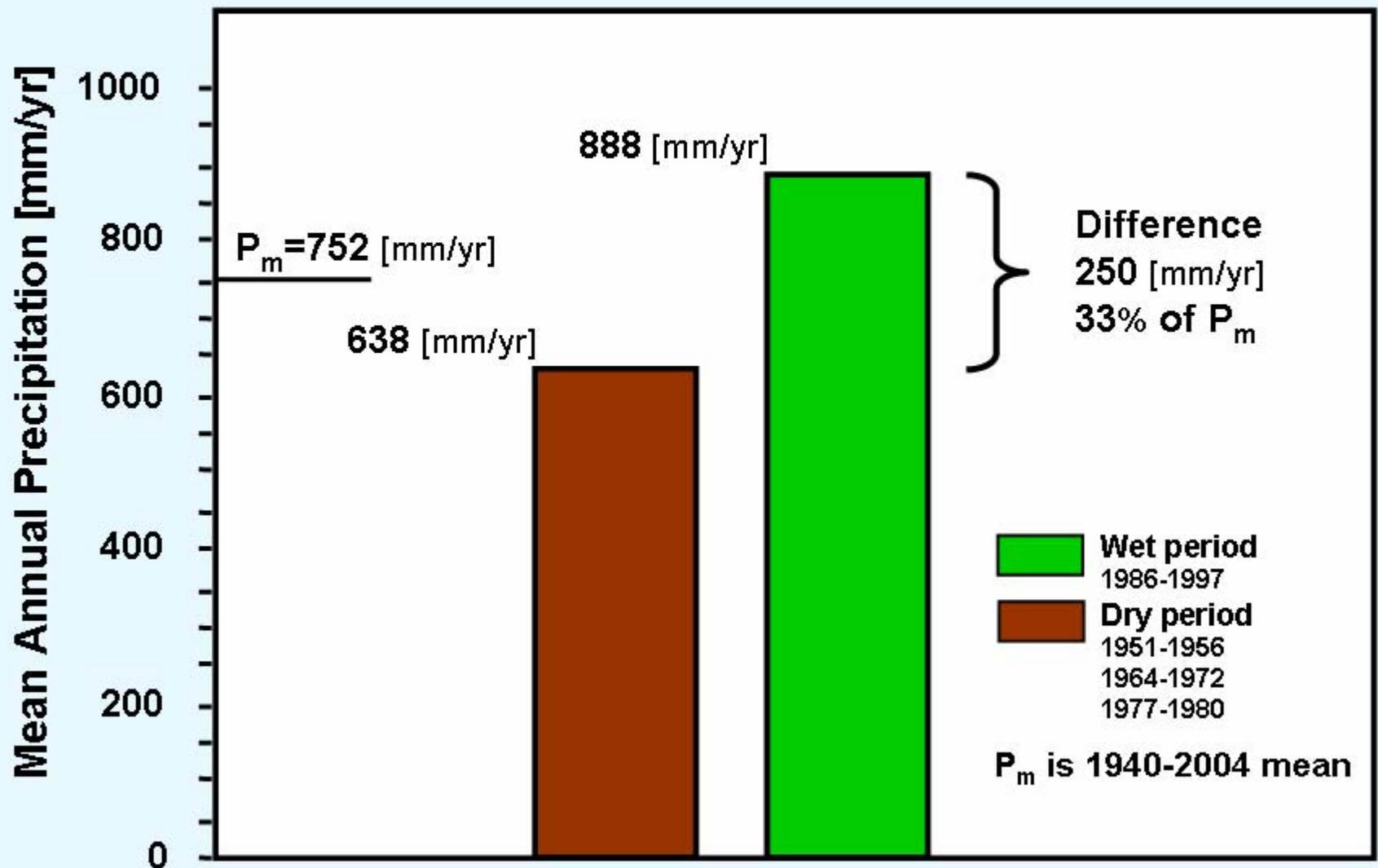


# Annual Precipitation and Wet and Dry Periods

