

The Role of Water Conservation in a Long Range Drought Plan

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Problems With Droughts:

- **They can come on quickly**
 - Over a few months
- **They are difficult to predict**
 - Practically impossible over short term
- **Difficult to recognize early**
 - By the time you know you are in a drought it may be too late to respond effectively.

The hypothesis:

“Policies and plans that are pro-active rather than reactive and that aim at reducing risk rather than responding to crisis are more cost-effective, can lead to more sustainable resource management and reduced interventions by government”

Donald Wilhite 2005

Concerns:

- **Water conservation can lead to demand hardening**
- **The waste provides a cushion in times of shortage**
- **Conservation is project of last resort.**

Which is Better?

- **Conserve before the drought?**
 - Building codes, retrofits, Xeriscape, leak management, non-potable irrigation supply.
- **Rely on restrictions during drought to capture waste and inefficiency?**
 - Mandatory indoor and outdoor reductions.

Test Case

- **A 25 year simulation of a hypothetical community**
 - Moderate growth
 - Mainly SF Residential
 - No new water supply projects available
 - Fairly standard, non-conserving demand patterns.

Use Model to Test Alts.

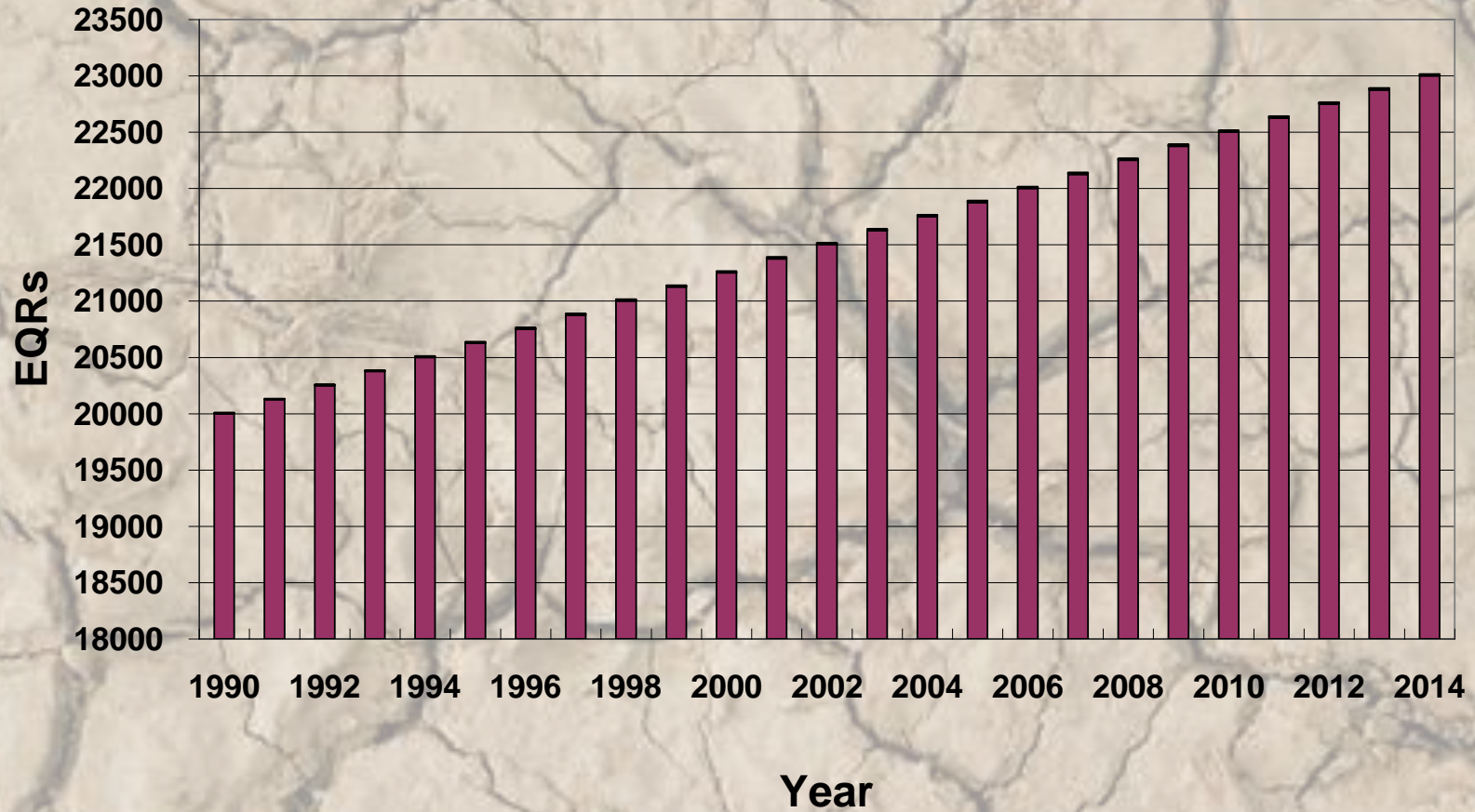
- **Model applied to a hypothetical system**
- **25 year, monthly model**
- **Demands disaggregated**
 - New/existing; by end uses
 - Baseline, Rationing and Conservation
- **Water supply including drought**
- **Reservoir operations**
- **Reliability Criteria (rules).**

