

A Simple and Reliable Index
for Characterizing and Ending **Drought Severity**
in the Big Cypress Swamp and Everglades



Bob Sobczak, Hydrologist
Big Cypress National Preserve

Signs of drought?



Marl chips are especially crunchy



Overwhelming sense of **vertigo**
along Tamiami Canal



Unable to **reasonably** paddle
down Turner River

Ultimate Litmus Test:



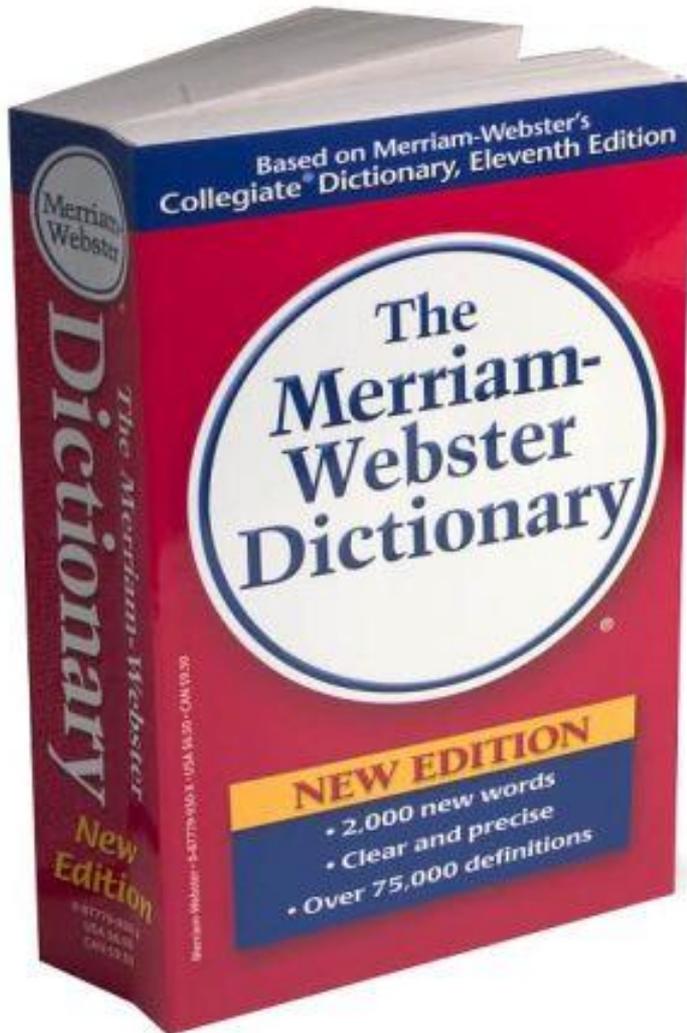
Walk through Sweetwater Culverts

My point:

“We know drought
when we see it ...”

But how do we **define** it?

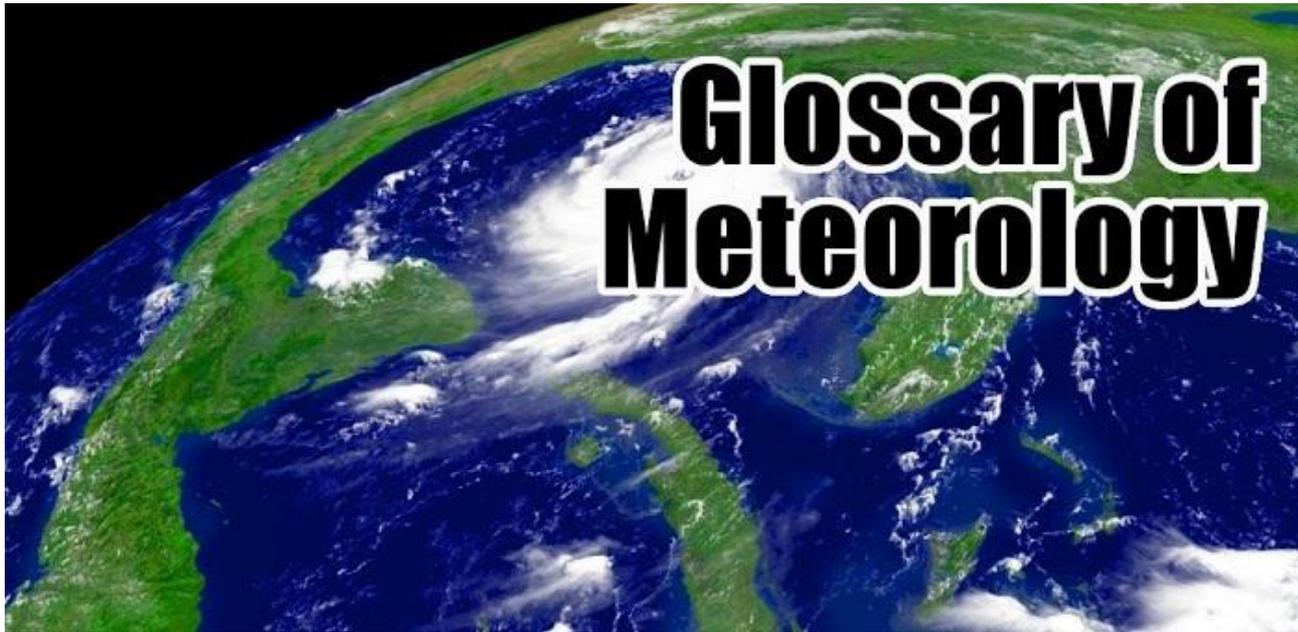
Start with Webster's Dictionary



1. A long period with little or no rain.
2. A shortage or dearth

Glossary of Meteorology

(Second Edition, Page 238)



“Drought is a period of abnormally dry weather sufficiently long enough to cause a **serious** hydrological imbalance.”

