Highland Lakes Inflows Trend Drives Need for New Water Supplies: Sooner vs Later

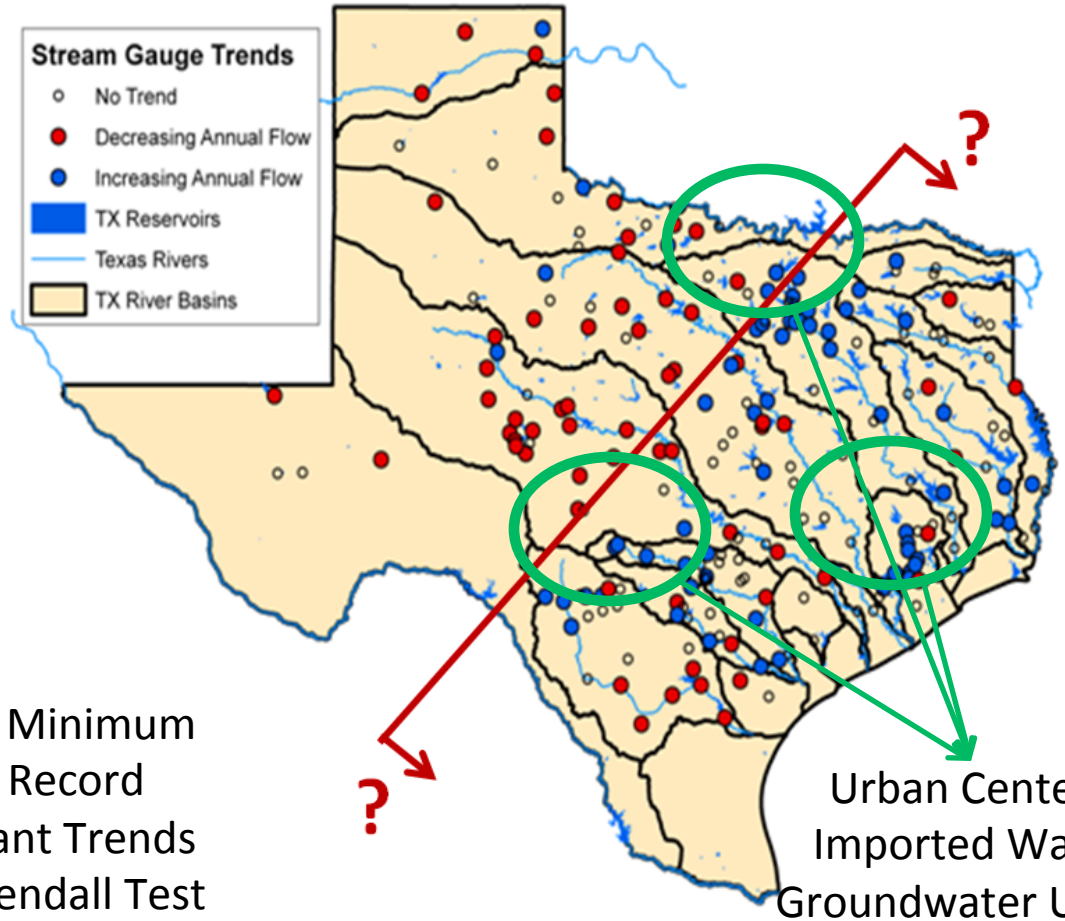
Presentation to Region K WPG

By Central Texas Water Coalition

January 8, 2014

CENTRAL TEXAS WATER COALITION

Stream Gauge Records Show Drying Trend*



50 year Minimum
Flow Record
Significant Trends
Mann-Kendall Test

Urban Centers
Imported Water
Groundwater Usage

