Water Availability Modeling Overview

Austin Water Resources Planning Task Force

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Topics Covered

- Introduction to Water Availability Models (WAMs) in Texas
- Conventional and Conditional Reliability Modeling (CRM)
- Modeling drought persistence for the Colorado River Basin

WAM Used for Strategy Assessment

- Strategies being considered can be assessed using the WAM for:
  - the amount of water that the strategy provides,
  - the amount of water that can be saved in storage in the Highland Lakes, and
  - possible interactions with other basin water rights.

Water Availability Model (WAM)

- A WAM is a computer model that:
  - represents all existing water rights in the basin,
  - simulates a specific set of management conditions,
  - simulates those rights through a sequence of hydrologic conditions,
  - determines the amount of water that would be available to the rights under those hydrologic and management conditions .

WAM Data

Input: Naturalized Hydrology

- Historical stream flow data are adjusted to remove historical diversions, returns, and impoundments.
- Historical net evaporation-precipitation data are assembled.

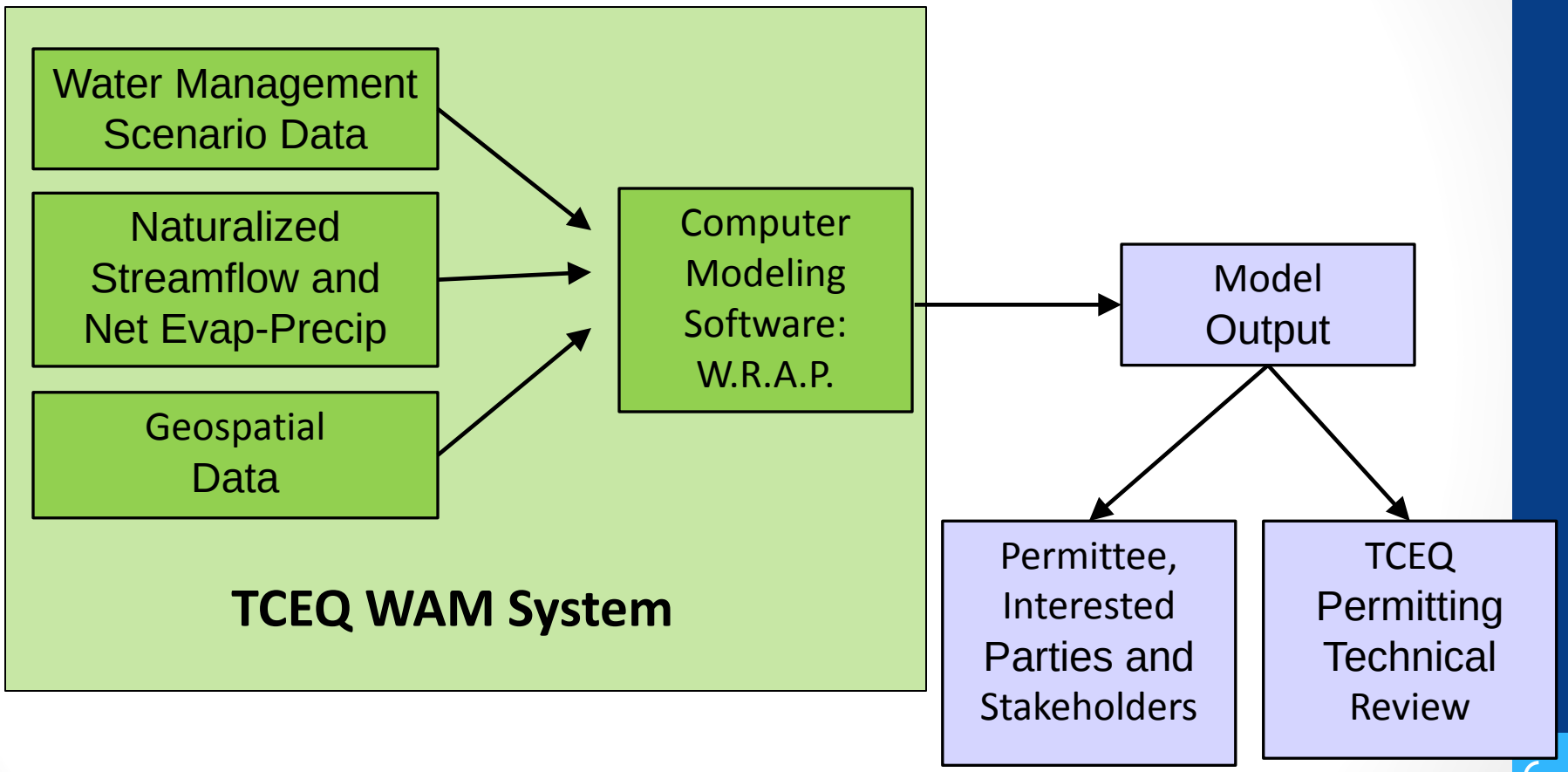
Input: Water Management Scenario

- A specific water management condition is simulated through a repetition of the historic naturalized hydrology.