Drought Recognition

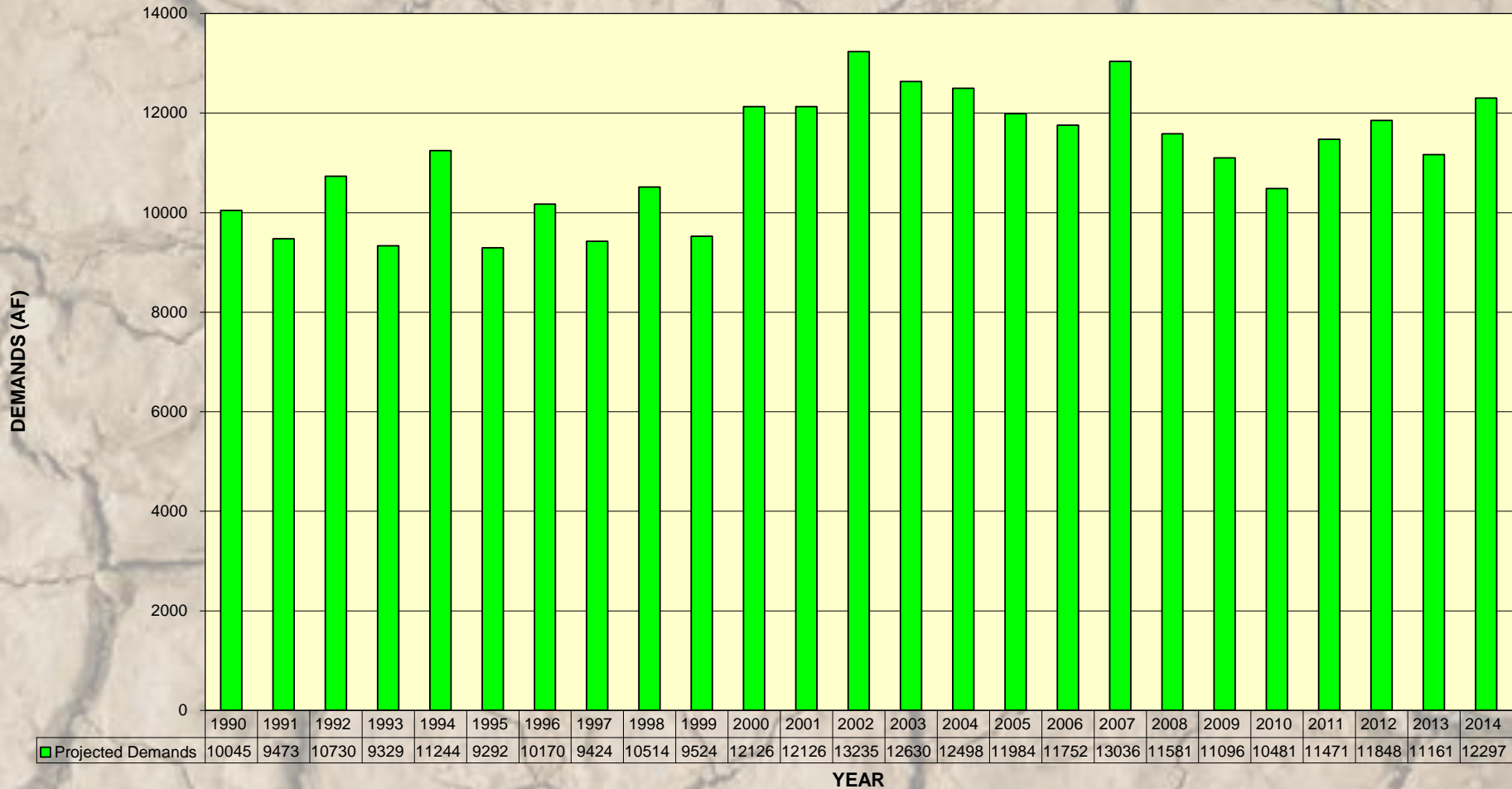
- Available Storage = 12 kaf = 1 yr dems
- Reliance on spring snowmelt
- Failure to fill to at least 67% of capacity



