This presentation premiered at WaterSmart Innovations

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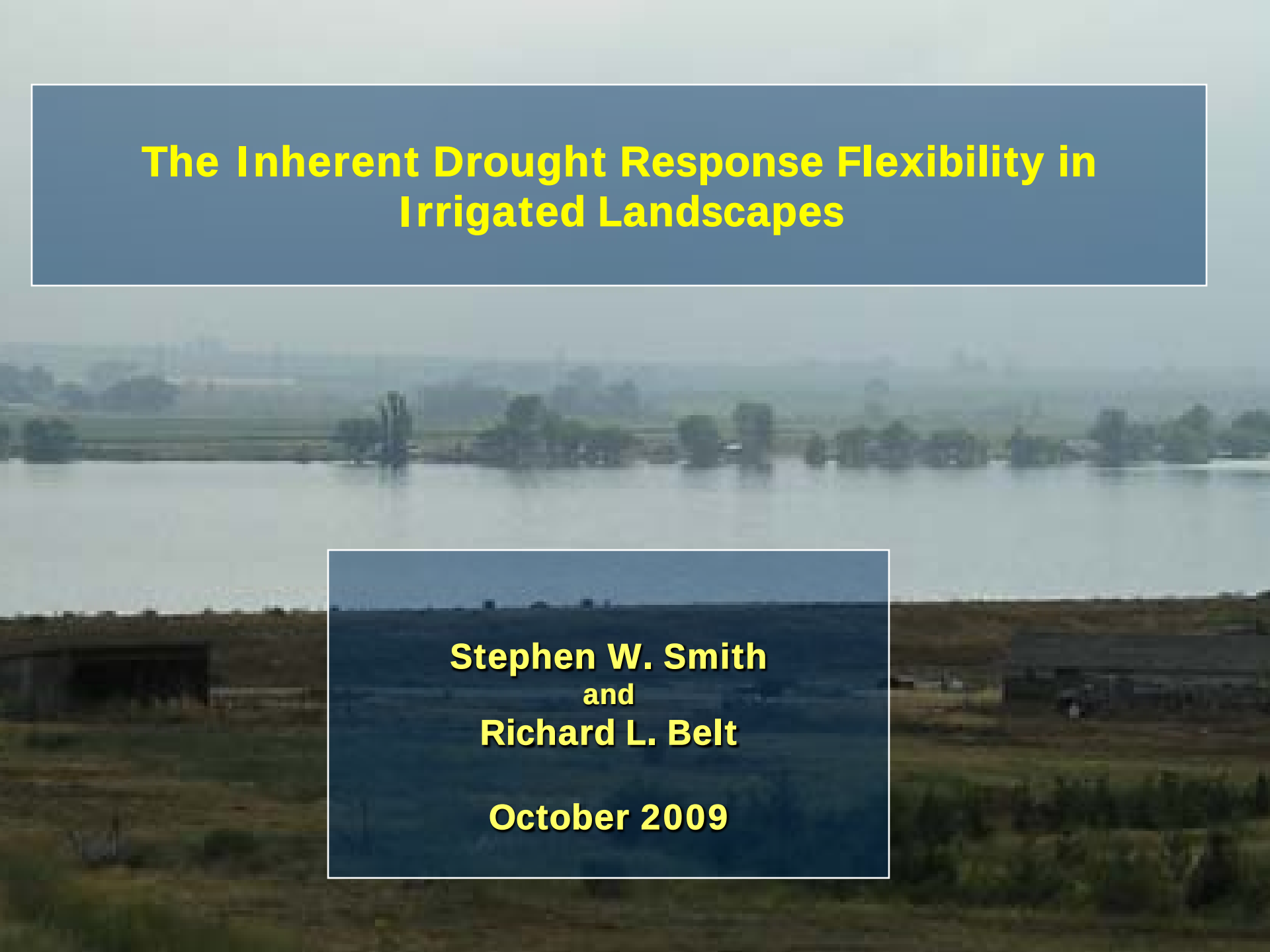
The Inherent Drought Response Flexibility in Irrigated Landscapes



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and
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October 2009

Presentation / discussion:

- Drought and planning for drought.
- Landscapes and landscape irrigation systems.
- Water and the flexibility available in the landscape.
- Discussion / questions.

The premise is ...

landscapes can provide highly desirable flexibility in dealing with drought, or other water shortage, and the magnitude of the response can be directly related to the magnitude of the event.