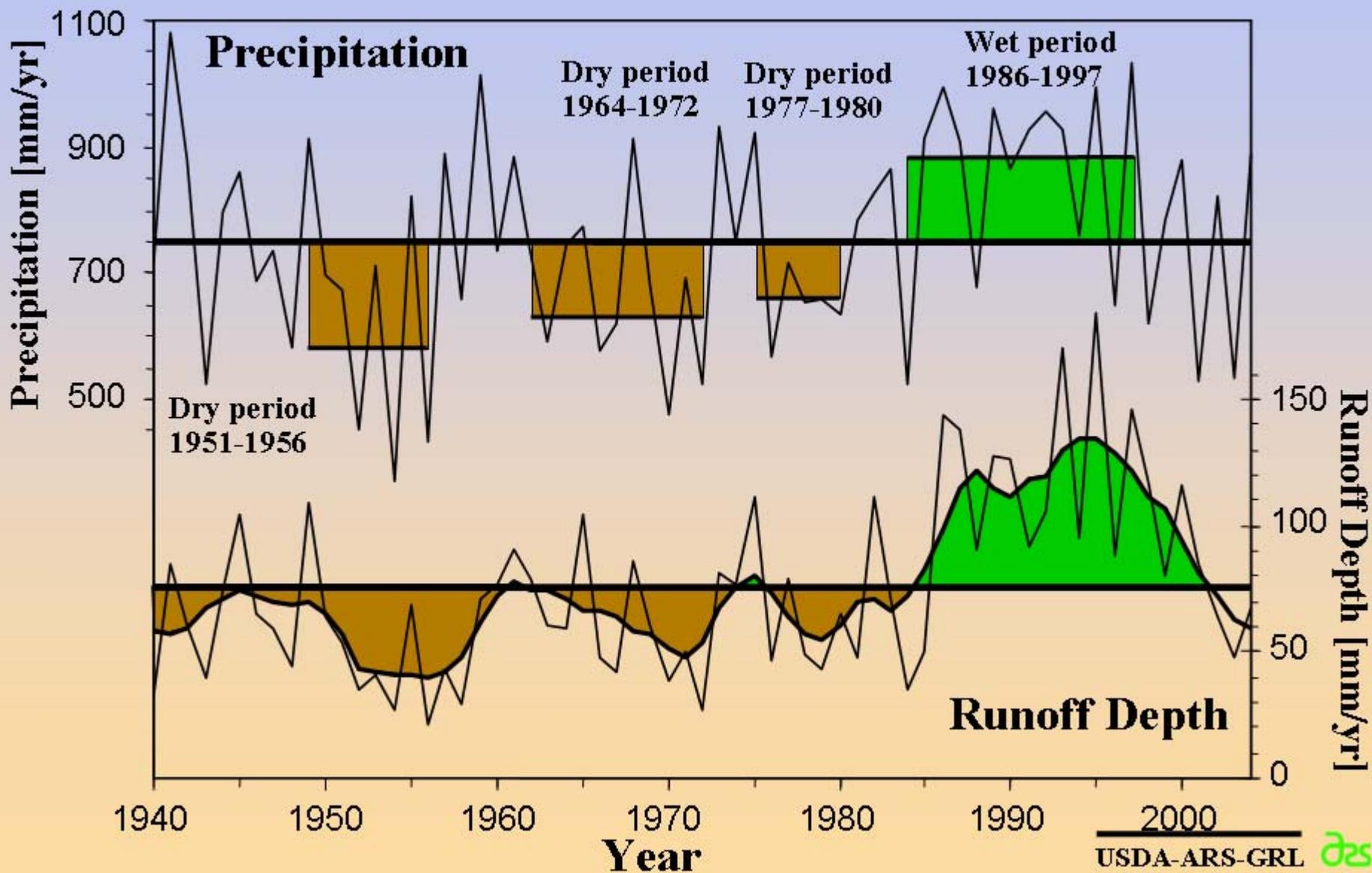
## Fort Cobb Watershed; 1940-2004



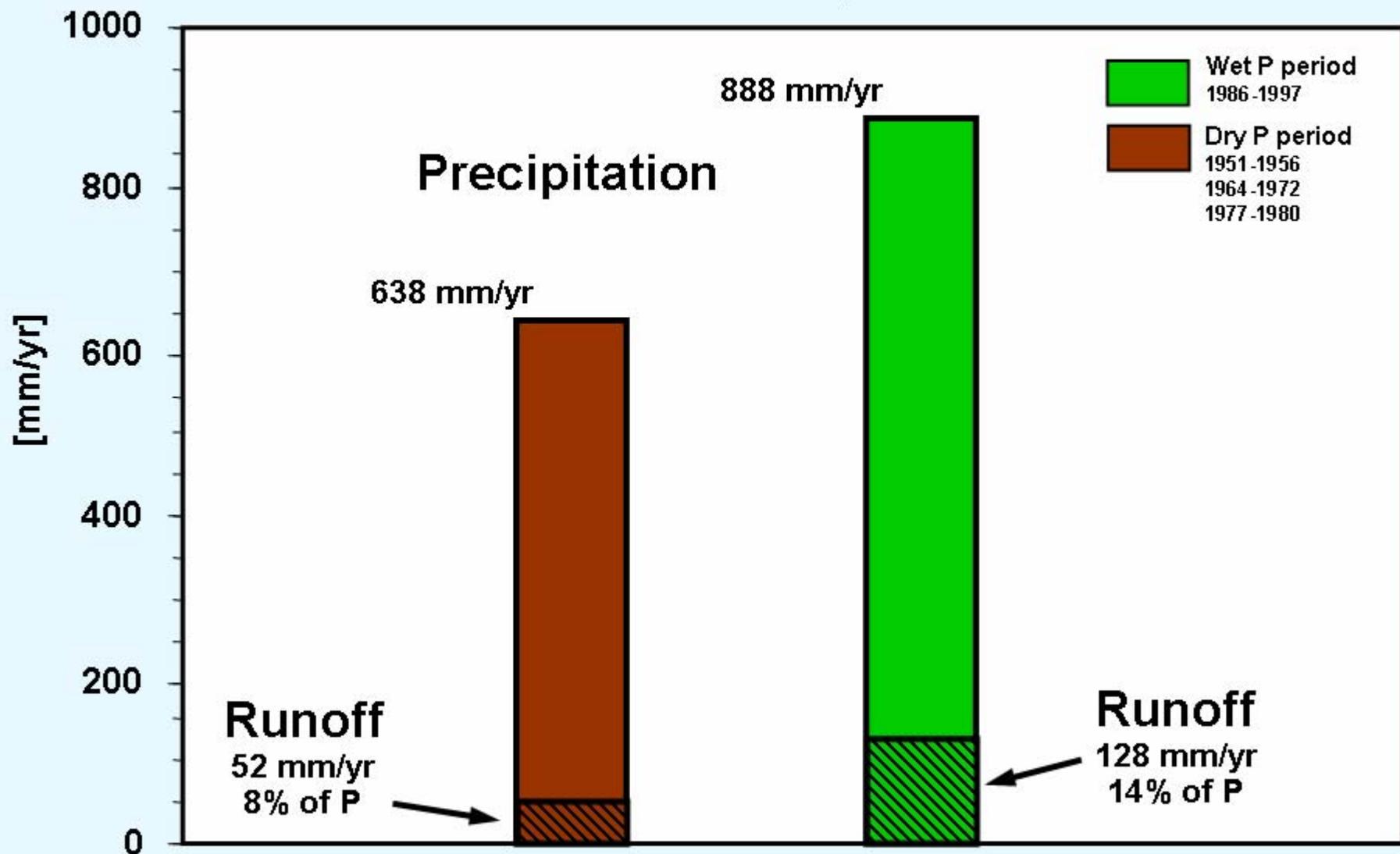
# Annual Hydrologic Budget for Wet and Dry Periods Fort Cobb Watershed; 1940-2004