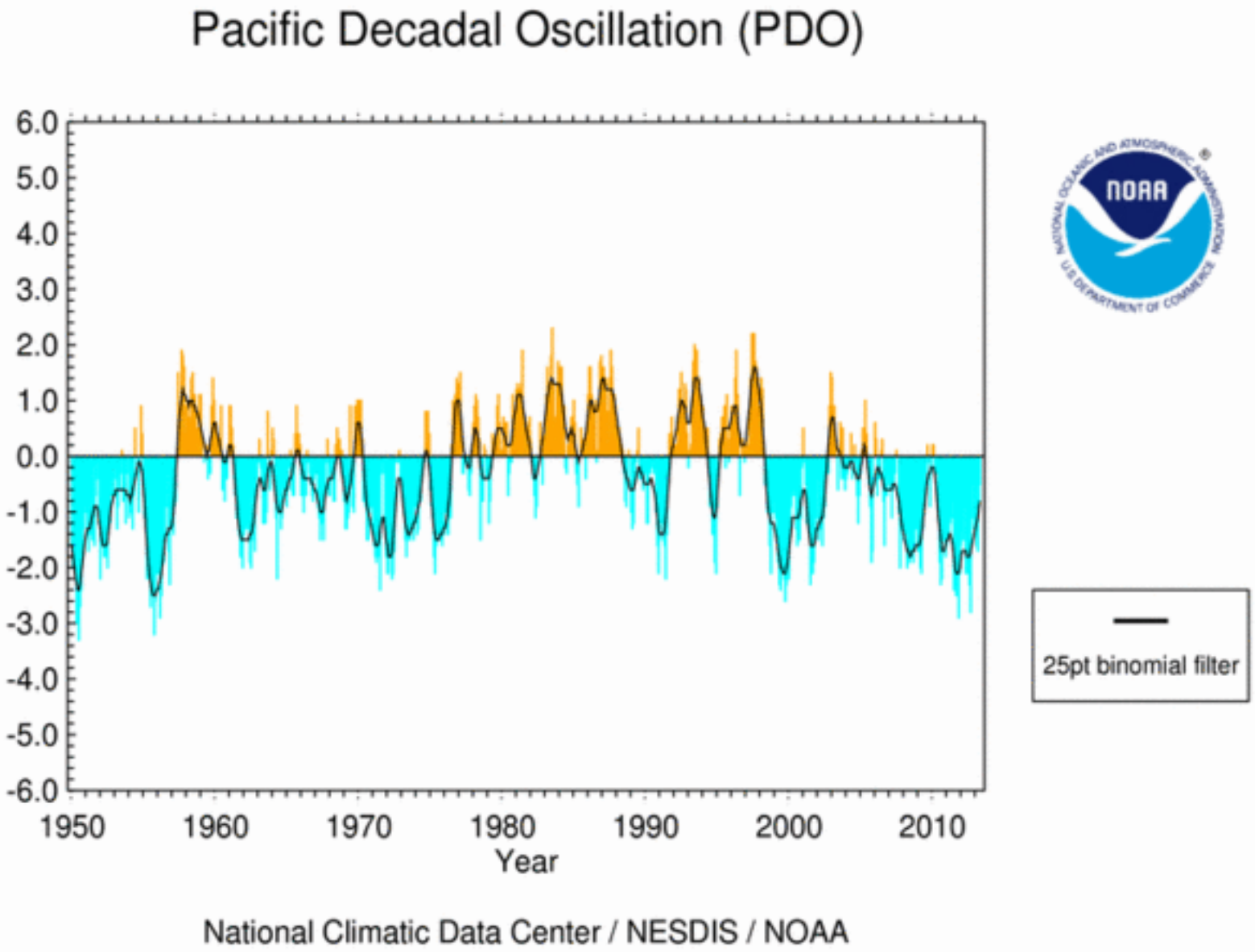
*Intera Analysis, May 8, 2013


BUCHANAN DAM
SEPTEMBER 2013

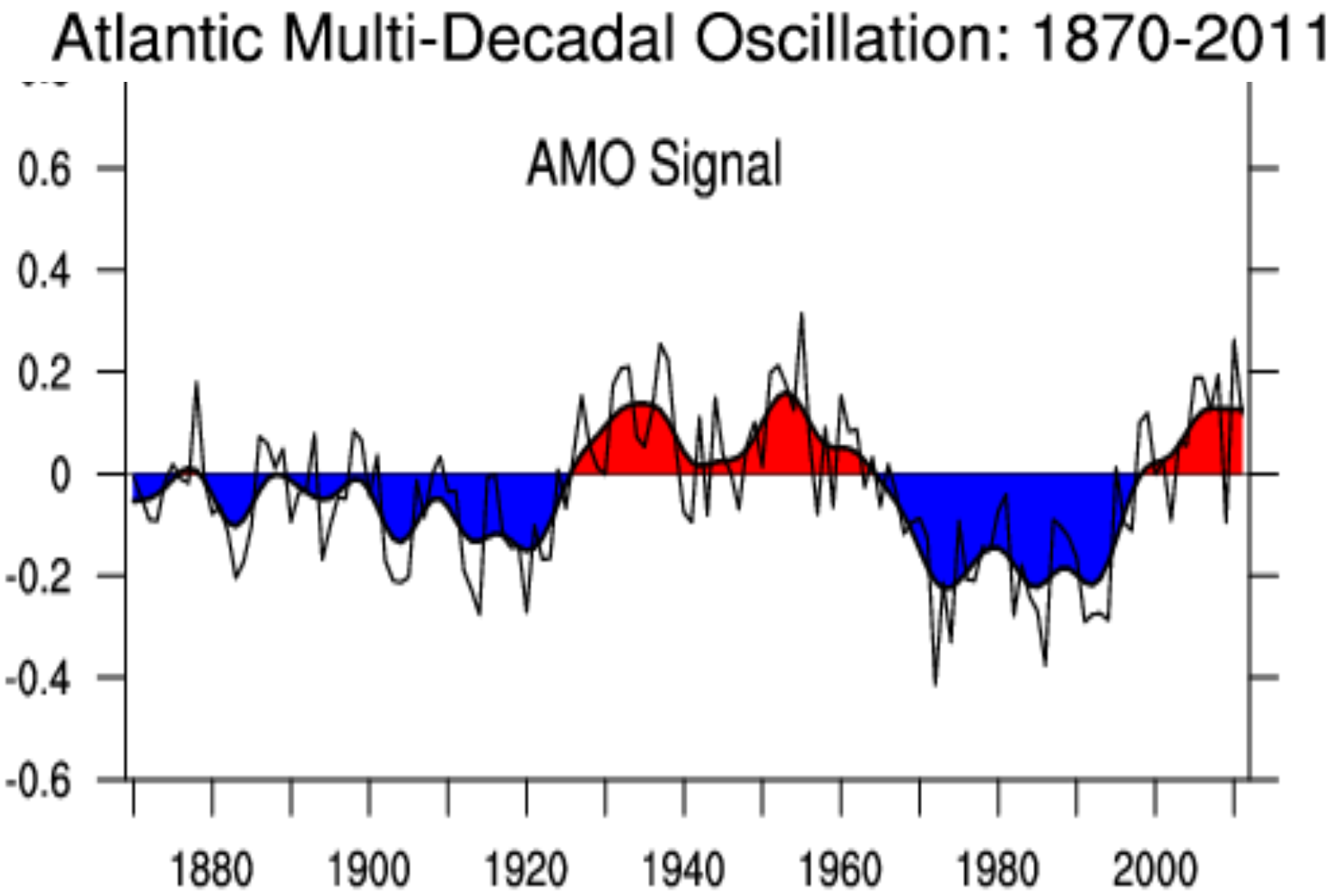
Factors Driving the Drought:
Bob Rose and John Nielsen-Gammon

- **Drought conditions include meteorological drought (rainfall and temperature) and hydrologic drought (streamflow and evaporation).**
- **Similar oceanic conditions in the Pacific and Atlantic are occurring now as in the 1950's.**
- **Texas appears to be in a multi-year drought period, along the lines of the drought years of the 1950s:**
  - **Alignment of long-term natural ocean surface temperature cycles, the cool phase of the Pacific (PDO) and warm phase of the Atlantic (AMO)**
  - **Cycles can remain in place for 20-30 years**
  - **Higher temperatures exacerbate problem**