Characterization of the nationwide, ever changing circumstance …

nationalatlas.gov™
Where We Are

PRECIPITATION

Precipitation varies widely across the United States, from a low of 2.3 inches per year in California's Death Valley to a high of 460 inches on Hawaii's Mount Waialeale. Nevada ranks as the driest state, with an average annual precipitation of 9.5 inches, and Hawaii is the wettest, at 70.3 inches.

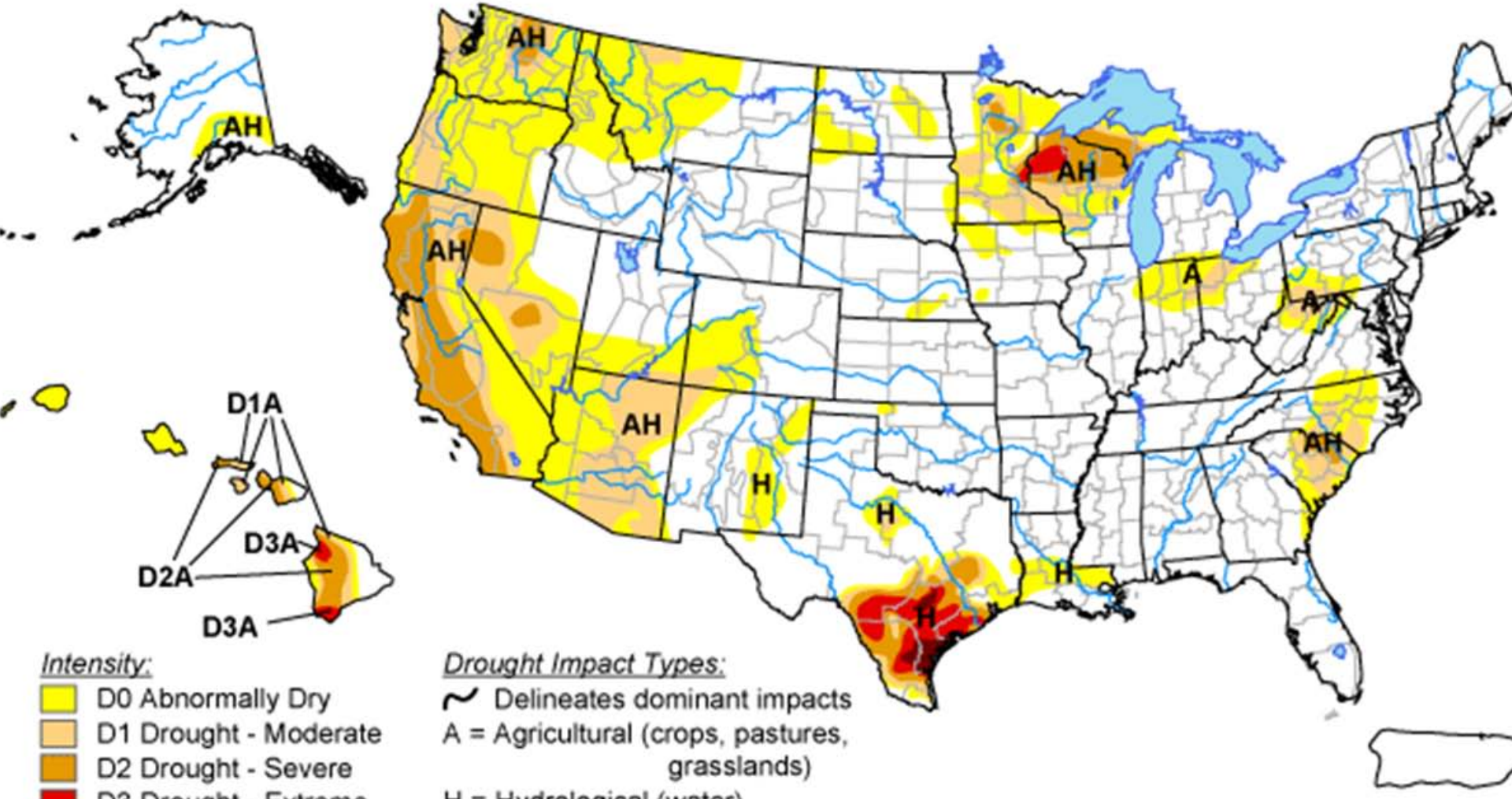
Average Annual Precipitation (in inches)
1961–1990