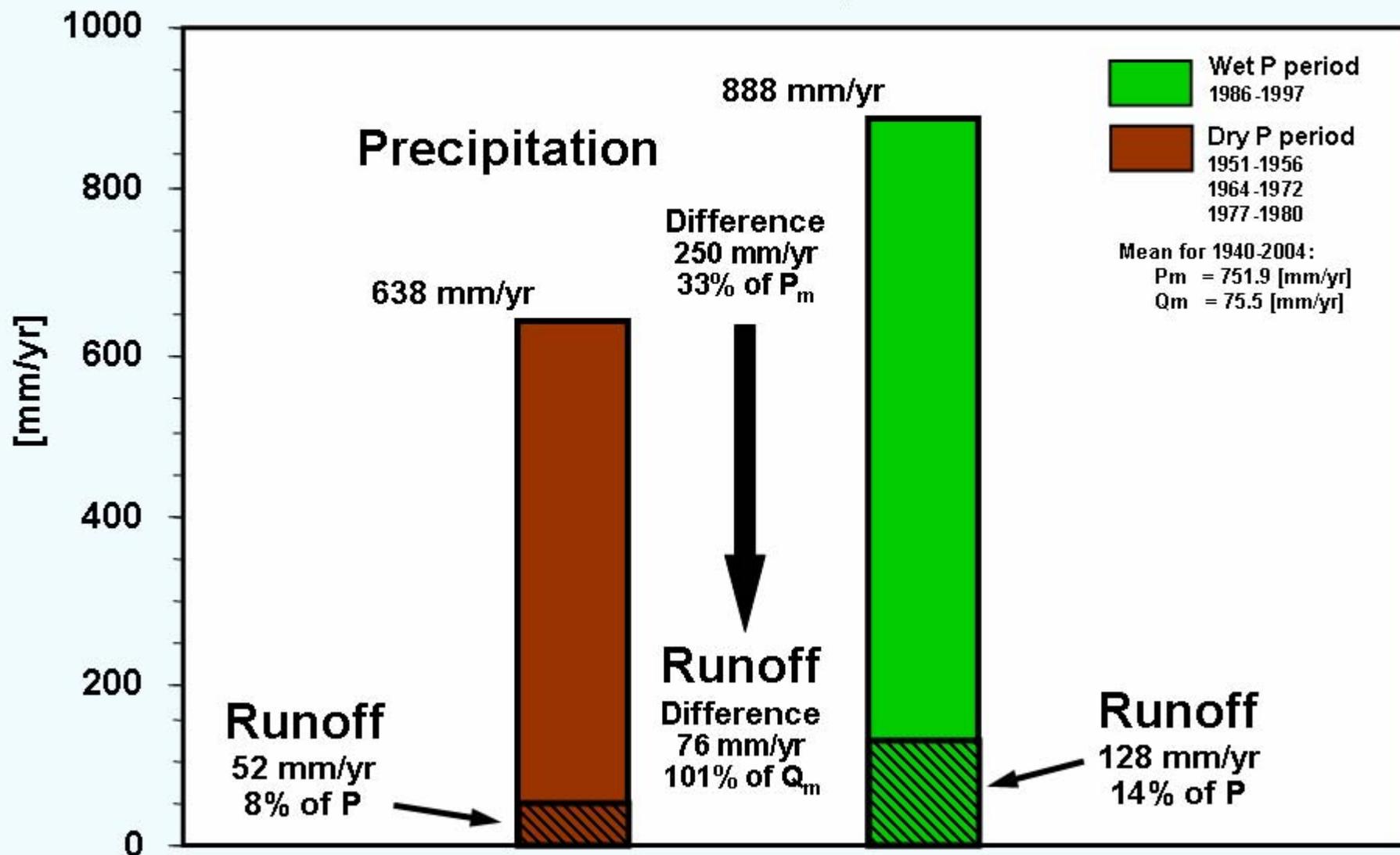
# Dry and Wet Periods for Precipitation-Runoff Impact Analysis Fort Cobb Reservoir Watershed; 1940-2004