Output

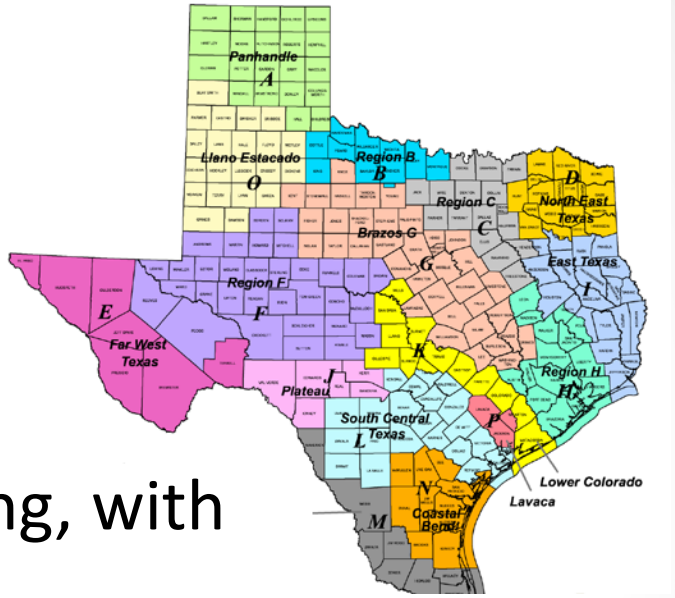
- Stream flows, storage content, depletions, returns, etc. at all locations identified in the input management scenario.