180.1–200	35.1–40
140.1–180	30.1–35
120.1–140	25.1–30
100.1–120	20.1–25
80.1–100	15.1–20
70.1–80	10.1–15
60.1–70	5.1–10
50.1–60	5 and less
40.1–50	

U.S. Department of the Interior
U.S. Geological Survey

U.S. Drought Monitor

September 29, 2009
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

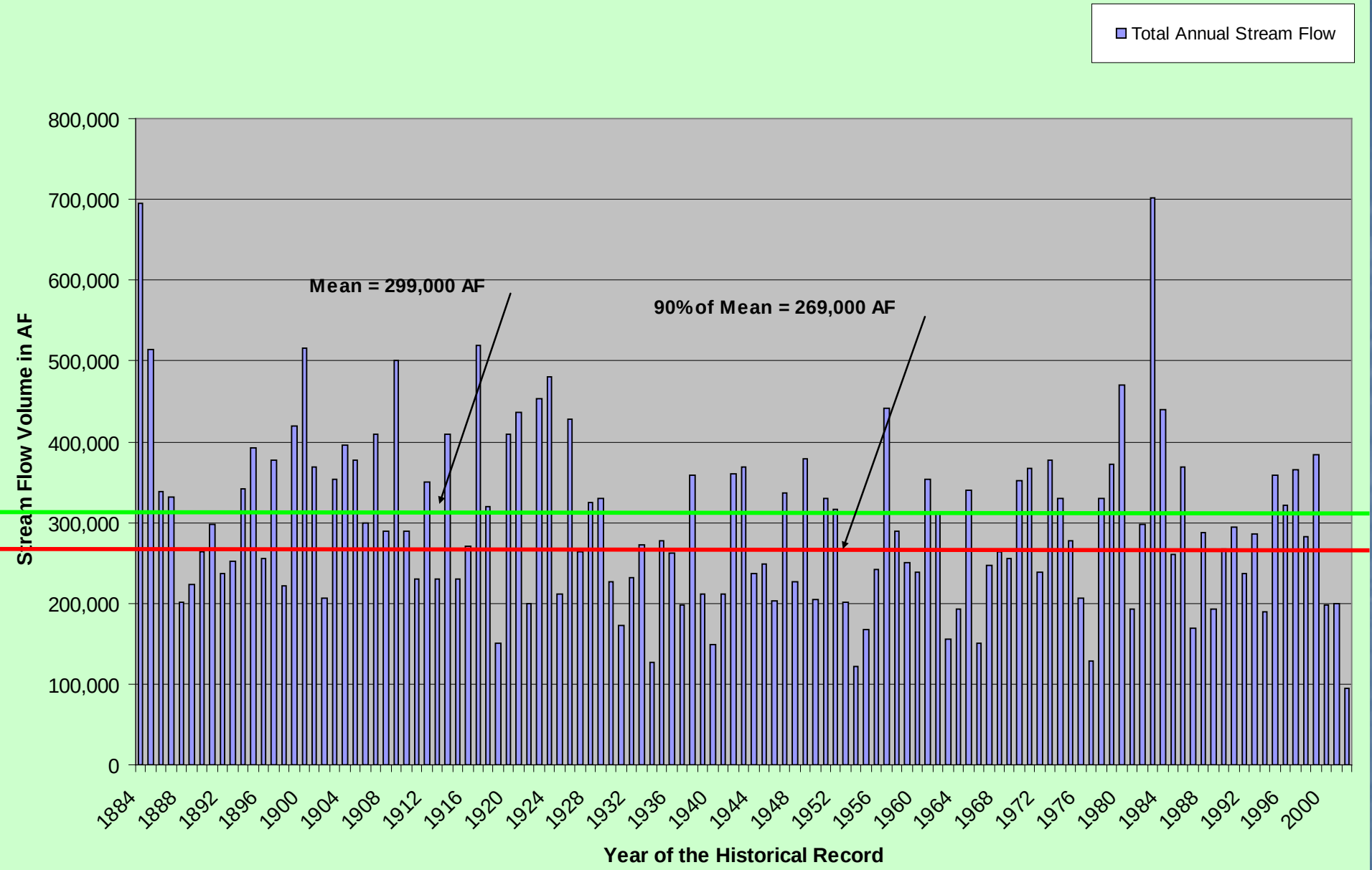
- ~ Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