Dr@*!&!ght is not
Inherently a dirty word ...



- South Florida has a **seasonal** drought each winter
- **Native** flora and fauna require seasonal drought
 - Wading birds forage on recession
 - Exotic fish flourish in overly wet areas

But self-inflicted drought is vulgar.

- Over drainage, i.e. canals and levees
- Global climate change, i.e. drier winters

What Do the **experts** Say?



“Drought is a deficiency of moisture that results in **adverse impacts** on people, animals, or vegetation over a sizeable area.

NOAA together with its partners provides short- and long-term Drought Assessments.”

NOAA: National Weather Service’s On-line Glossary

National Drought Monitor

Drought Monitor

Forecasts

What's New

Current Conditions

About Us

Archive

Contact Us

Links

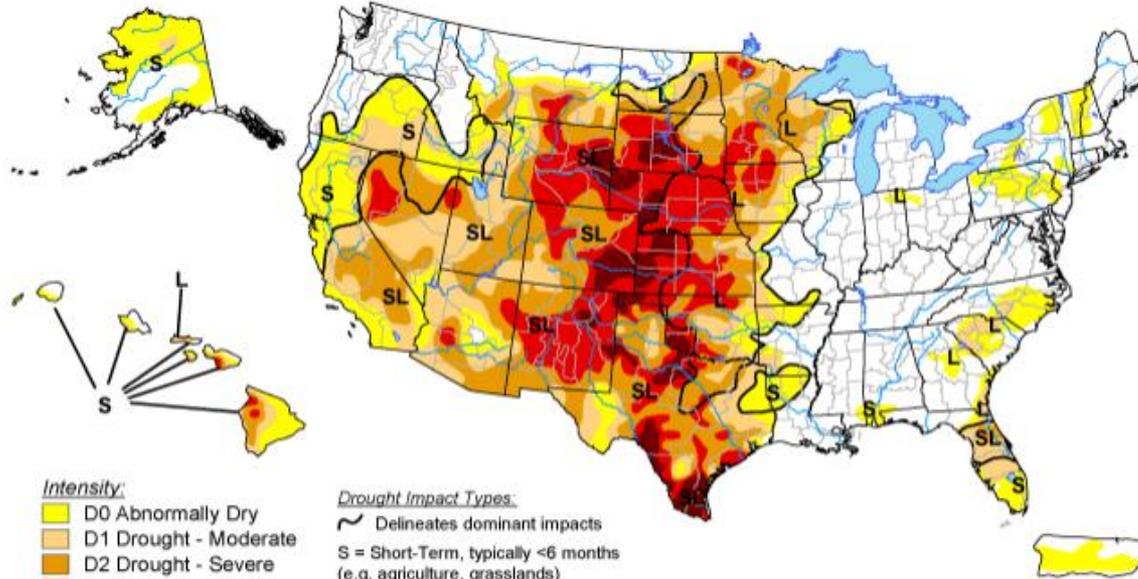
Current U.S. Drought Monitor

The data cutoff for Drought Monitor maps is Tuesday at 7 a.m. Eastern Standard Time. The maps, which are based on analysis of the data, are released each Thursday at 8:30 a.m. Eastern Time.

NOTE: To view regional drought conditions, click on map below. State maps can be accessed from regional maps.

U.S. Drought Monitor

April 9, 2013
Valid 7 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
- S = Short-Term, typically <6 months (e.g. agriculture, grasslands)
- L = Long-Term, typically >6 months (e.g. hydrology, ecology)

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

<http://droughtmonitor.unl.edu/>



Released Thursday, April 11, 2013
Author: David Miskus, NOAA/NWS/NCEP/CPC

Drought Categories

Drought Severity	Return Period (years)	Description of Possible Impacts	Drought Monitoring Indices		
			Standardized Precipitation Index (SPI)	NDMC* Drought Category	Palmer Drought Index
Minor Drought	3 to 4	Going into drought; short-term dryness slowing growth of crops or pastures; fire risk above average. Coming out of drought; some lingering water deficits; pastures or crops not fully recovered.	-0.5 to -0.7	D0	-1.0 to -1.9
Moderate Drought	5 to 9	Some damage to crops or pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested.	-0.8 to -1.2	D1	-2.0 to -2.9
Severe Drought	10 to 17	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed.	-1.3 to -1.5	D2	-3.0 to -3.9
Extreme Drought	18 to 43	Major crop and pasture losses; extreme fire danger; widespread water shortages or restrictions.	-1.6 to -1.9	D3	-4.0 to -4.9
Exceptional Drought	44+	Exceptional and widespread crop and pasture losses; exceptional fire risk; shortages of water in reservoirs, streams, and wells creating water emergencies.	less than -2	D4	-5.0 or less