WAM System in Surface Water Permitting



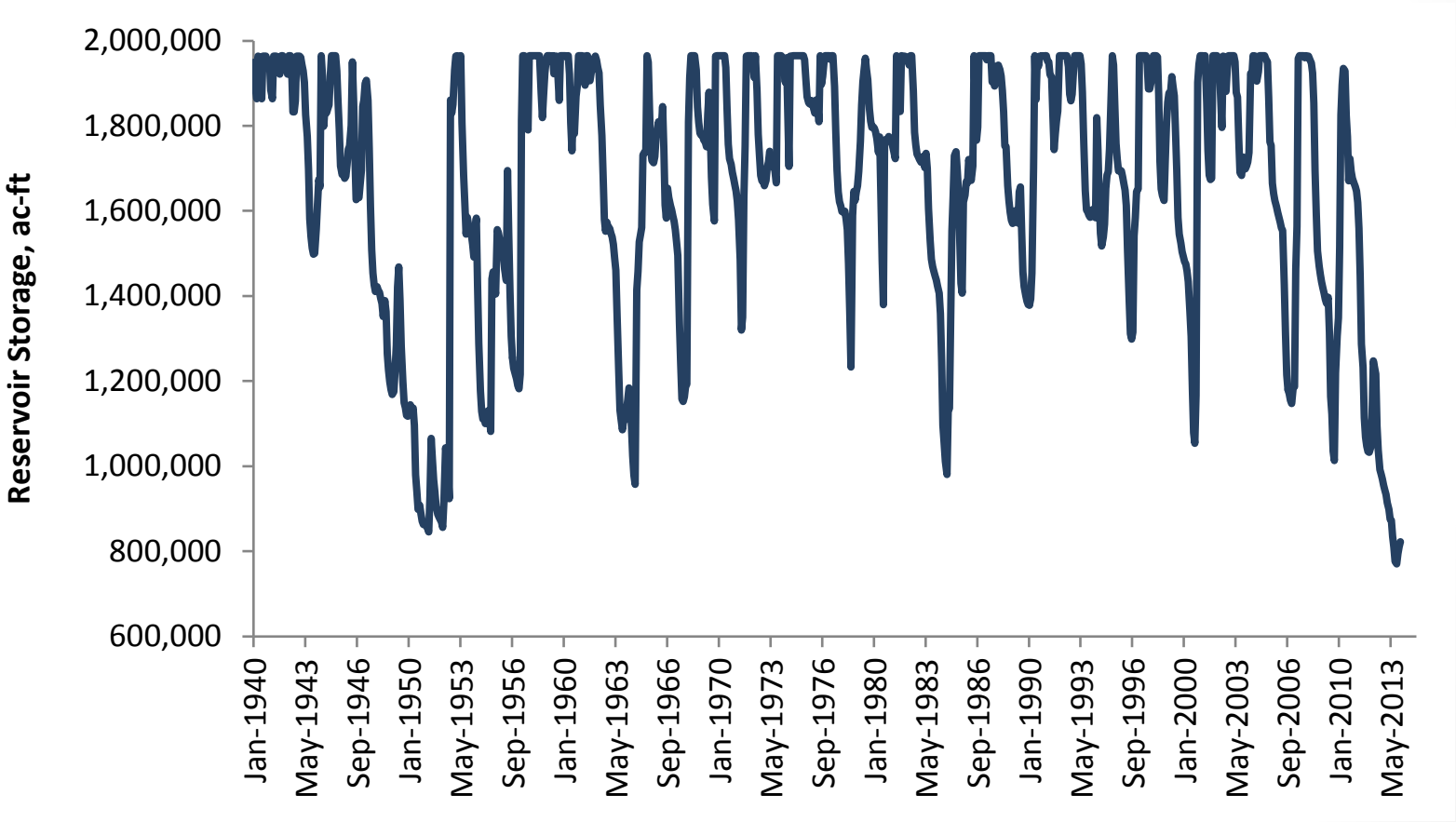
Water Availability Models in Planning

- 1997 Senate Bill 1
- 16 Regional Planning Areas
- WAM System used for planning, with modifications
  - Determine water available during a repeat of the worst drought in the period of record
  - WAM provides a platform for consistent analyses between regions



Conventional
and
Conditional Reliability Modeling
(CRM)

Conventional Simulation with WAM

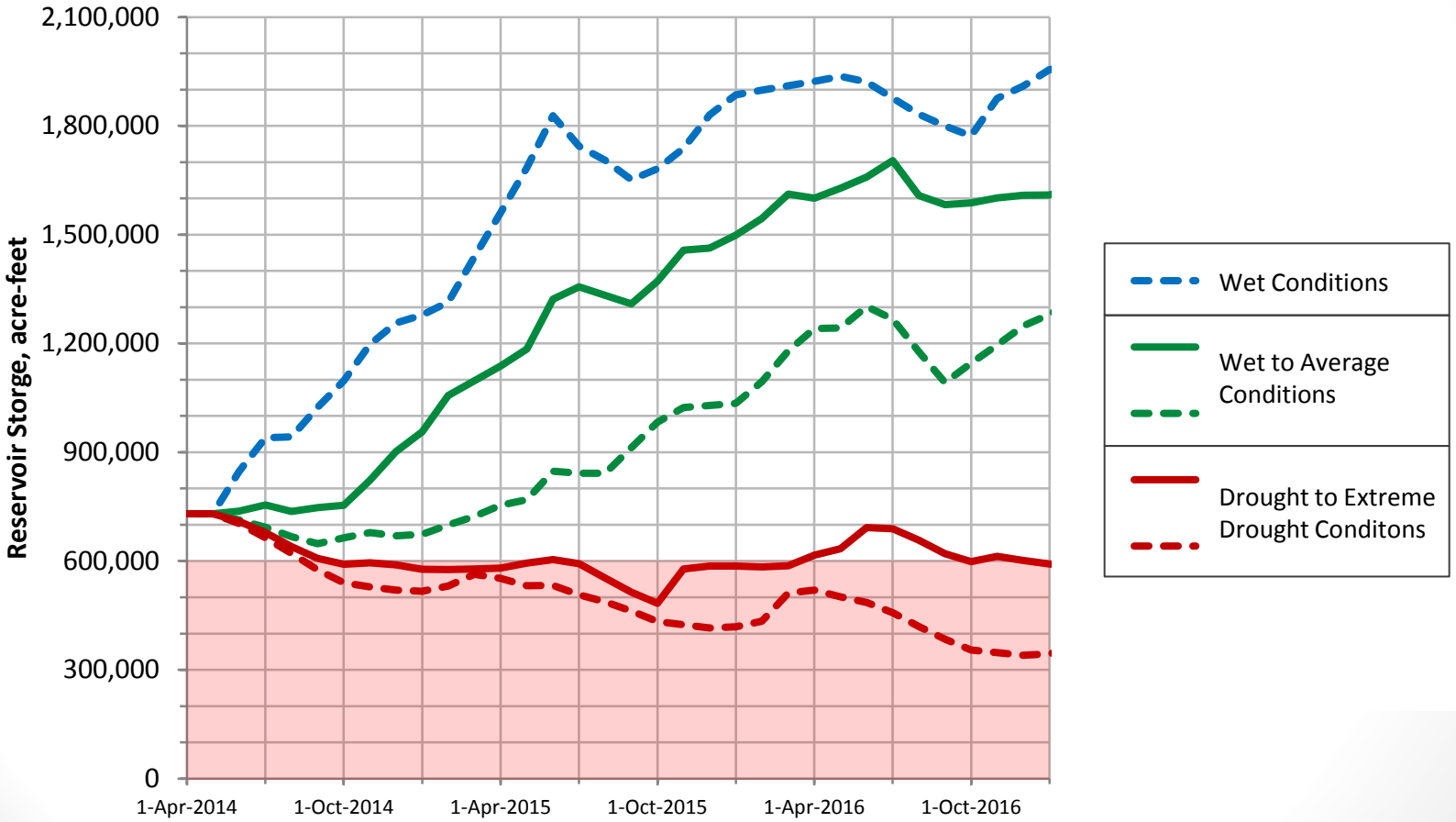


Conditional Reliability Modeling (CRM)