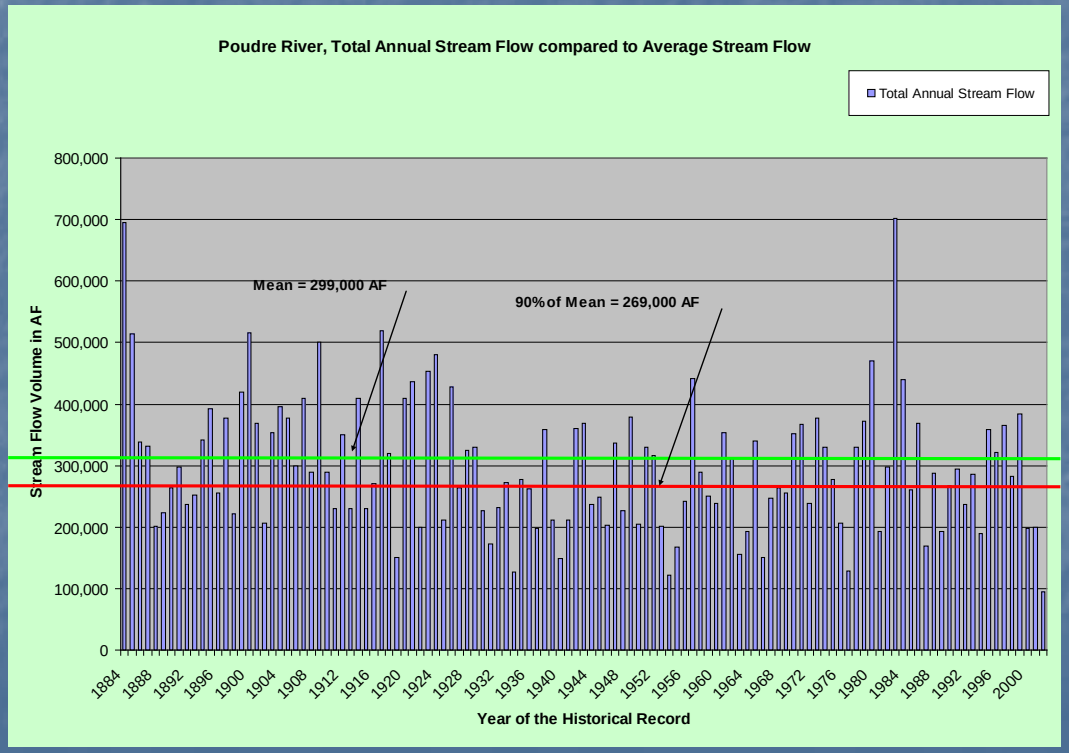
USDA National Drought Mitigation Center

Released Thursday, October 1, 2009

What constitutes a drought event? ...


Total Annual Stream Flow
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
Stream Flow Volume in AF
Mean = 299,000 AF
90% of Mean = 269,000 AF
1884
1888
1892
1896
1900
1904
1908
1912
1916
1920
1924
1928
1932
1936
1940
1944
1948
1952
1956
1960
1964
1968
1972
1976
1980
1984
1988
1992
1996
2000
Year of the Historical Record

Water storage projects store excess water in normal and wet years in order to release and deliver that water in dry years ....