# Annual Hydrologic Budget for Wet and Dry Periods Fort Cobb Watershed; 1940-2004



# Annual Hydrologic Budget for Wet and Dry Periods Fort Cobb Watershed; 1940-2004



# Susp. Sediment-Discharge Relationship

$$Q_s \sim pQ^j$$

**$2 < j < 3$  for streams in western US (Graf, 1971)**

**$j \sim 1.2$  for Pigeon Roost Creek (Vanoni, 1975)**

**$j \sim 1.85$  for Powder River (Leopold and Maddock, 1953)**

**$j \sim 1.9$  for Sugar Creek (adjacent to Fort Cobb watershed)**

**Persistent, multi-year P variations**



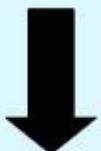
**Fort Cobb watershed**

**Annual P change = 33%**



**Observed runoff**

**Annual Q change = 100%**



$Q_s \sim pQ^2$

**Annual S yield change = 200% ???**

**What are the implications for the assessment of conservation effectiveness?**

# Fundamental Question 1

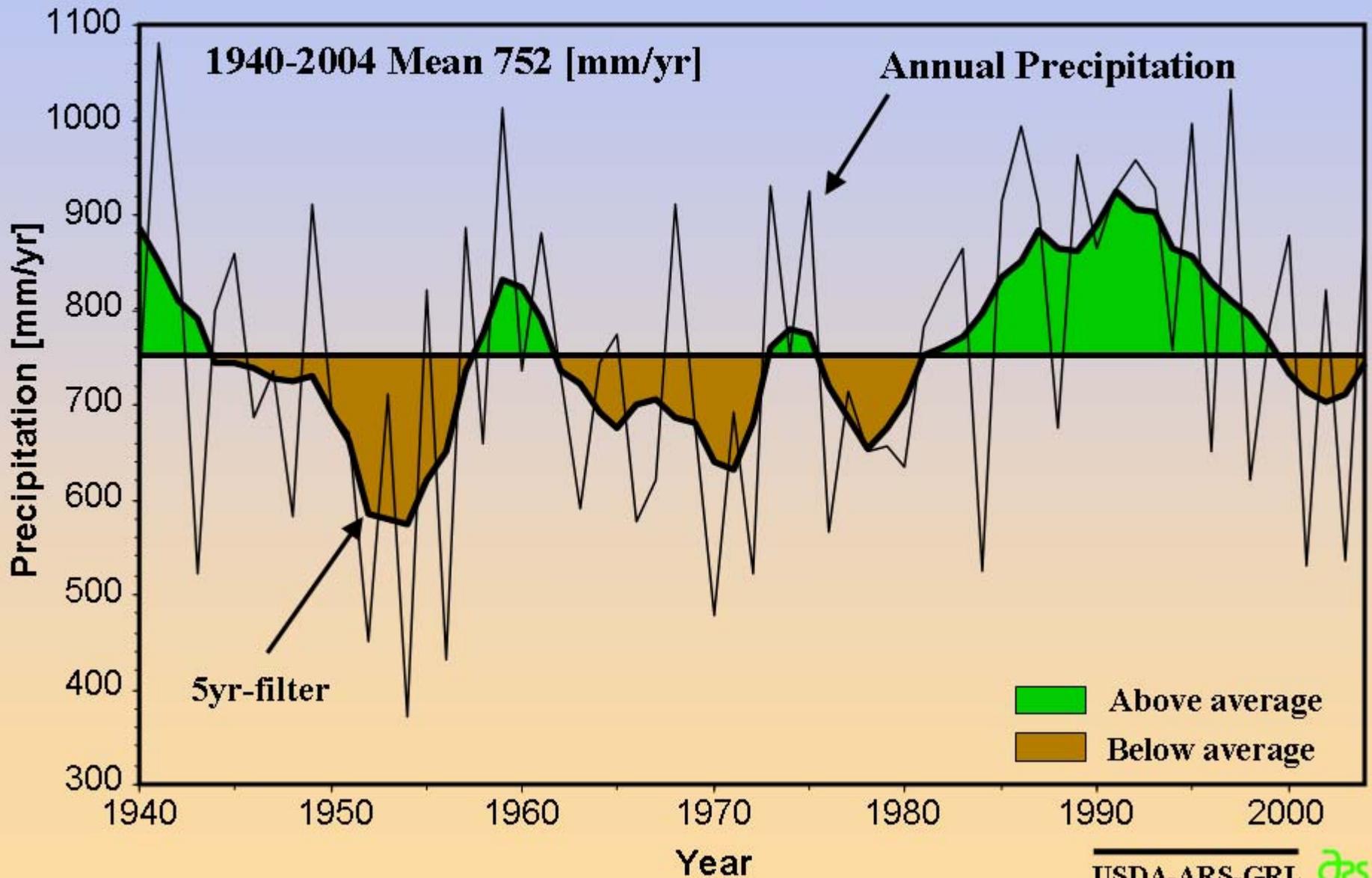
**How widespread and frequent are persistent multi-year precipitation variations?**

# Fundamental Question 2

**How are CEAP-WAS benchmark watershed data sets situated with regard to persistent multi-year precipitation variations?**

# Annual Precipitation for Ft. Cobb Watershed

## Fort Cobb Watershed; 1940-2004



# Fundamental Question 3

**How relevant are persistent multi-year precipitation variations to the assessment of conservation effectiveness?**

# Annual Hydrologic Budget for Wet and Dry Periods Fort Cobb Watershed; 1940-2004

Persistent, multi-year P variations



Annual P change = 33%



Annual Q change = 100%



Annual S yield change = 200% ???