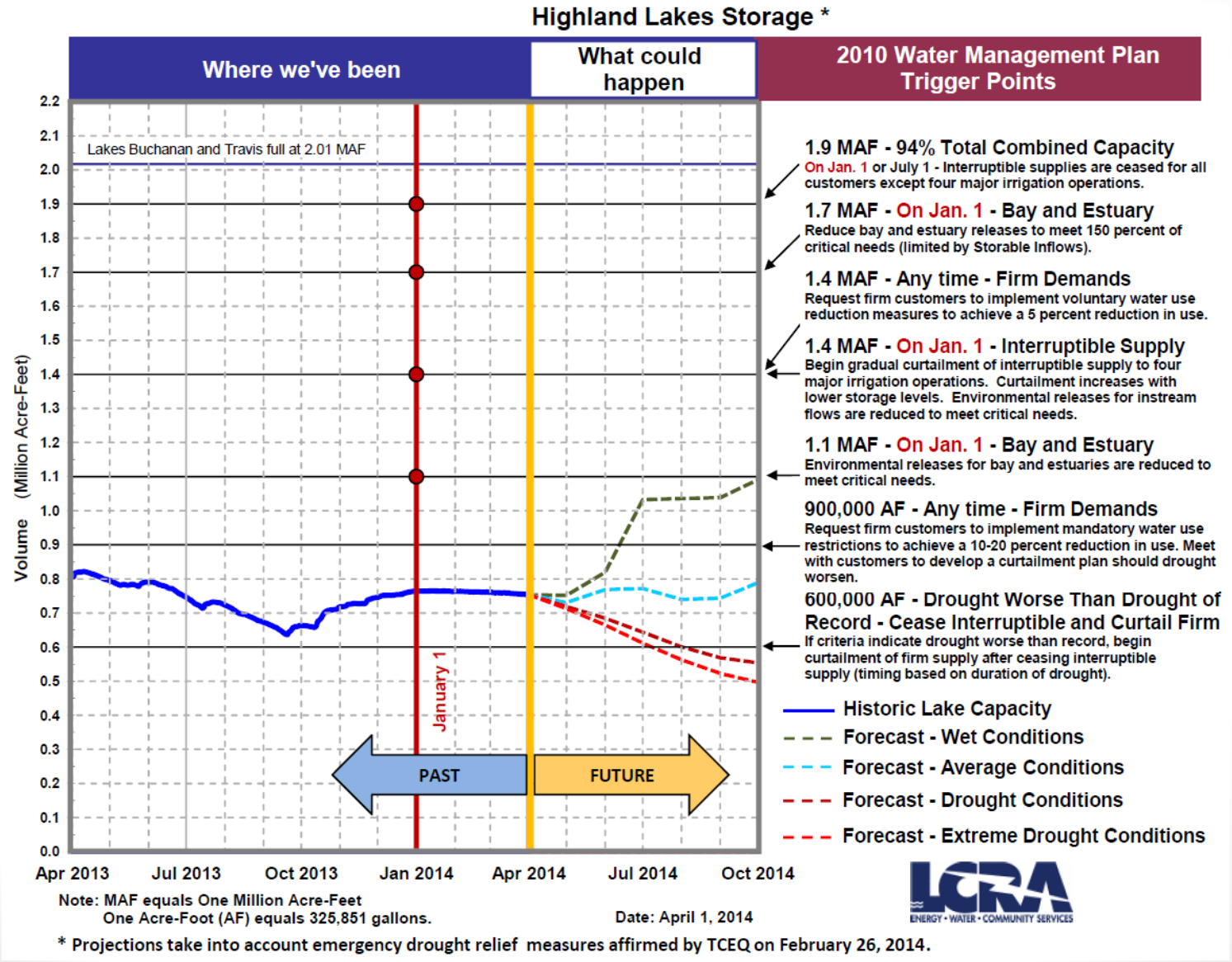
- **Simulations started with reservoir storage content at current amount**.
- Select length of hydrologic sequences to extract from the period of record.
- Simulate water management scenario with reservoir storage initialized to current amount through each hydrologic sequence.
- Develop storage frequency and reliability metrics for each month through the hydrologic sequence.

CRM Simulation with WAM

Period of Record Conditions



LCRA Storage Forecast



Modeling Assumptions

- Initialized May 2014 Combined Storage
- Reference year demands
- Demand growth
- Firm customer DCPs
- LCRA WMP Emergency Order for Interruptible Stored Water
- Other LCRA temporary amendments for environmental flows and diversion points
- DWDR cutoff of all interruptible stored water
- Corpus Christi diversion begins, July 2015