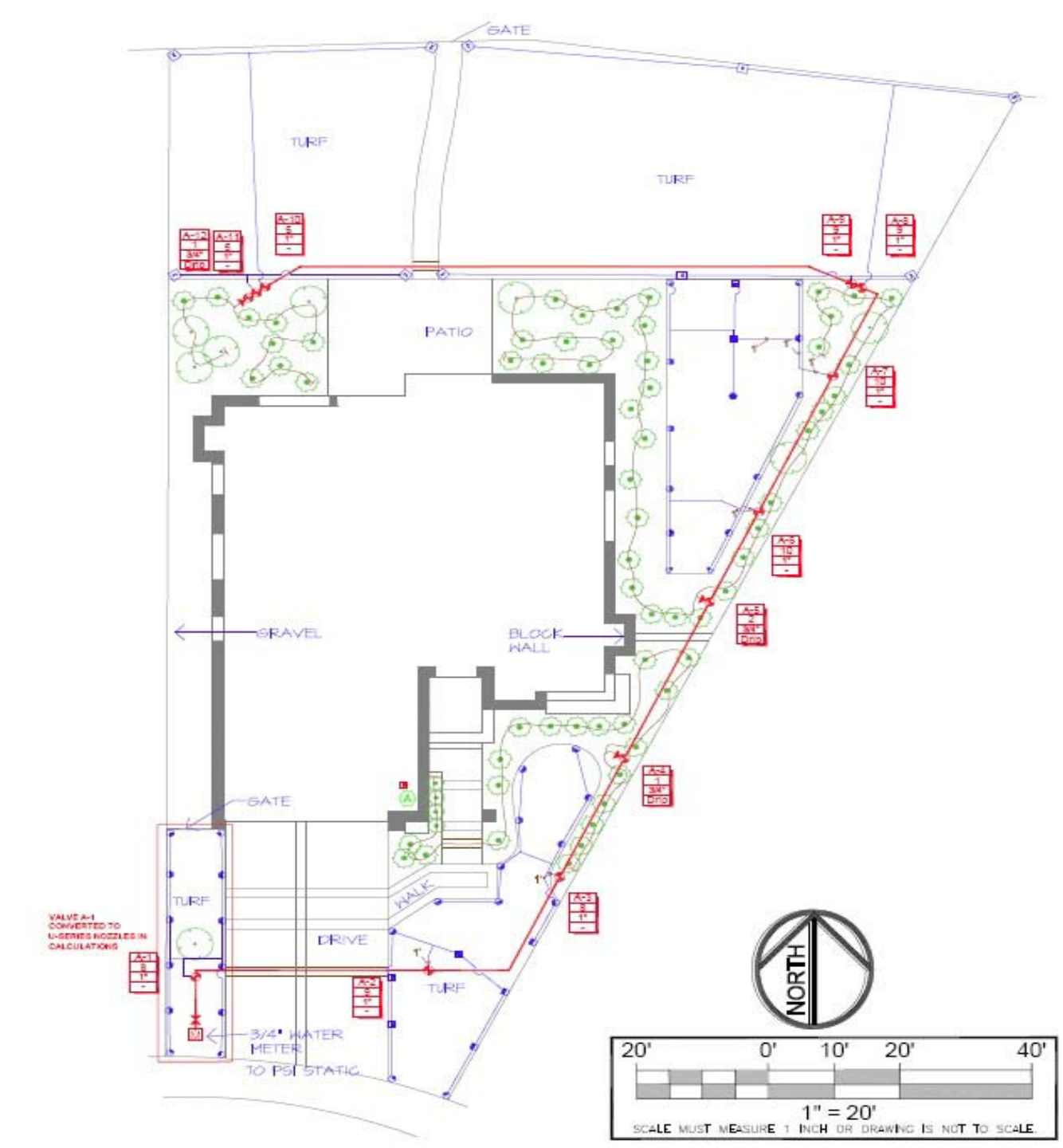


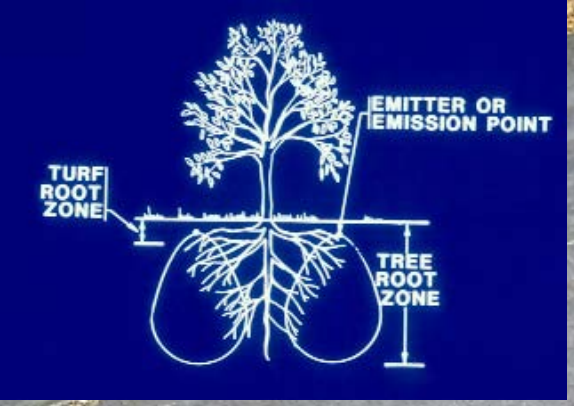
Municipalities and water districts evaluate water supplies on the basis of “safe yield” … safe yield is the amount of water that can likely be delivered considering analysis of a suitable hydrologic period – generally 50 years.

The answer to the safe yield question includes potable water for landscape irrigation.

Characterization of flexible and adaptable landscapes ...


drip irrigated
trees in
unirrigated
dryland grass
sprinkler irrigated
turf grass
drip irrigated
shrub bed


GATE
TURF
TURF
PATIO
GRAVEL
BLOCK WALL
GATE
TURF
WALK
DRIVE
TURF
VALVE A-1 CONVERTED TO U-SERIES NOZZLES IN CALCULATIONS
3/4" WATER METER
TO PSI STATIC
NORTH
20' 0' 10' 20' 40'
1" = 20'
SCALE MUST MEASURE 1 INCH OR DRAWING IS NOT TO SCALE.