*NDMC - National Drought Mitigation Center

D0 to D4

U.S. Drought Monitor

Southeast

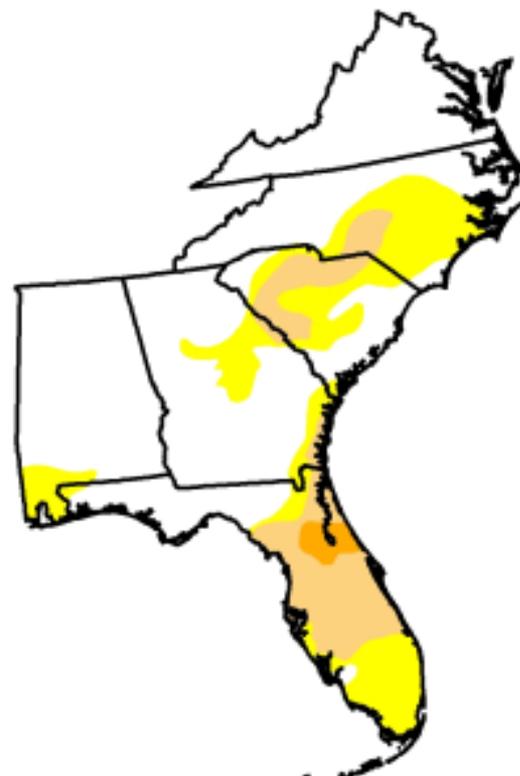
April 9, 2013

Valid 7 a.m. EST

Drought Conditions (Percent Area)

	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	66.99	33.01	13.39	1.23	0.00	0.00
Last Week (04/02/2013 map)	63.62	36.38	19.16	1.23	0.00	0.00
3 Months Ago (01/08/2013 map)	28.57	71.43	44.97	20.40	9.51	2.10
Start of Calendar Year (01/01/2013 map)	29.15	70.85	45.65	20.64	9.58	2.10
Start of Water Year (09/25/2012 map)	66.49	33.51	17.18	11.50	8.53	3.52
One Year Ago (04/03/2012 map)	22.46	77.54	58.79	36.74	20.92	3.32

Intensity:



Tools to control drought are **limited**,

But we should be able to:



1. Short term – Assess severity of drought for management applications, i.e. fire
2. Long-term – Plan and implement hydrologic restoration to dampen incursions into deep drought

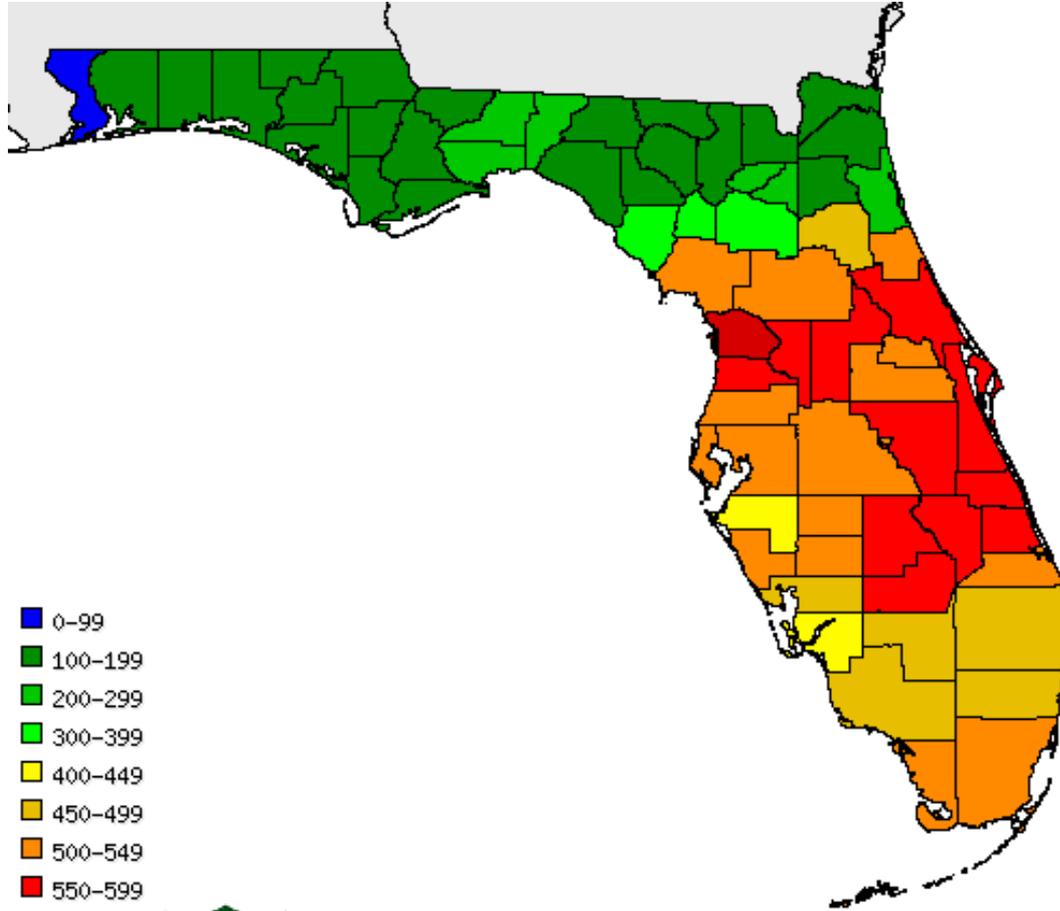
What's the **best** way
to track drought?