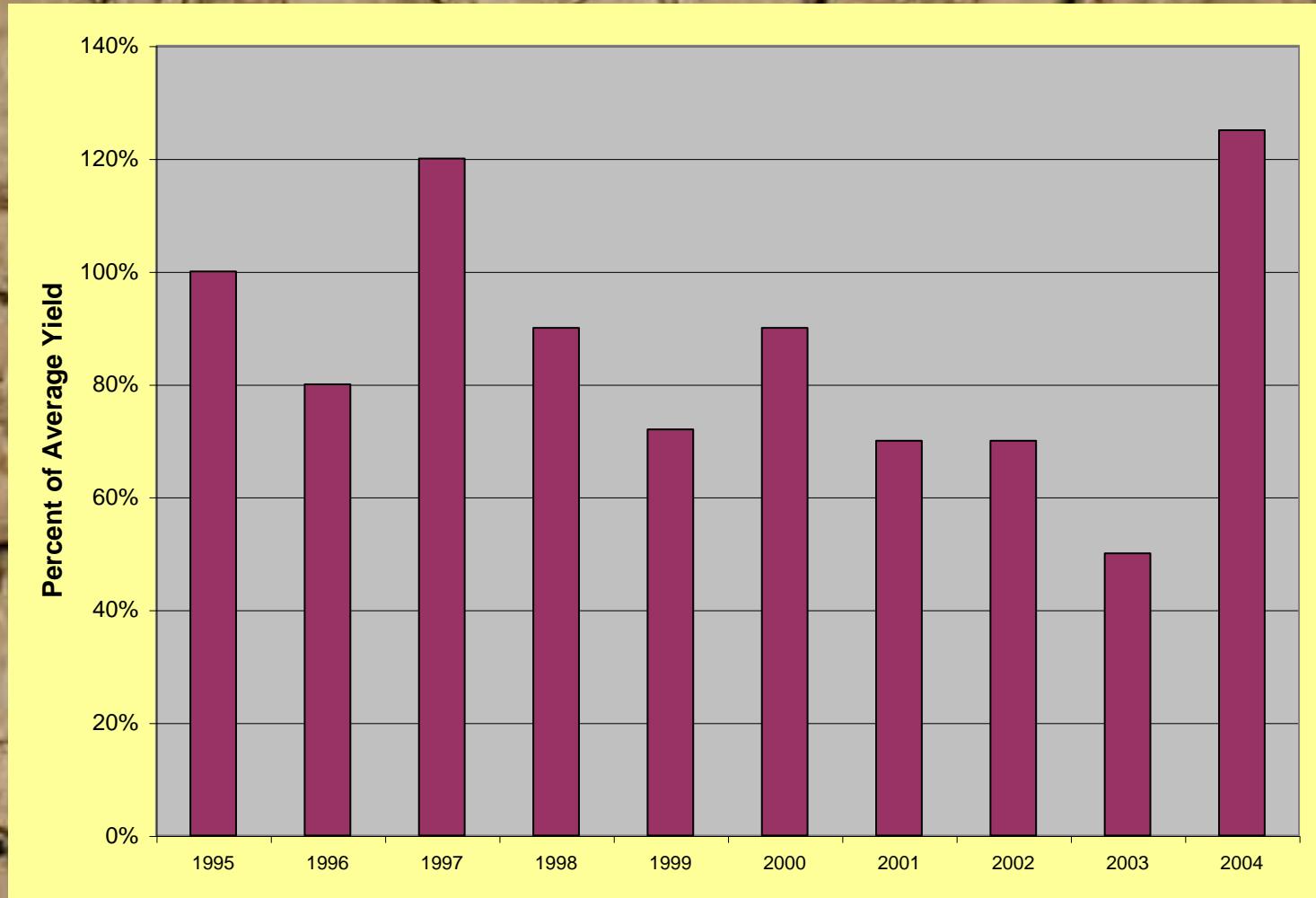
Projected EQR Growth



**ANUAL WATER DEMANDS
No Constraints**