Modeling Drought Persistence for the Colorado River Basin

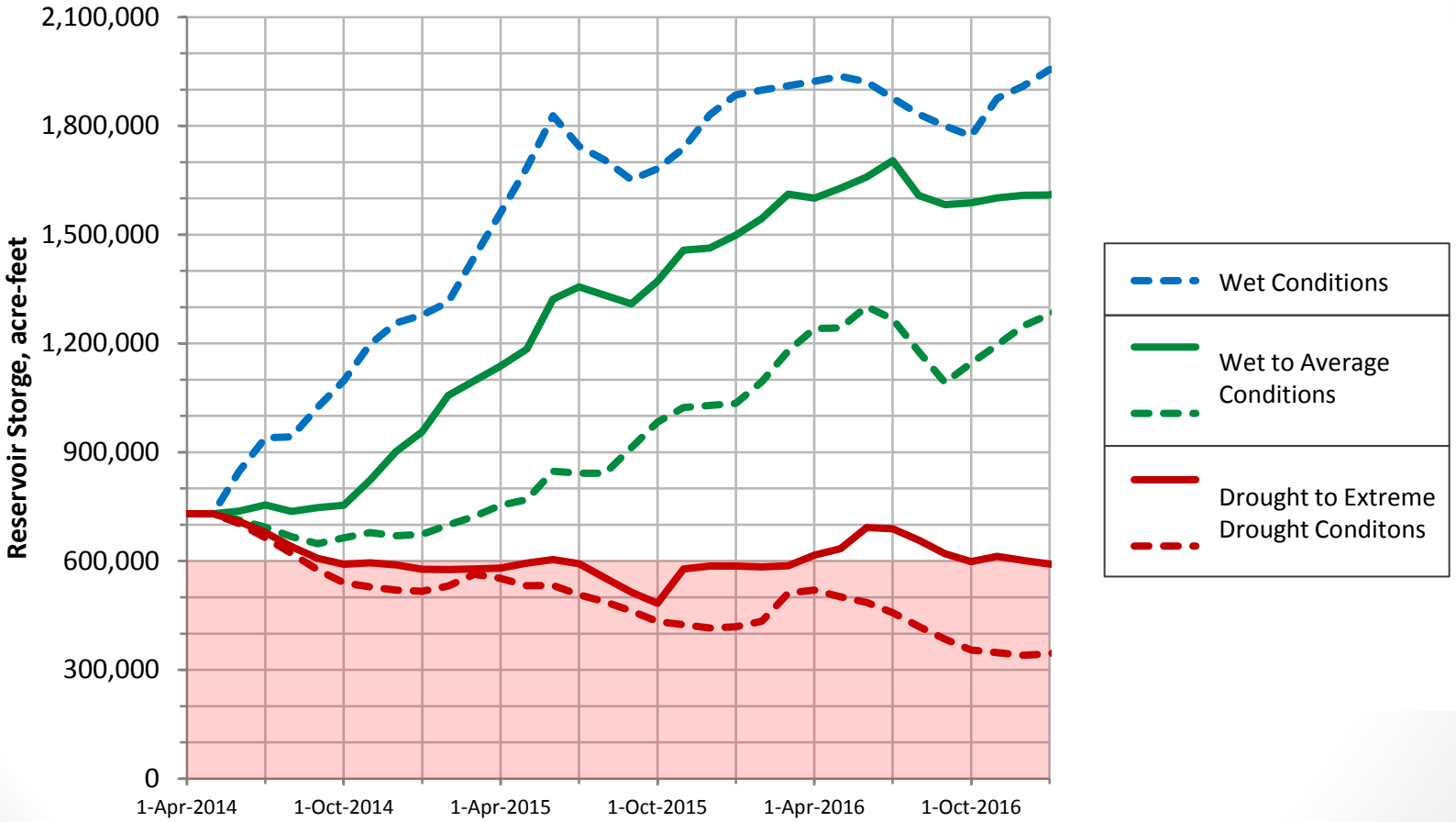
Drought Hydrology Input

- The 1940-2013 period-of-record represents a full range of hydrologic conditions.

- In order to test the effectiveness of management scenarios for the current drought, WAM simulations can be performed with:
  - Adjusted period of record flows that replicate the statistical properties of the current drought, or
  - Select the current drought hydrology and continue to repeat it for the next several years.