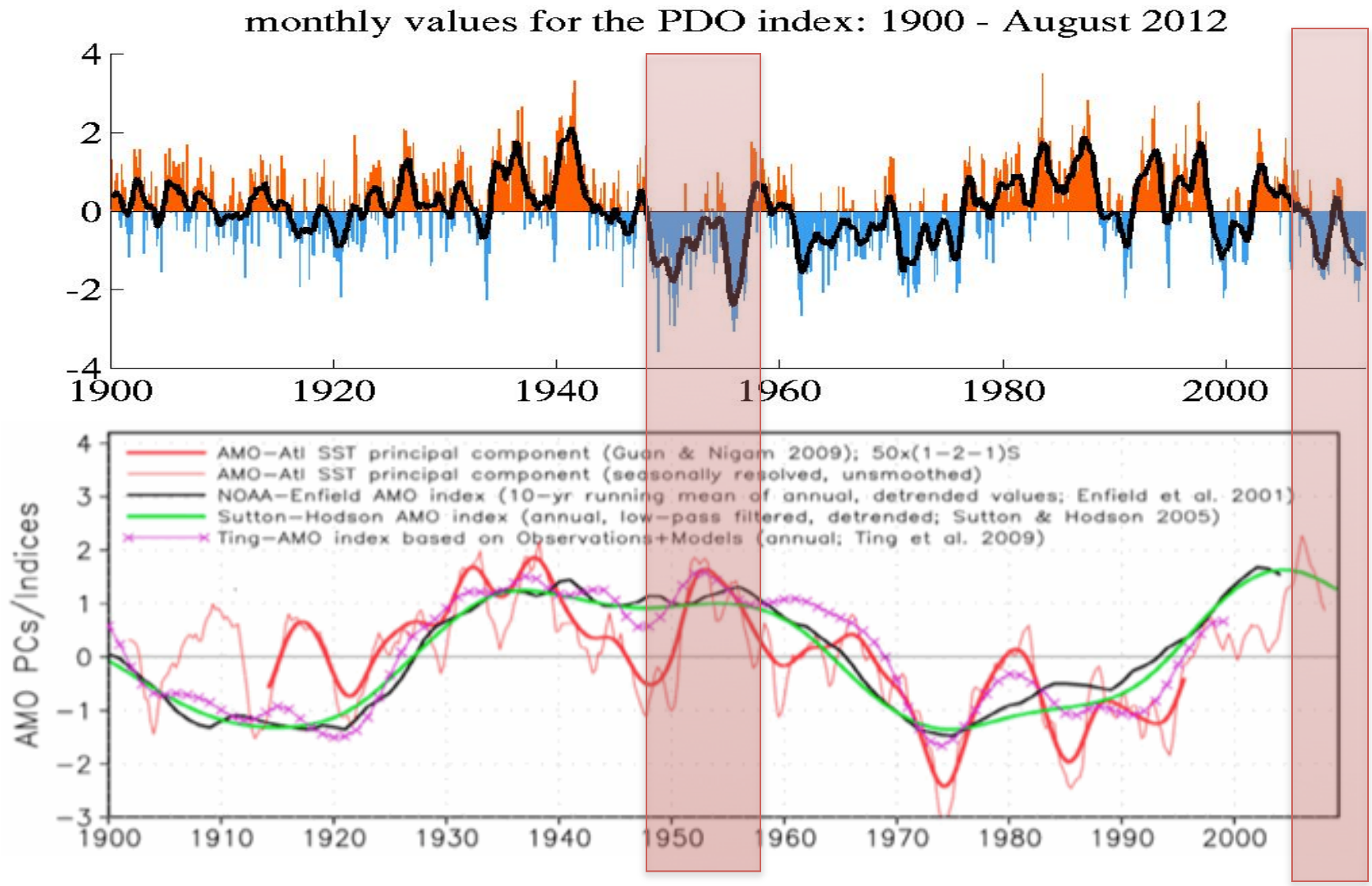
Ocean Surface Water Temperature Cycles



Ocean Surface Water Temperature Cycles



Extended Alignment Periods of PDO and AMO Cycles



So How Severe is the Current Extended Drought and Hydrology?

- **Inflows for 2011 into the lakes were the lowest annual inflows on record, about 10% of average.**
- **Calendar years 2008, 2009, 2011 and 2012 are among the lowest 10 years of inflows to the Highland Lakes**
- **2013 is on track to be among the five lowest.**
- **Inflows from just one year from the historic Drought of Record (50's) fall within the 10 years of lowest inflows**
- **monthly inflows have been below average in 42 of the past 43 months.**
- **The inflow deficit and the inflow statistics for the past six years reveal a hydrologic condition that is more severe than any hydrologic condition evaluated as part of the 2010 WMP.**