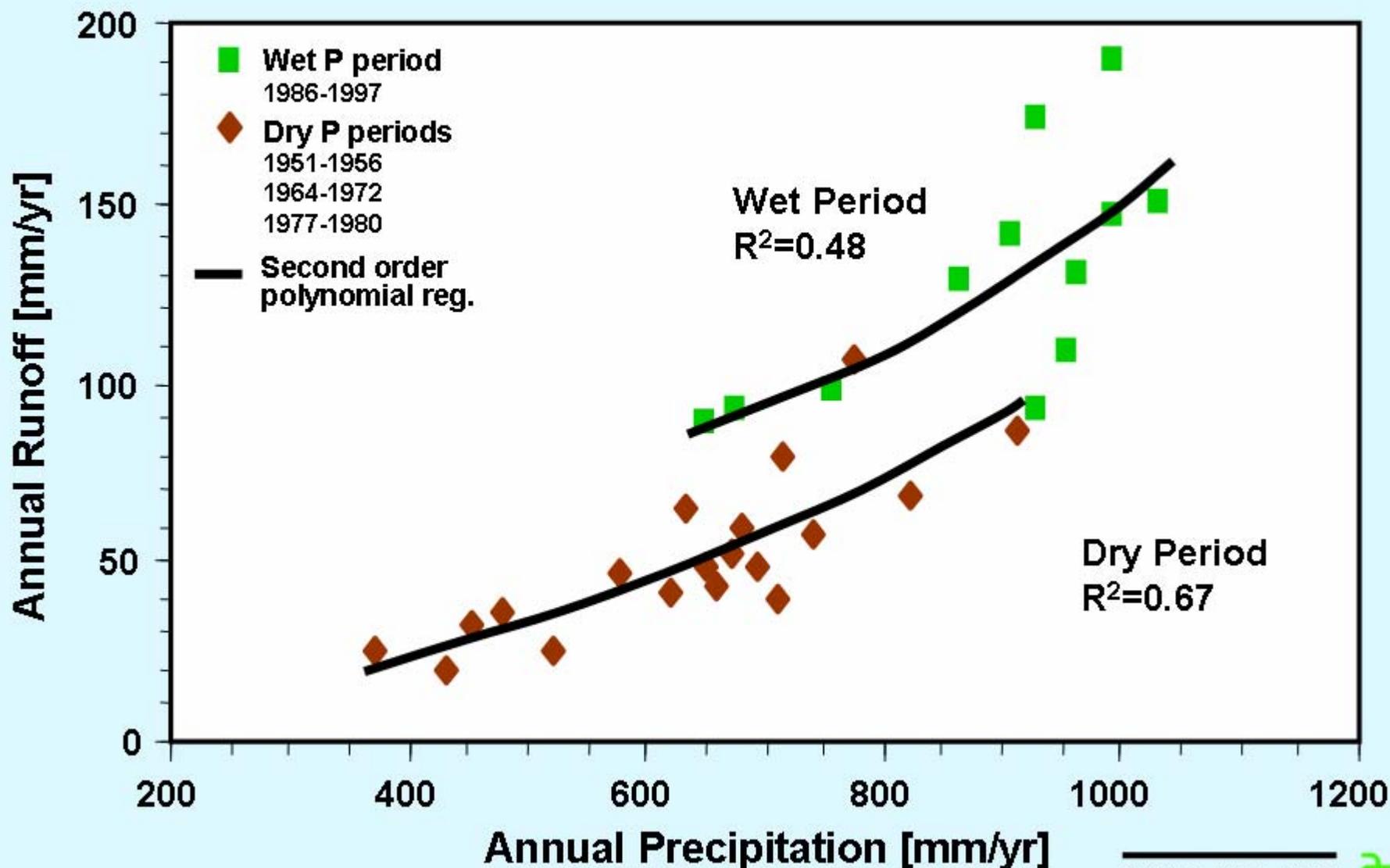
Conservation effectiveness values???