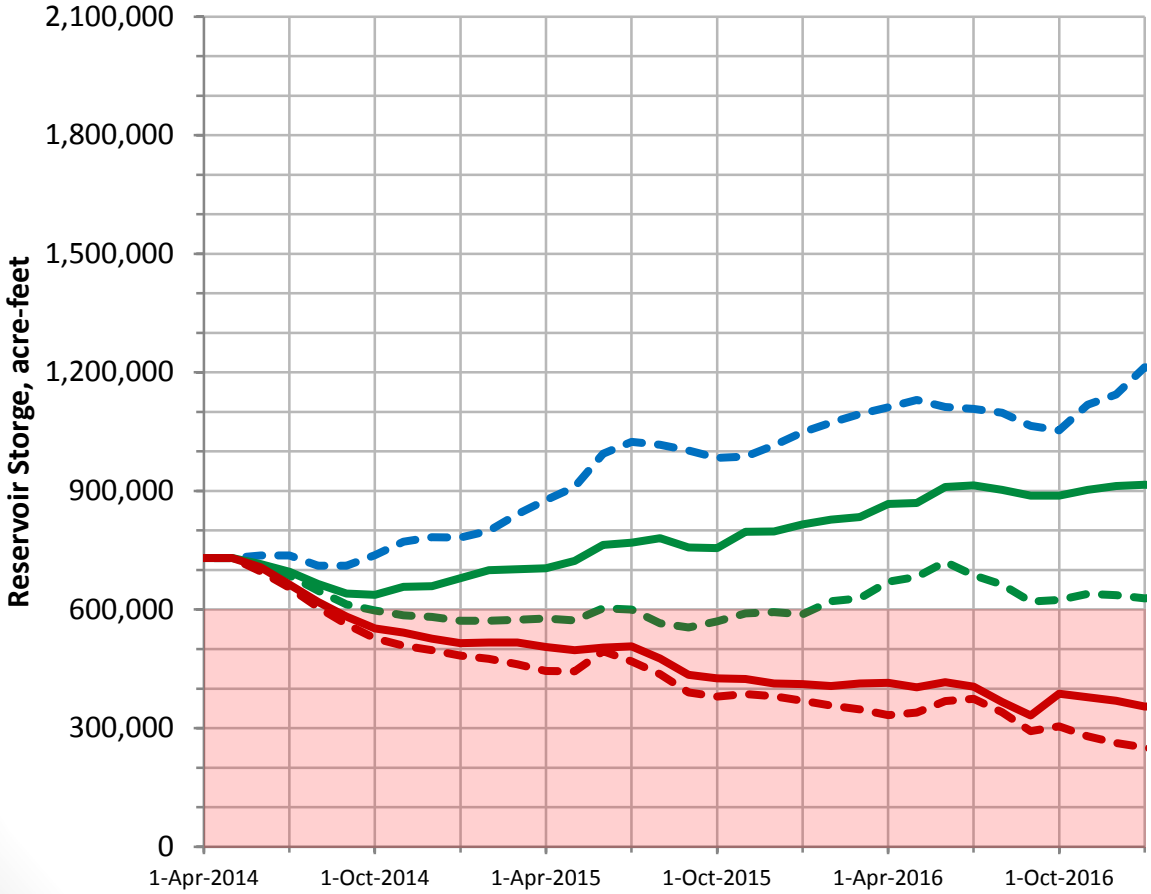
CRM Simulation with WAM

Period of Record Conditions



CRM Simulation with WAM

Persistent Drought Conditions



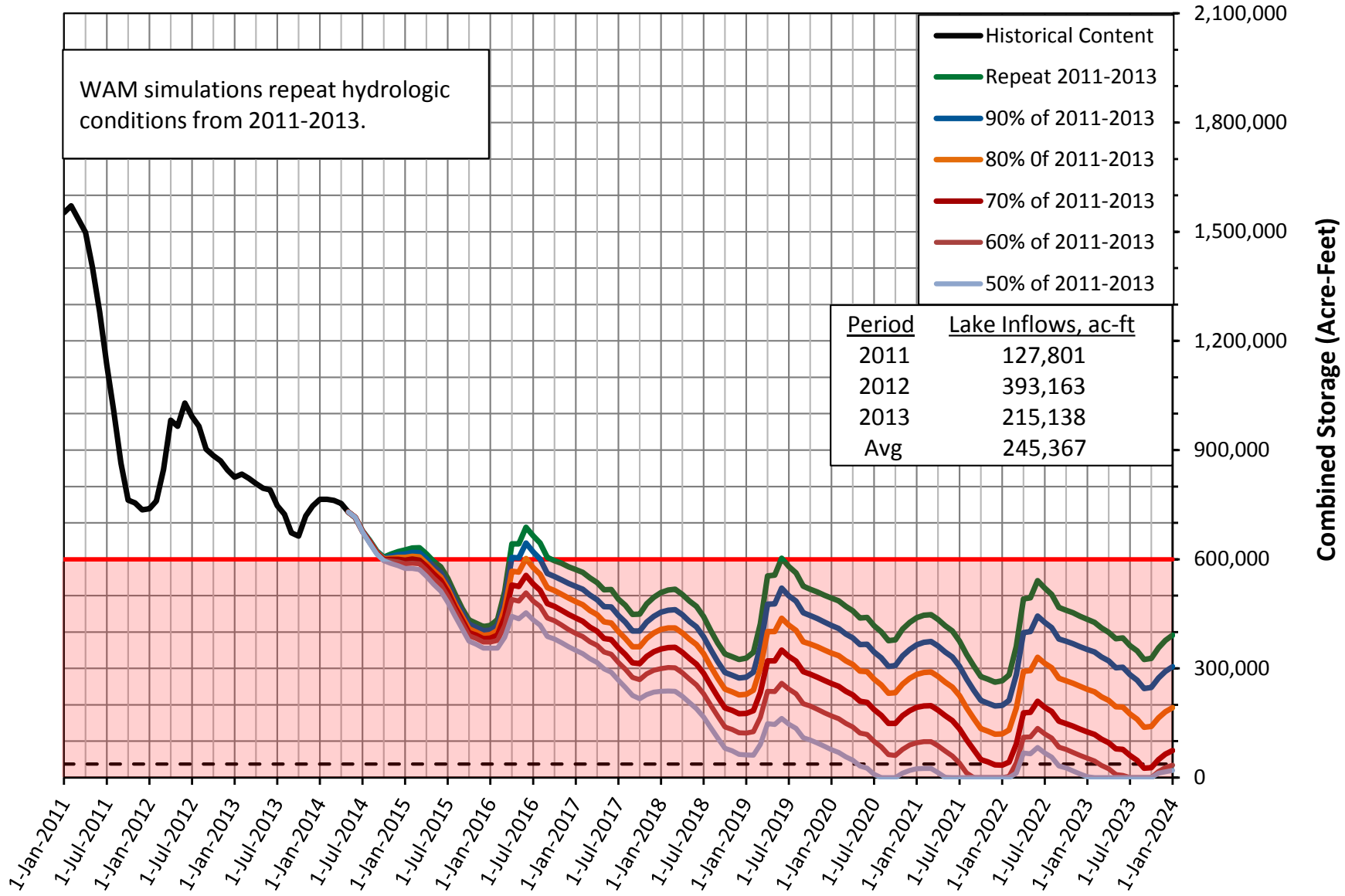
1940 - 2007 hydrology adjusted to replicate the long-term average and variability of 2008-2013.