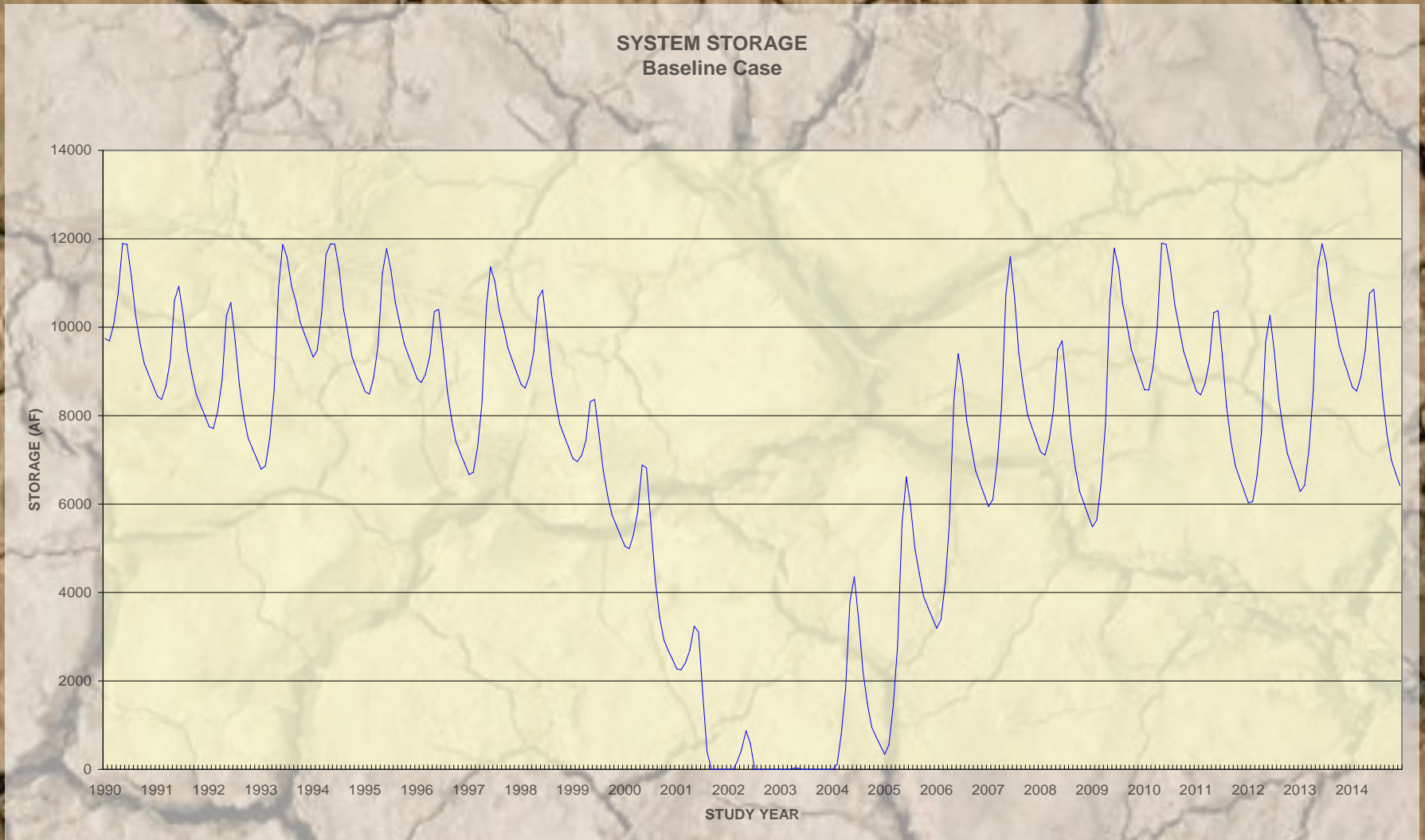


Drought Pattern



Colorado Drought Conference
October 8, 2008

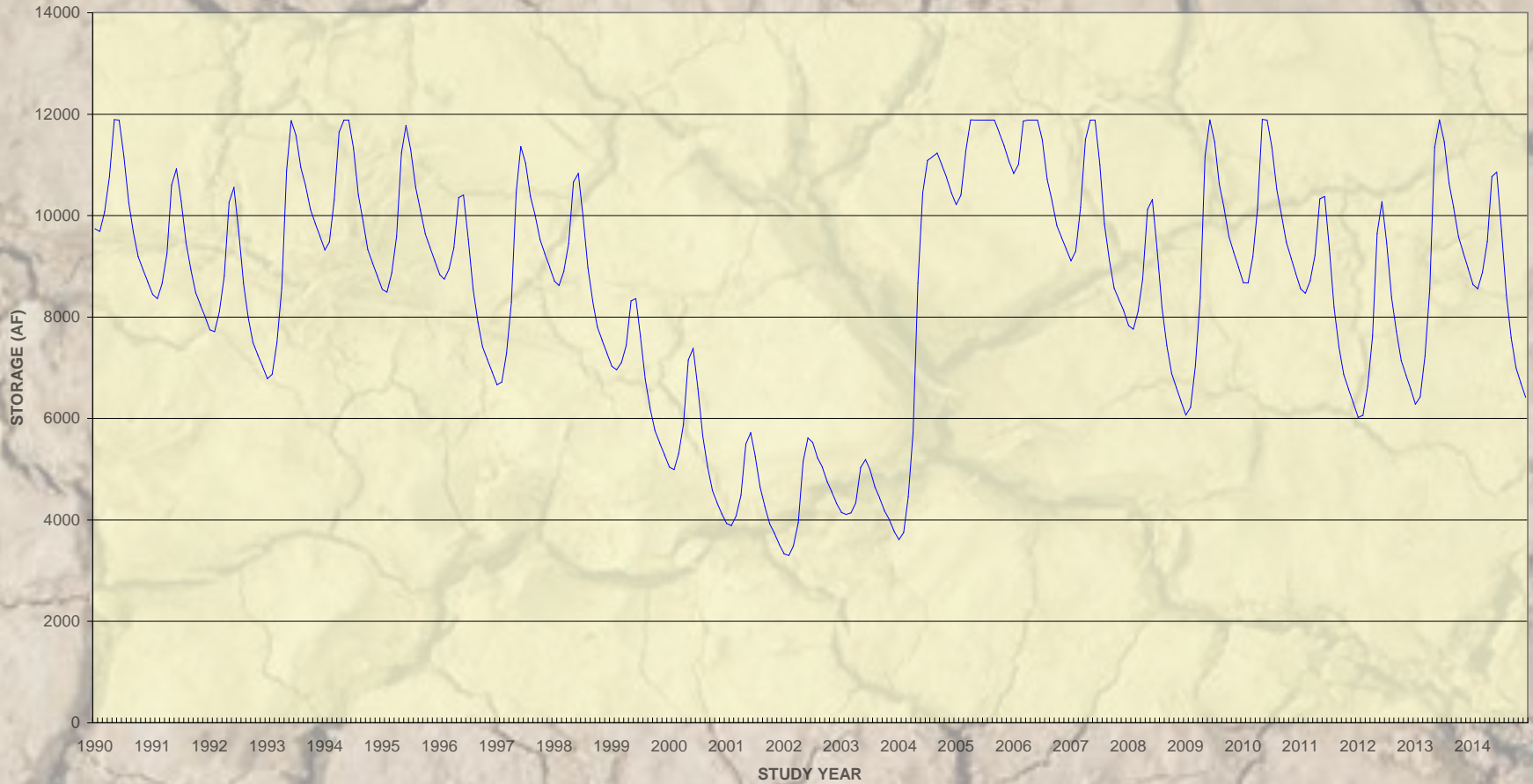