All sorts of Indices

- Drought Monitor Index (D0-4)
- Palmer Drought Index
- Standardized Precipitation Index
- NOAA Drought Severity Classification
- Fire metrics (100 hr, 1000 hr, etc)
- Keetch Byram Drought Index
- Bass pond behind Bubba's place

... The List goes on

Current KBDI Readings



- 0-99
- 100-199
- 200-299
- 300-399
- 400-449
- 450-499
- 500-549
- 550-599
- 600-649
- 650-699
- 700-749
- 750+



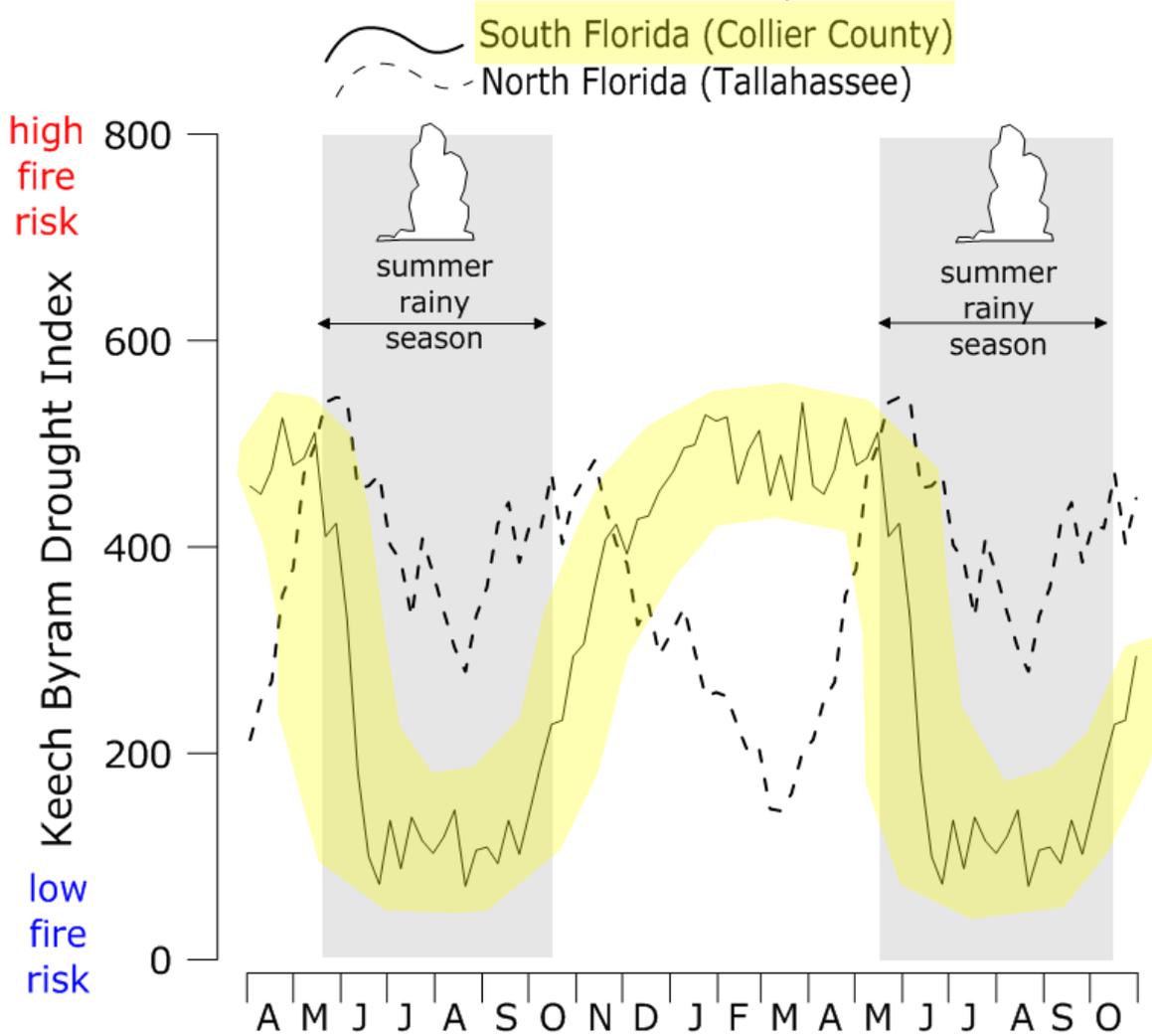
Apr 14 2013

Problems with KBDI:

- Varies across Florida
- Doesn't show trends
- Not 100 percent suitable for south Florida

Why?

Comparison of Median Keech Byram Drought Index for North and South Florida, 2000-2011



KBDI Comparison:
South Peninsula
vs. Panhandle

Note of Interest:

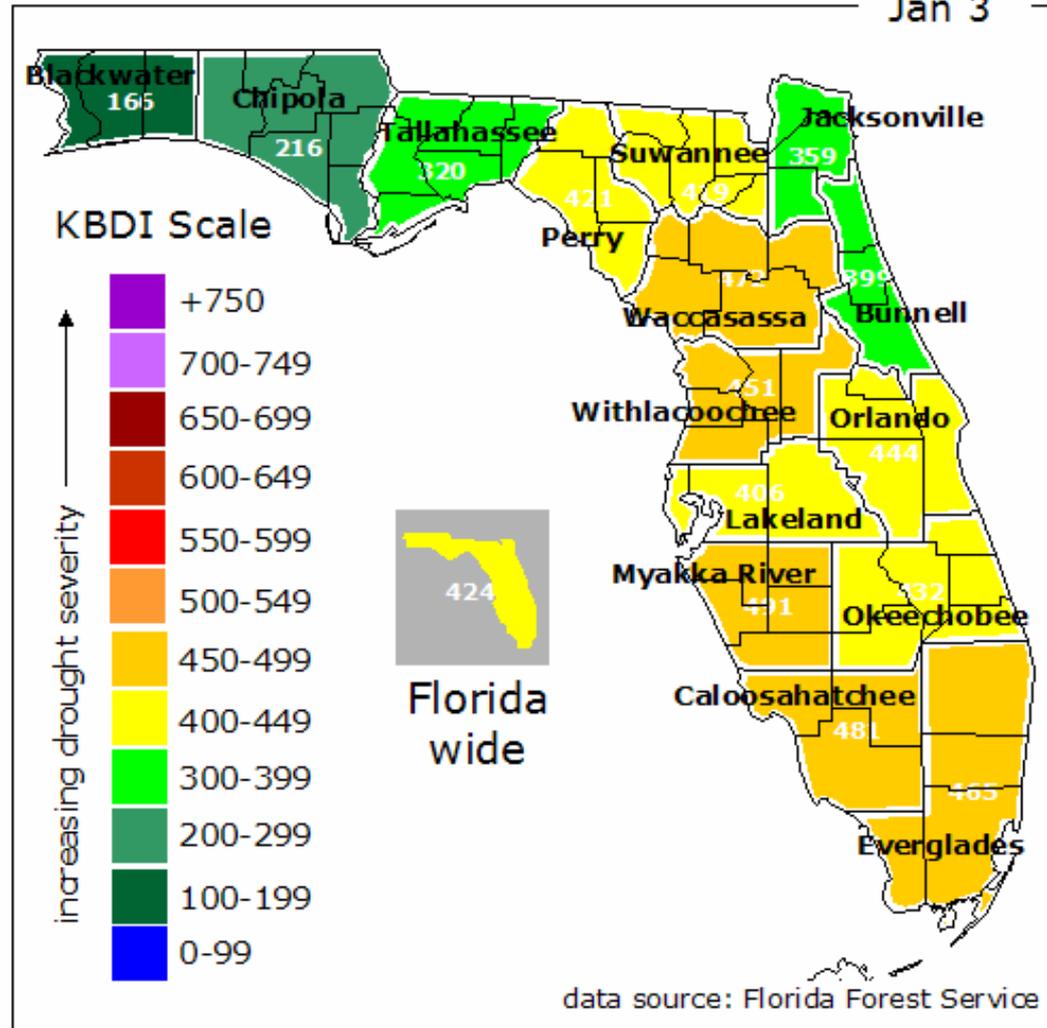
North Florida has a wetter winter than south Florida, but late spring drought severity actually surpasses south Florida.

Florida's Median Annual Atmospheric Drought Cycle

as based on Keetch Byram Drought Index (KBDI),
by Wildland Fire District, 2000-2011

Jan 3

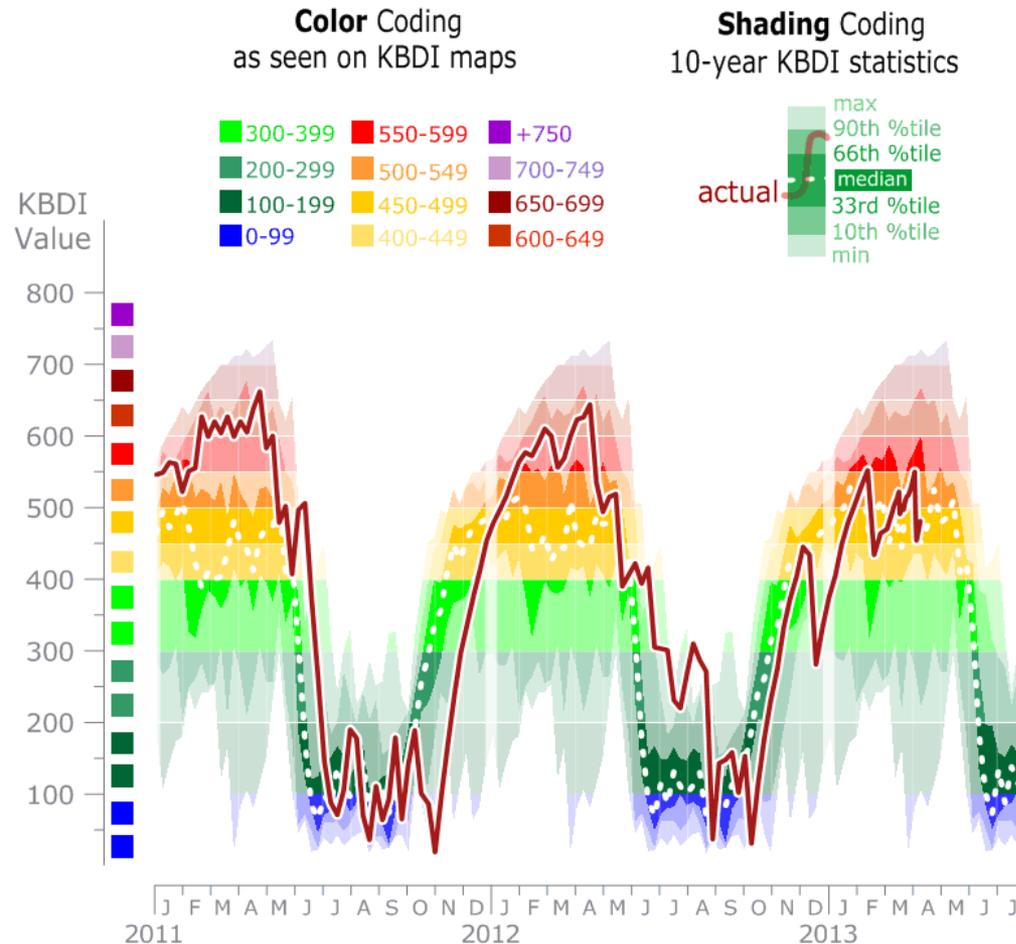
Florida's KBDI annual cycle 2000-2011



Collier County's KBDI statistics 2000-2012

KBDI Graph for Collier County

Statistical overview of Keech Byram Drought Index for Collier County, Florida. Data source: Florida Forest Service