Repeating 2011-2013 only

- Select the lowest inflow years (to date) of the current drought as a repeating hydrologic sequence.

- Reducing the inflows can be used as a “stress test” for worsening drought conditions.

Simulated Combined Storage of Lakes Buchanan and Travis
May 1, 2014 Start



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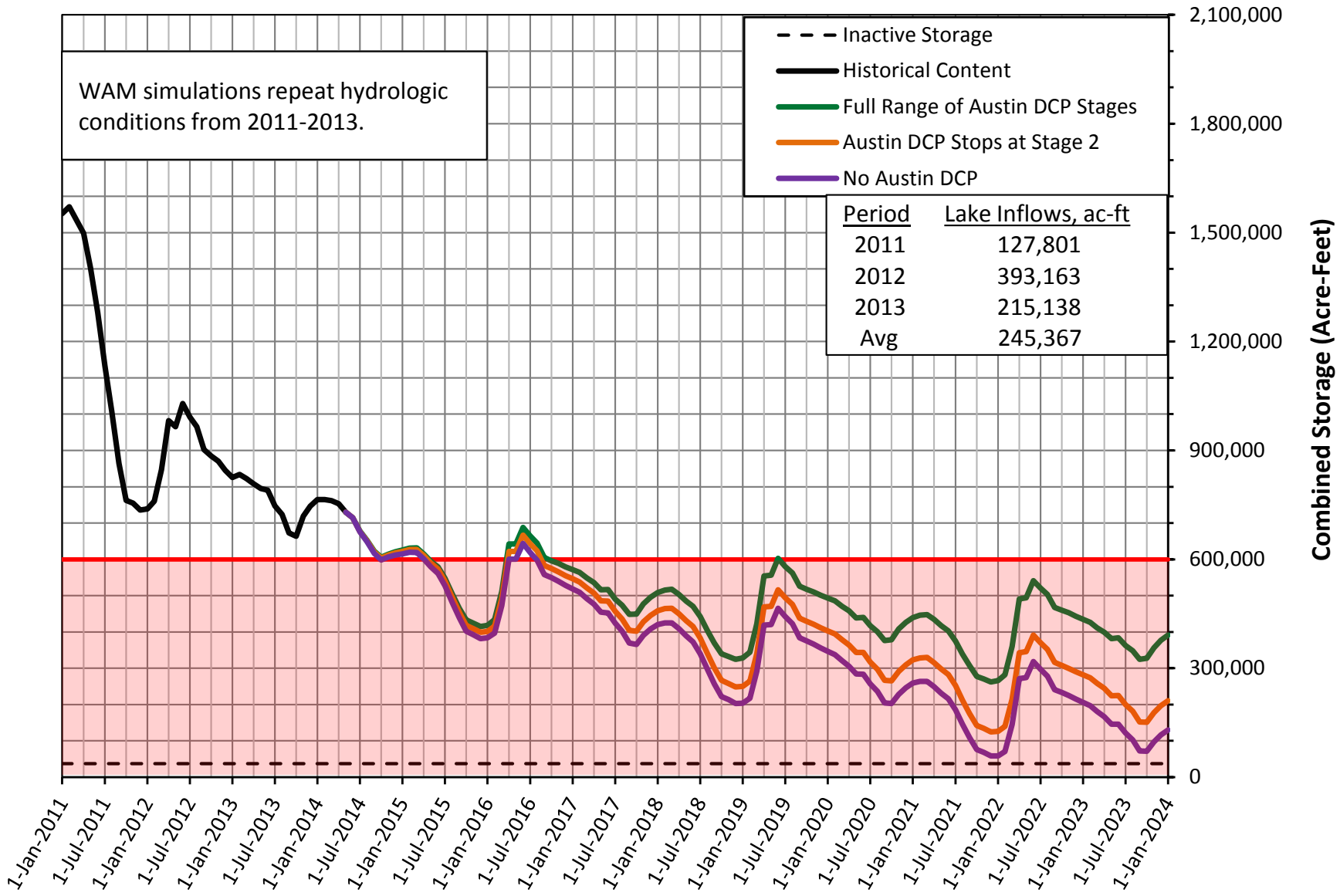