Baseline Results



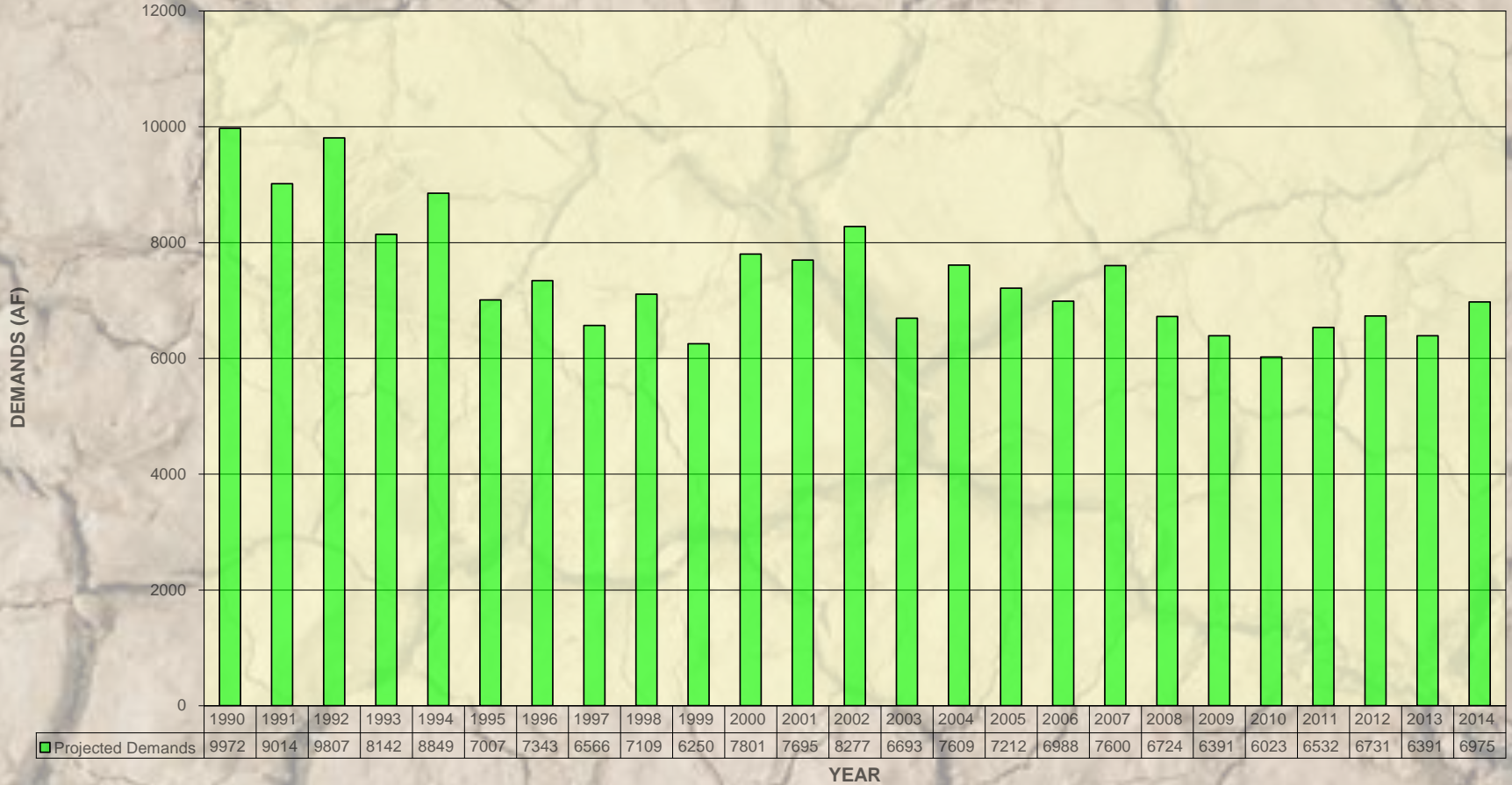
Required Rationing Factors

Year	Indoor	Outdoor
2000	1.00	0.75
2001	0.90	0.50
2002	0.90	0.25
2003	0.85	0.25
2004	0.85	0.00
2005	0.85	0.00
2006	0.85	0.90
2007	0.85	1.00