Collier County's KBDI History 2000-2013

Collier County **KBDI** History

Historical look at the
Keetch Byram Drought Index
for Collier County, Florida
data source: Florida Forest Service



Current KBDI values as of 04/13/13

Regions	KBDI Value	Difference in KBDI from ...			Period of Record Calendar
		long term daily mean	one month ago	one year ago	
see overview map		4/13	3/13	4/13/2012	

KBDI Summary Table

Florida-wide

FLORIDA WIDE 390 ↑ 77 ⇒ 12 ↓ -150 [POB](#)

PANHANDLE

Blackwater	104	↓ -141	↗ 42	↓ -205	POB
Chipola	154	↓ -79	↑ 97	↓ -152	POB
Tallahassee	166	↘ -65	↑ 130	↓ -155	POB
Perry	203	↓ -88	↑ 79	↓ -241	POB
Suwannee	160	↓ -108	⇒ 25	↓ -273	POB

NORTH PENINSULA

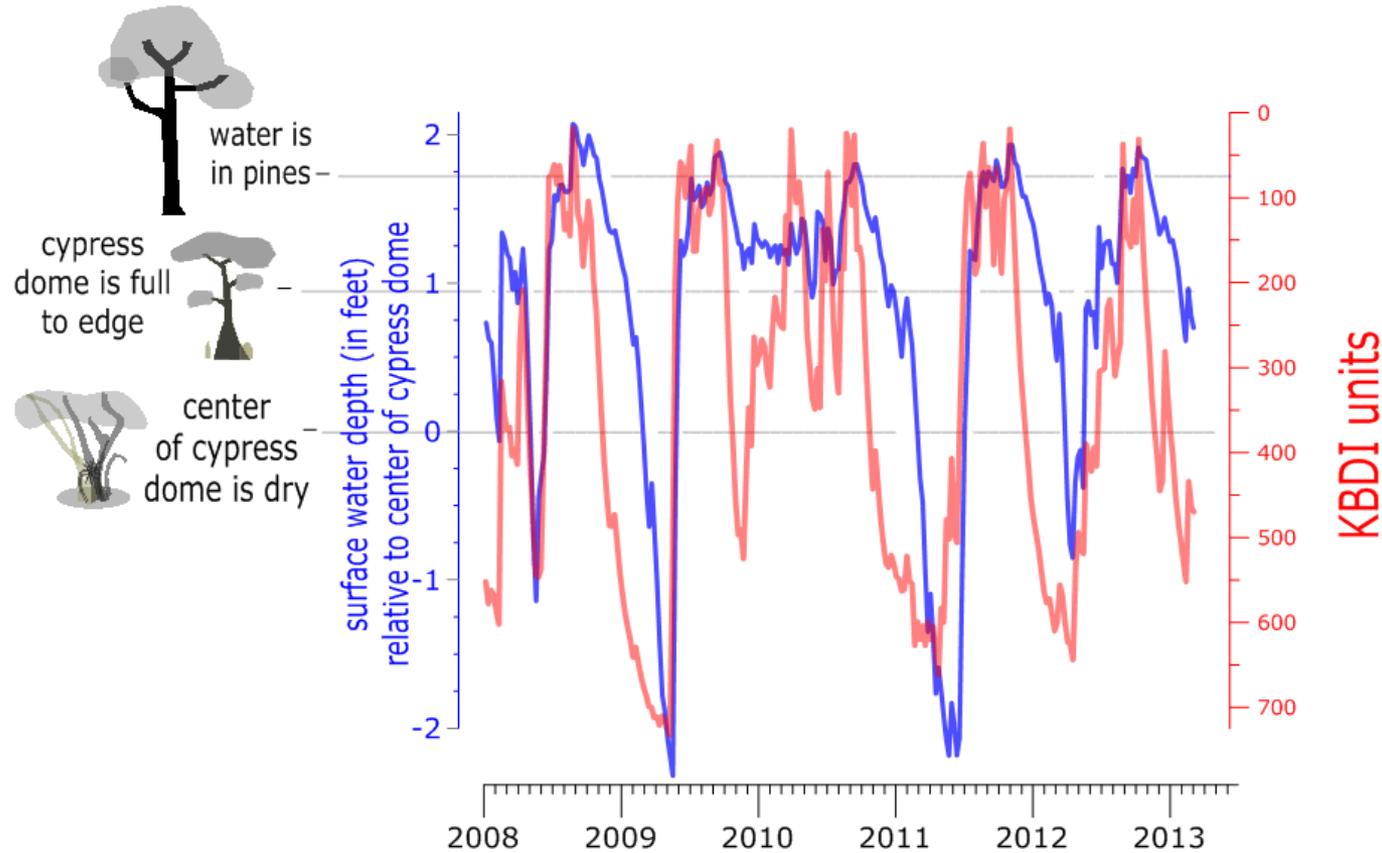
Jacksonville	168	↓ -115	↘ -45	↓ -368	POB
Waccasassa	479	↑ 183	↑ 67	↘ -65	POB
Bunnell	477	↑ 208	⇒ 25	↓ -100	POB
Withlacoochee	562	↑ 256	⇒ 14	↓ -71	POB
Orlando	557	↑ 234	⇒ -16	↓ -67	POB
Lakeland	517	↑ 100	↓ -75	↓ -132	POB