# Fundamental Question 4

**Are simulations of conservation effects restricted to climate conditions similar to those used for model calibration?**

# Annual Precipitation – Runoff Relationship

Fort Cobb Reservoir watershed; 1940-2004

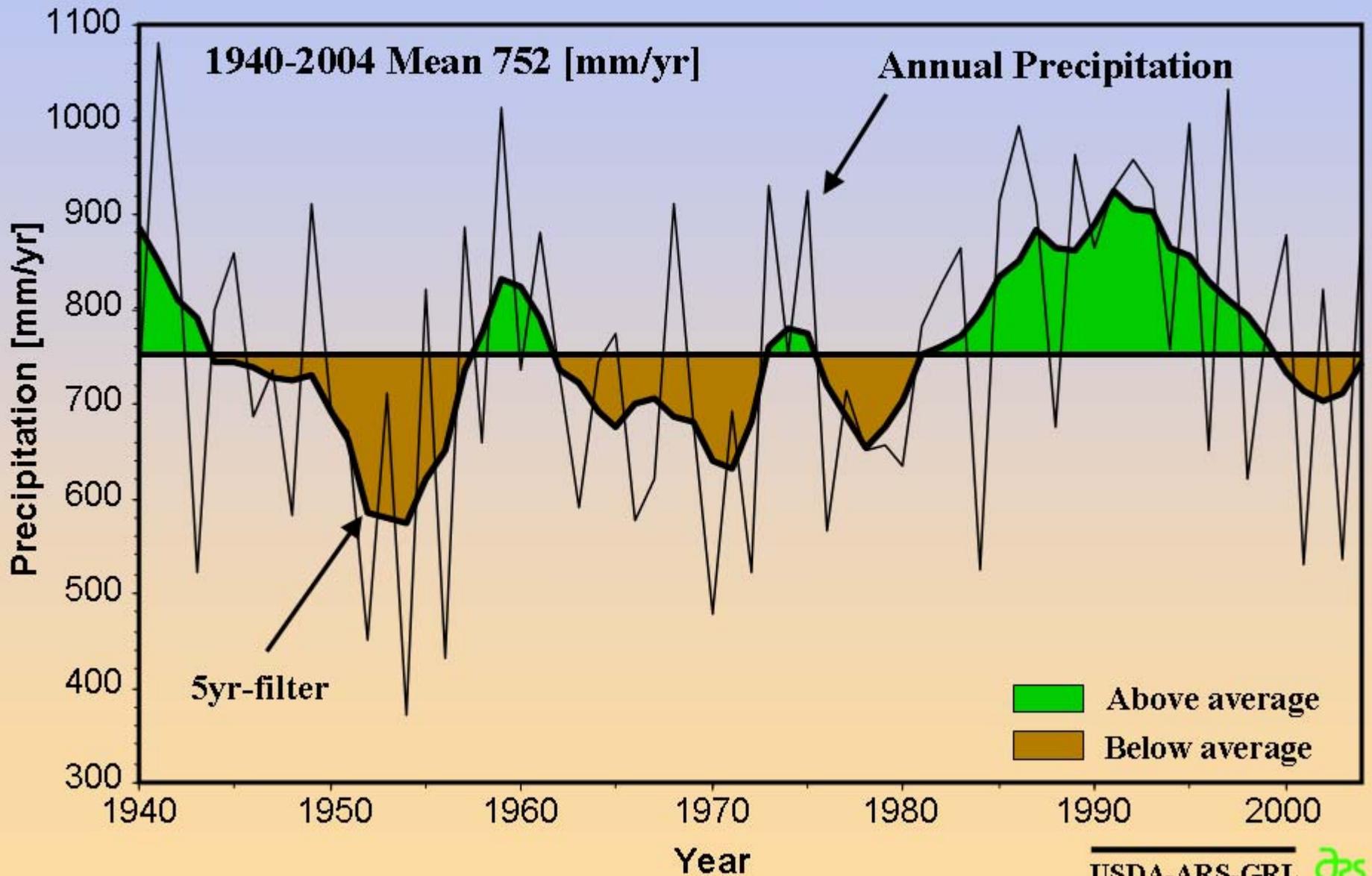


# Fundamental Question 5

**What are appropriate climate conditions to drive the conservation effects assessment?**

# Annual Precipitation for Ft. Cobb Watershed

## Fort Cobb Watershed; 1940-2004



# Concluding Comments

**Persistent, multi-year precipitation variations are an important consideration in runoff and sediment yield investigations.**

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**The role of precipitation variations with regard to CEAP objectives should be determined.**

**Until then, conservation effectiveness should be reported in terms of underlying climatic drivers, and these should be placed in the larger climate-variation context.**

# Beware of the climate