Per Ryan Rowney and Ron Anderson, LCRA

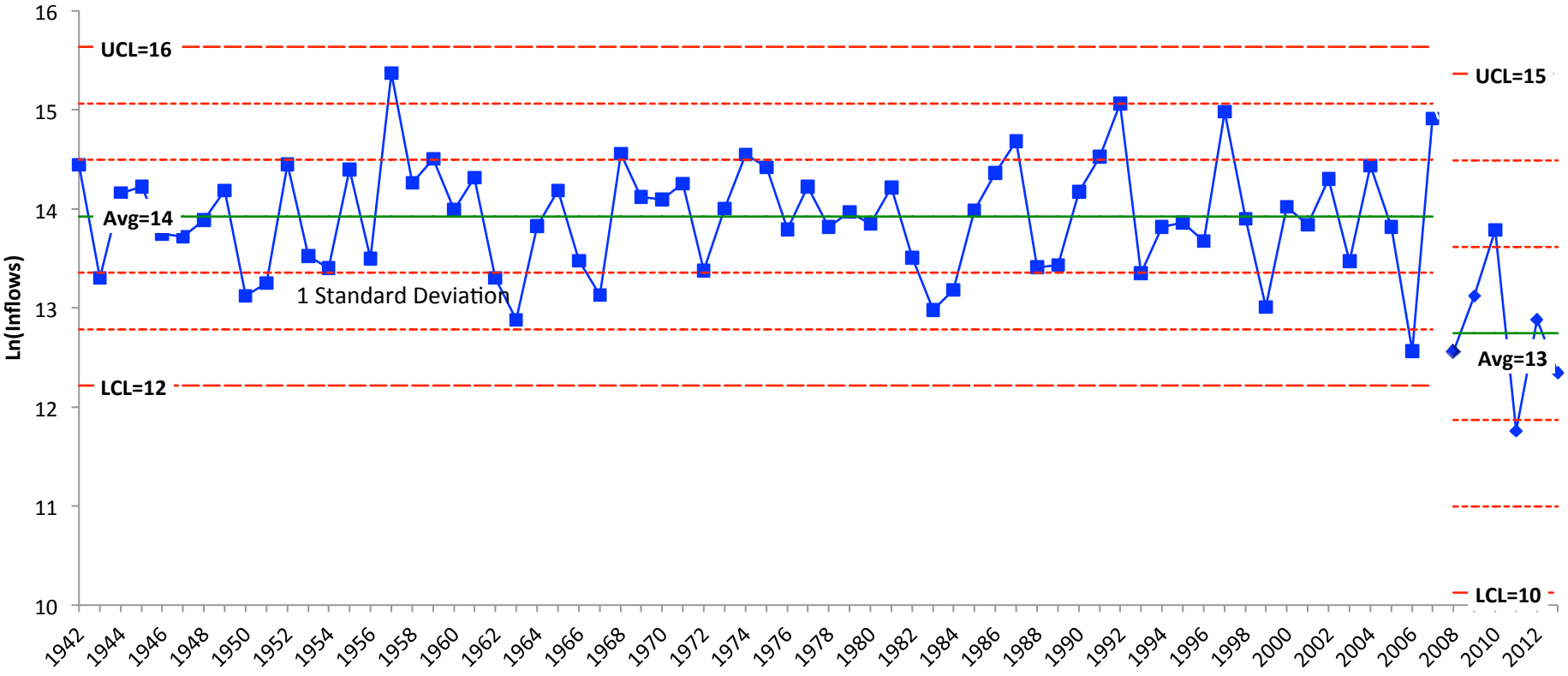
Benefits of Utilizing Statistical Control / Process Behavior Chart Analysis

- Macro Ocean Temperature Cycles appear to be producing distinctly different inflow distributions into the Highland Lakes
- Recent study by noted statistical expert Dr. Don Wheeler found hurricanes statistically fall into two different activity patterns, linked to naturally occurring climate oscillations.
- Accurate prediction requires use of appropriate current distribution
- Statistically evaluate inflow data to see if historical inflows have changed/shifted to a different distribution pattern

Ln Control Chart of Actual Inflows* shows Shift to Much Lower "New Normal" Distribution in 2008