SOUTH PENINSULA

Myakka River	490	↑ 93	↓ -125	↓ -190	POB
Okeechobee	549	↑ 78	⇒ -11	↓ -91	POB
Caloosahatchee	471	↗ 37	↘ -42	↓ -177	POB
Everglades	512	↑ 96	⇒ -28	↓ -141	POB
Collier	486	↗ 35	⇒ -5	↓ -140	POB

From **Drought Tab**
in Go Hydrology!
website

But core problem **remains:**



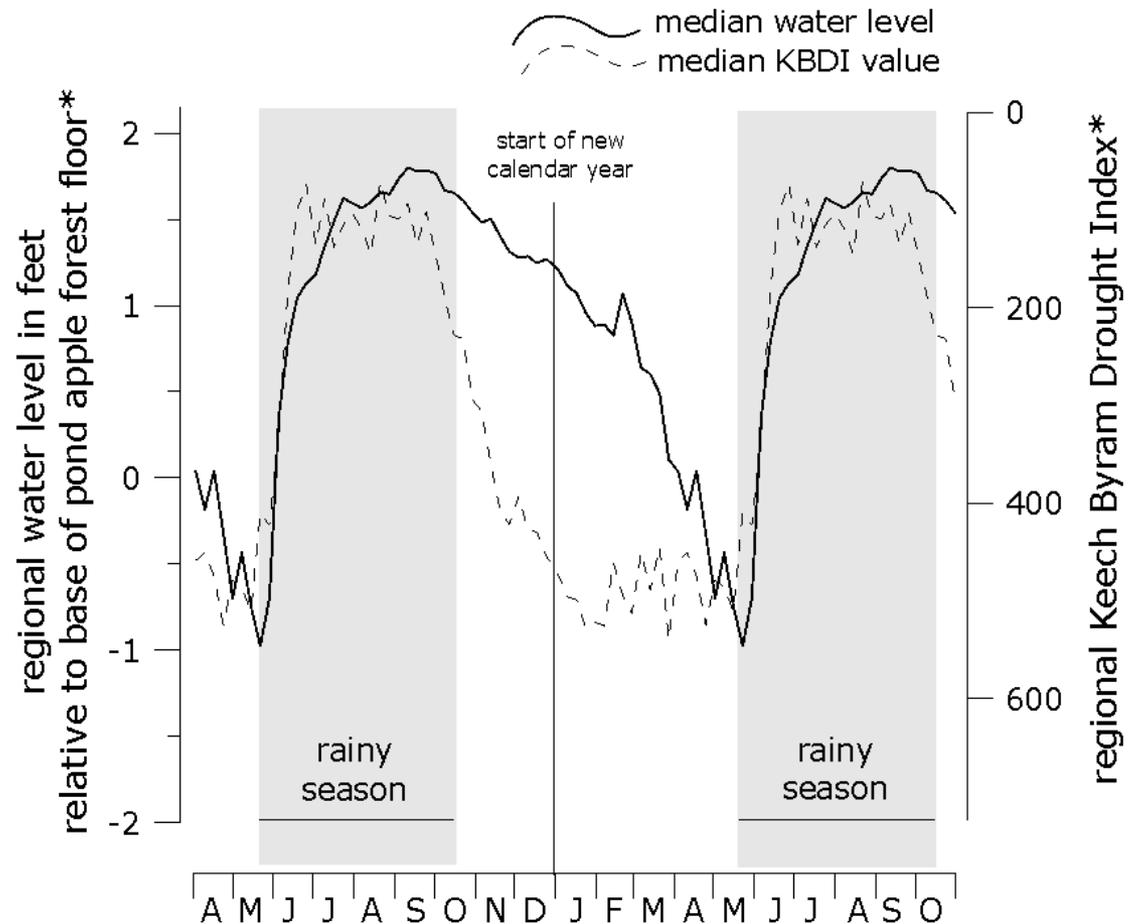
KBDI is an **imperfect** index
for landscape susceptibility to drought
in large wetland areas

Why is this?

-Predicts deep spring drydown
too early

-Thus, it gets the
fall, winter and
early spring
wrong

Comparison of median water levels and
Keech Byram Drought Index for Big Cypress
National Preserve, 2000-2011



*Upper and lower values for both vertical axes are drawn to match the historic range

Better word to replace drought?



Search
Committee
Rules

1. Don't scare public
2. Advertising friendly
3. Ecosystem relevant
4. Anything but drought

Short list of entries

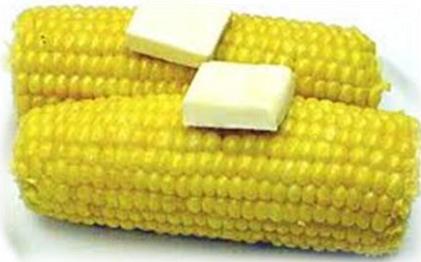


1. Apocolypse of aridity Index
2. "End of water cycle" cataclysm Index
3. Devestation of dryness Index
4. Popcorn Index



Very saturated
(crackers recommended)