10/7/2009


sprinkler irrigated cool season grass
drip irrigated wind break
supplementally irrigated native grasses
sprinkler and drip irrigated home garden
unirrigated native grasses

Characterization of flexible and adaptable irrigation systems ...

Emphasis on “systems” ...

Considerations are logically:

- Combination of efficient methods.
- Suitable control scheme.
- Management / scheduling scheme.
- Plan for shortage – drought response plan.


RAIN MASTER
EAGLE

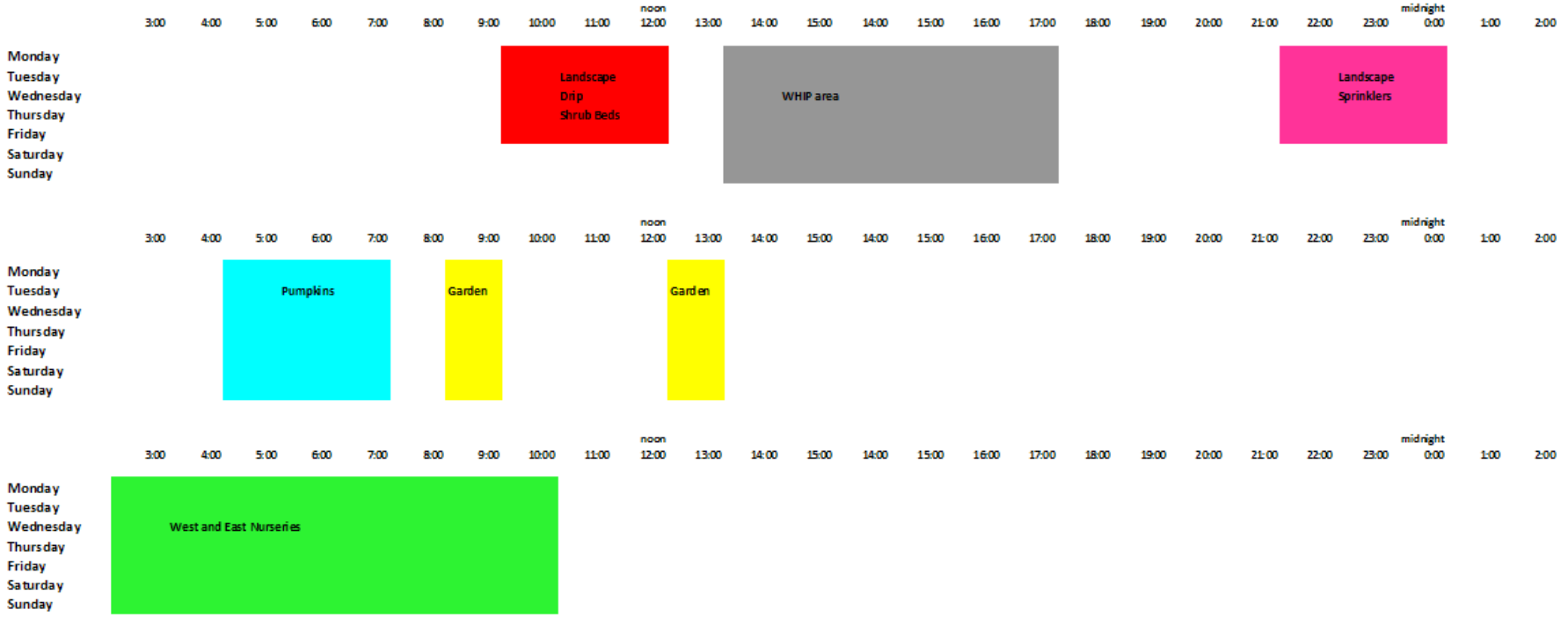

ESP-LX MODULAR


Real Time Flow Monitoring
Hunter
ICD-100

DAY OR DATE	*IRRIGATION DEPTH (inches) (+)*	*EFFECTIVE RAINFALL (inches) (+)*	*ET (inches) (-)*	*DEEP PERCOLATION (inches) (-)*	*WATER CONTENT AT THE BEGINNING OF THE TIME PERIOD (inches)*	*WATER CONTENT AT THE END OF THE TIME PERIOD (inches)*	
1.	--	--	0.25	--	3.00	2.75	<----
2.	--	--	0.28	--	2.75	2.47	