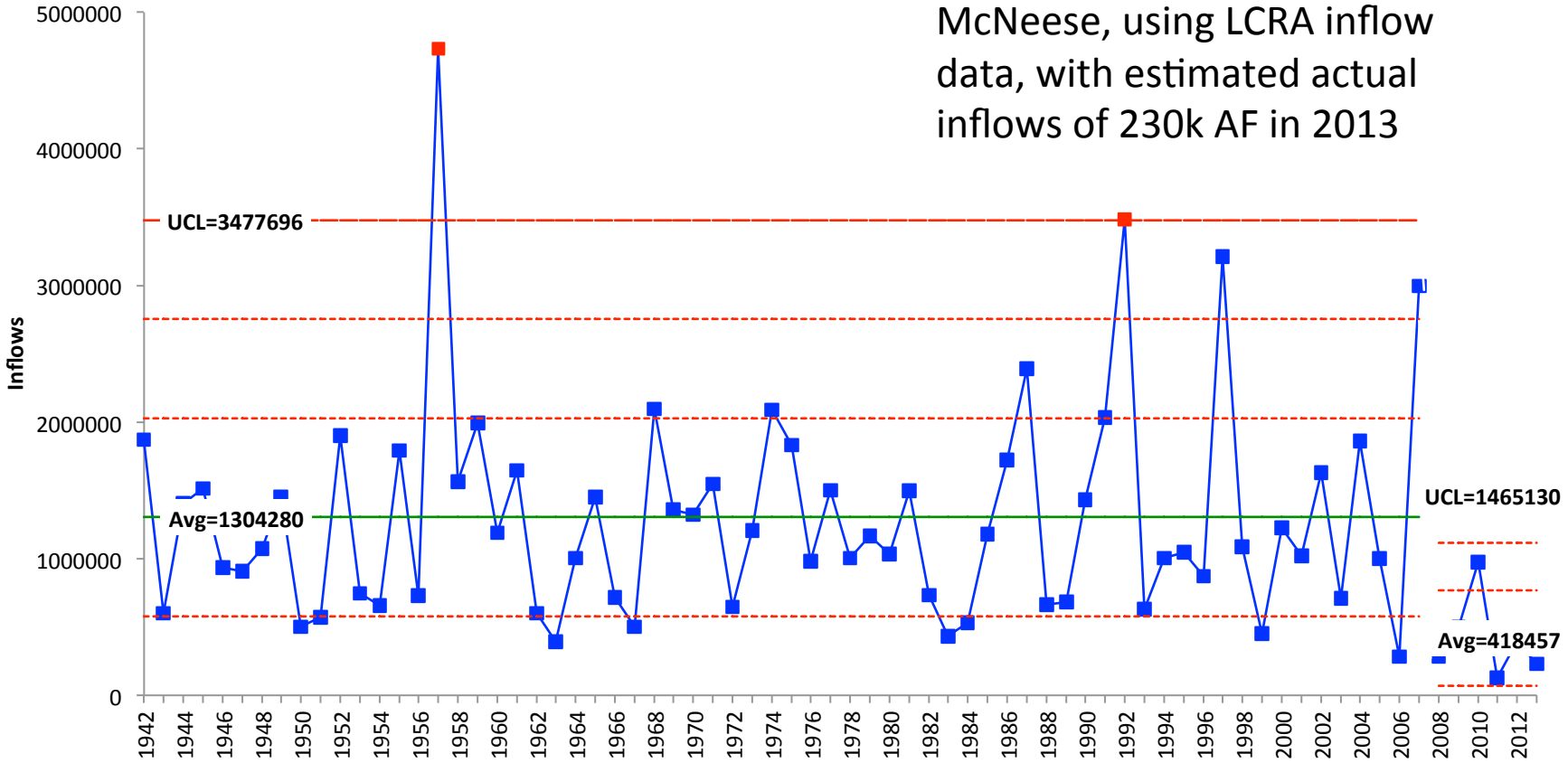
(5 of last 6 years beyond 1 std deviation)

* Analysis by Dr. Bill McNeese, using LCRA inflow data, with estimated actual inflows of 230k AF in 2013



Inflows to Highland Lakes - Shift to "New Normal" Split Control Chart Estimates New Inflow Average* of Approximately 418k AF/yr

* Analysis by Dr. Bill McNeese, using LCRA inflow data, with estimated actual inflows of 230k AF in 2013



Current Stored Water Demands Barely Matching Current Average Inflows

- **Current average inflows are about 418k AF/yr, but still evolving.**
- **Current stored water commitments/uses in curtailed state are at 352-443k AF/yr;**
  - **Firm Customers : 230k+ AF/yr and growing**
  - **Garwood Contract : 20-40k AF/yr (incl ROR)**
  - **Environmental releases : 27-33k AF/yr**
  - **Evaporation : 75-140k**
- **Reservoir lakes are unable to recover, putting water supply for over 1 million at risk with the very low inflows persisting**

Implications for Strategic Water Planning

- **New water supply resources appear to be needed much sooner than currently expected to build the water supply to a safe level.**
  - **Increase focus on serious conservation**
  - **Use LCRA target of 1.1MM AF in combined storage as a initial minimum baseline goal (requires 350k AF from today's level)**
- **Better understanding and utilization is needed for key meteorological, climatological and hydrological factors driving low inflows into Highland Lakes.**
- **Recurrence of aligned naturally occurring PDO/AMO cycles needs to be recognized and addressed.**

CENTRAL TEXAS WATER COALITION

Presented by David M. Lindsay

For additional information, contact me at: davelindsay02@gmail.com

or

www.CentralTexasWaterCoalition.com