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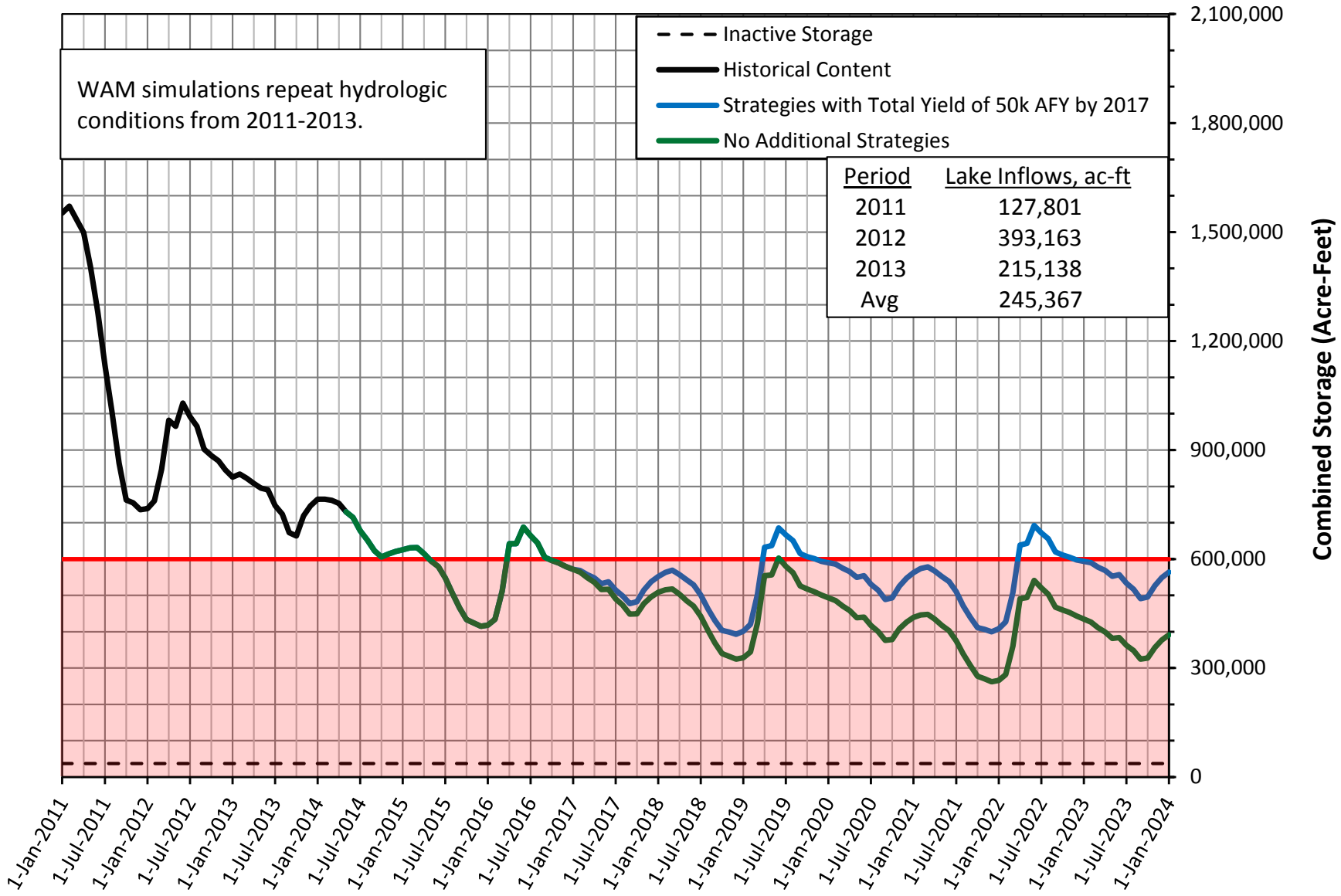

Summary

- WAM is a tool used by state agencies and other stakeholders for consideration of a water management strategies in the context of the entire basin.
- Tool for supporting strategy evaluation process including drought response.
- Various levels of drought intensity can be simulated with:
  - Statistical representation of drought, or
  - Specific repeat of current drought conditions.