3.	--	0.10	0.20	--	2.47	2.37	<----
4.	--	--	0.32	--	2.37	2.05	
5.	0.75	--	0.32	--	2.05	2.48	
6.	--	3.55	0.08	2.50	2.48	3.00 (3.45)	<----
7.	--	--	0.31	--	3.00	2.69	
8.	--	--	0.40	--	2.69	2.29	
9.	--	--	0.35	--	2.29	1.94	
10.	0.50	--	0.35	--	1.94	2.09	

RE: Buena Vida Farm

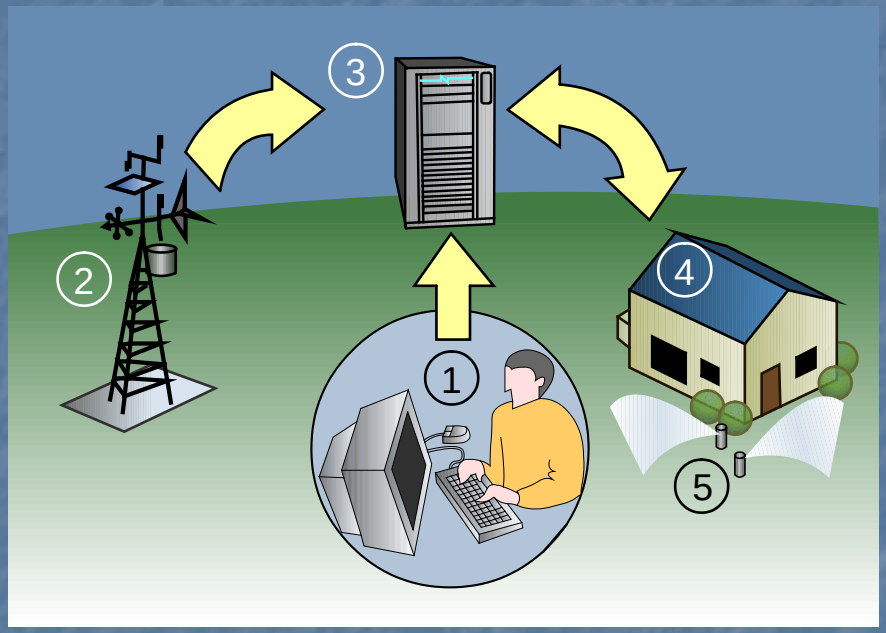
Program Time Blocks at Peak Season



PROGRAM NAMES:

PROG A	LS SPRINKLERS	Start:	10 PM
PROG B	LS DRIP	Start:	10 AM
PROG C	PUMPKINS	Start:	5 AM
PROG D	GARDEN	Start:	9 AM and 1 PM
PROG E	NURSERY	Start:	3 AM
PROG F	WHIP area	Start:	2 PM

Self adjusting climate based control -- how it works ...



1. Homeowner enters landscape profile online.
2. Local weather station measures ET and rainfall.
3. The server system develops customized watering schedule.
4. Controller calls daily to retrieve updated schedule.
5. Controller executes watering schedule.