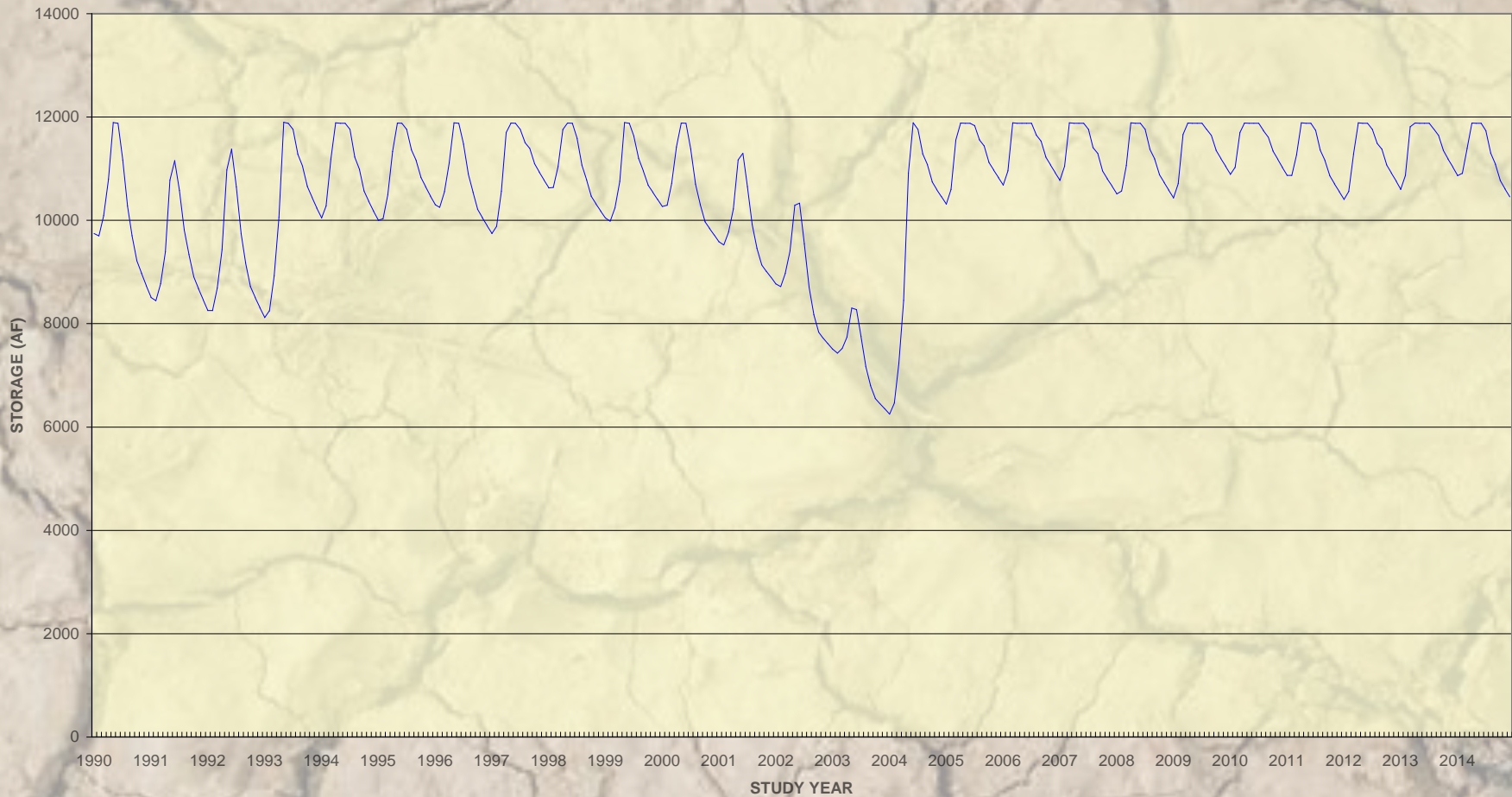
SYSTEM STORAGE With Rationing



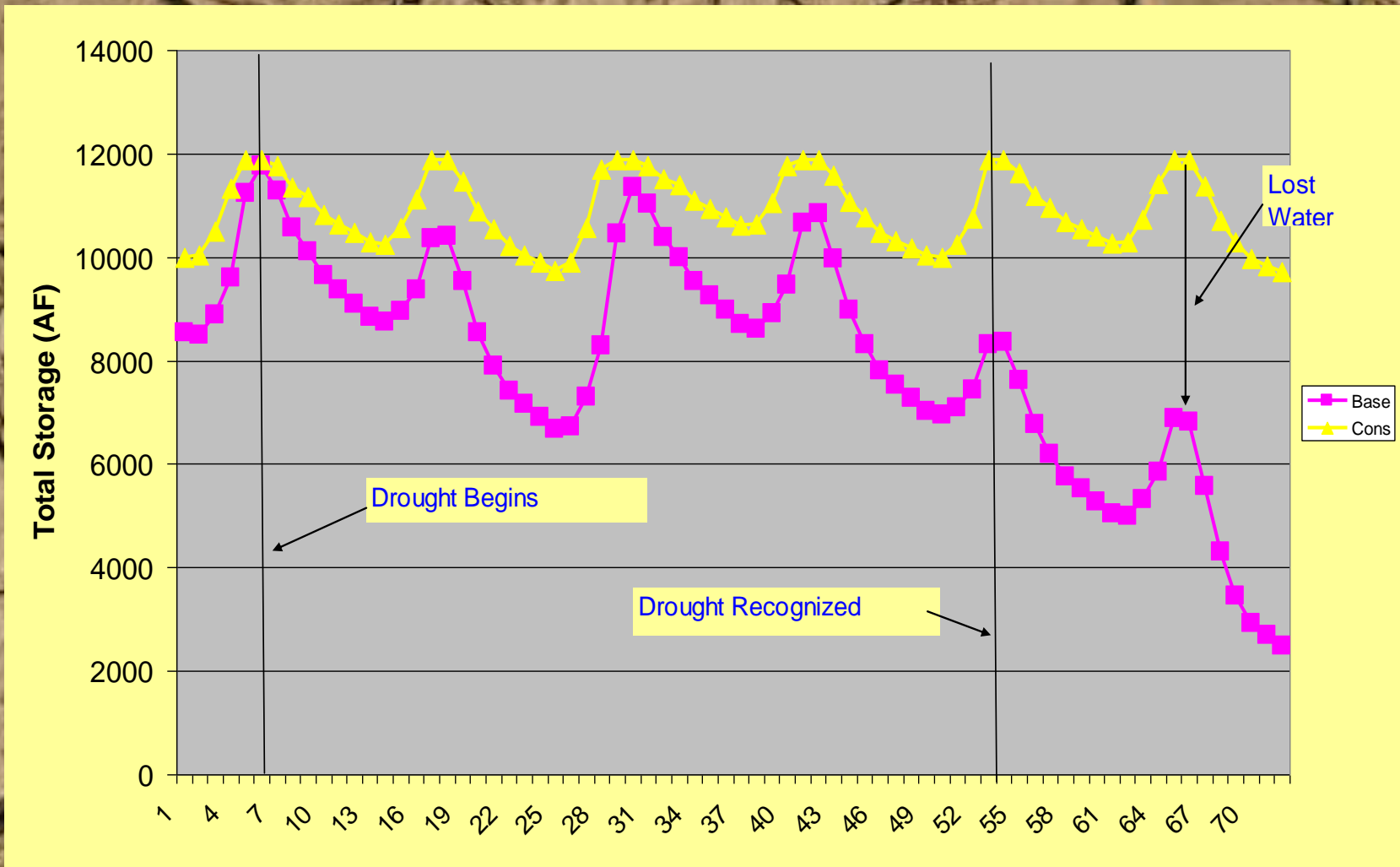
ANUAL WATER DEMANDS
With Conservation



SYSTEM STORAGE With Conservation



Lost Water



Conclusions:

- **Planning can reduce risks of drought damage.**
- **Important to understand the severity and extent of the design drought**
- **Conservation provides years of savings to system before it can be recognized.**
- **It can take 1 to 2 years for restrictions to make significant changes to demands.**
- **Best course is to start conservation efforts early, and provide a drought reserve.**