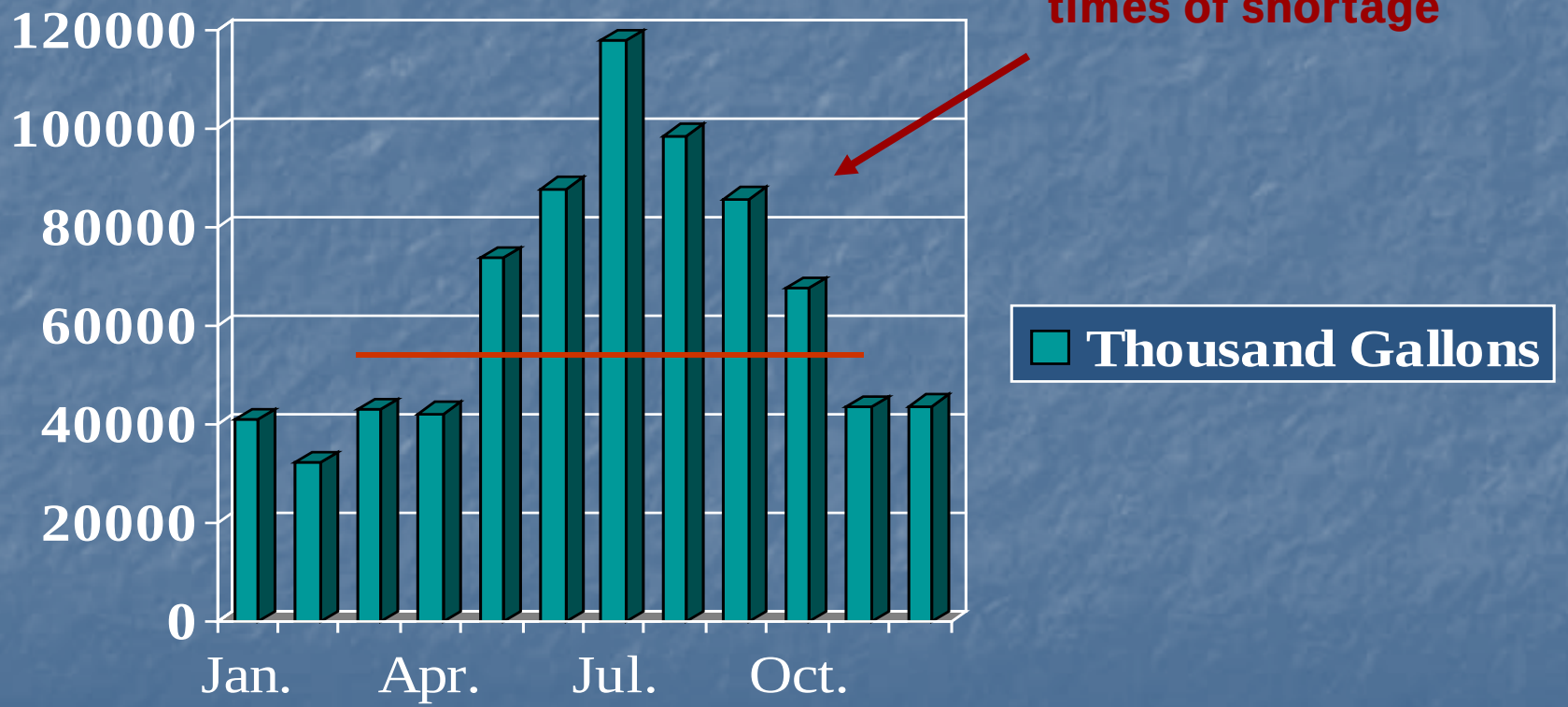
Drought Triggers and Response by Threshold

Storage at July 1st	Drought Stage	Water Savings Target	Restriction	Probable Restriction	Notes / Staff Action
100%	0	Unrestricted, normal use	No restriction	none	Customer mailings advise of policy matters and service area happenings.
90%	1	5% reduction from normal use	Voluntary restrictions	Customers asked to conserve.	Drought education mailings are initiated. Staff contacts blatant policy violators.
80%	2	10% reduction from normal use	Voluntary restrictions	Customers asked to carefully monitor irrigation and avoid waste.	Educational mailings concerning irrigation scheduling and sprinkler application rates.
70%	3	20% reduction from normal use	Mandatory restrictions	Residential customers limited to 3 days per week by house number. Parks irrigation decreased on low public use areas. Golf course roughs are not irrigated.	Additional staff assigned to monitor and contact violators.
60%	4	30% reduction from normal use	Mandatory restrictions	Residential irrigation limited to 2 days per week by house number. Parks irrigation limited to high use areas and sports fields. Golf course fairways are deficit irrigated.	Fines imposed for water wastage or irrigation outside of imposed restrictions.

Technology at its finest available ….

So let’s use it!

The benefits ...


Trimmed seasonal irrigation demands in times of shortage
120000
100000
80000
60000
40000
20000
0
Jan.
Apr.
Jul.
Oct.
Thousand Gallons

Summary:

- Landscapes offer water supply flexibility that we don't fully appreciate.
- The opportunity varies around the U.S. – many circumstances – generally there is no one size fits all circumstance.
- Let's assume we want, need, and appreciate our irrigated landscapes.
- Let's assume that we need to ensure sound design, construction, and management for the irrigation systems.
- Let's assume we desire maximum beneficial use of our water supply.

Questions / discussion ….