Popcorn Index



Mostly moist



Supposed to be moist

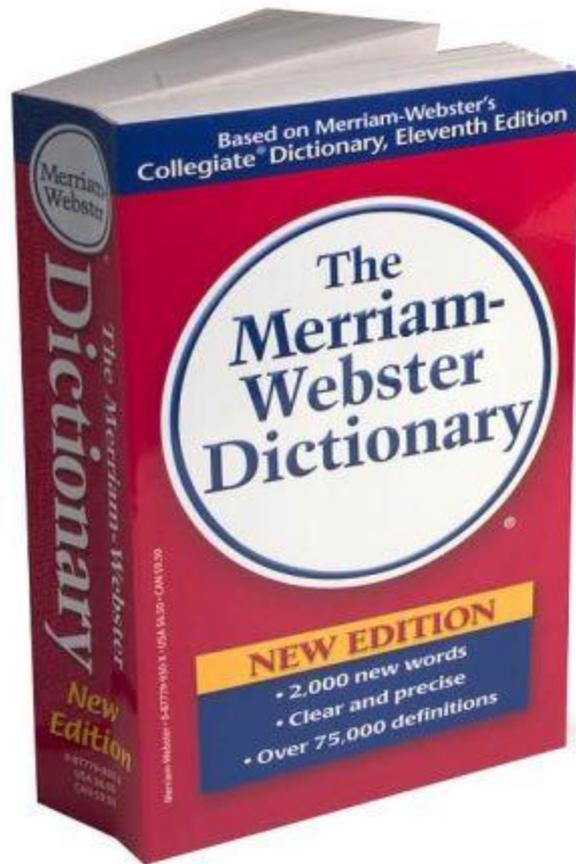
Mostly dry with small pool
of rapidly vanishing salsa



Extreme drought
(very large soda recommended)



Parchedness



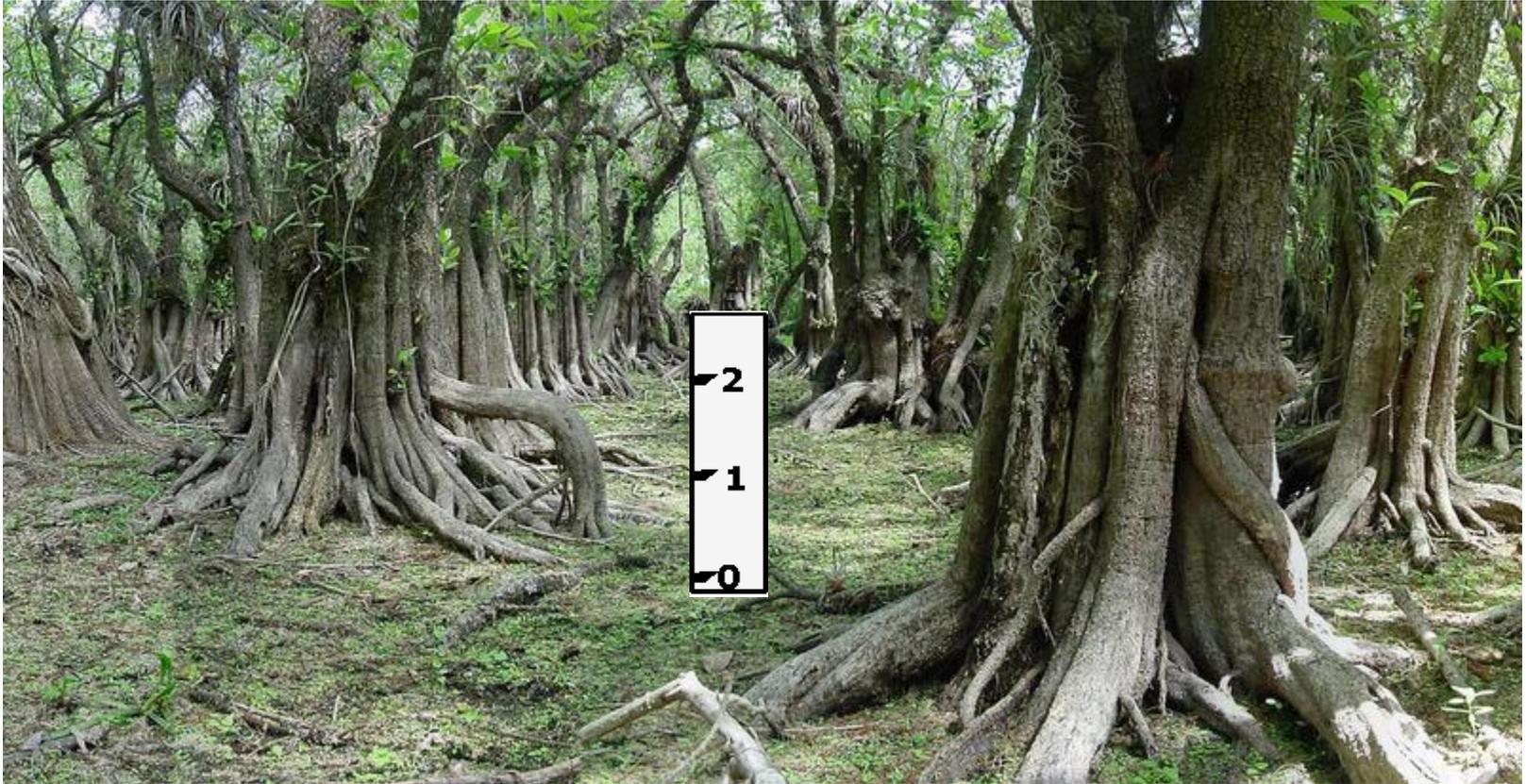
1. To make extremely dry, especially by heat.
2. To make thirsty.
3. To dry or to roast (corn, for example) by exposing to heat.
4. Index for explaining drought severity in large wetland environments.

Best place to predict
Parchedness in the swamp?



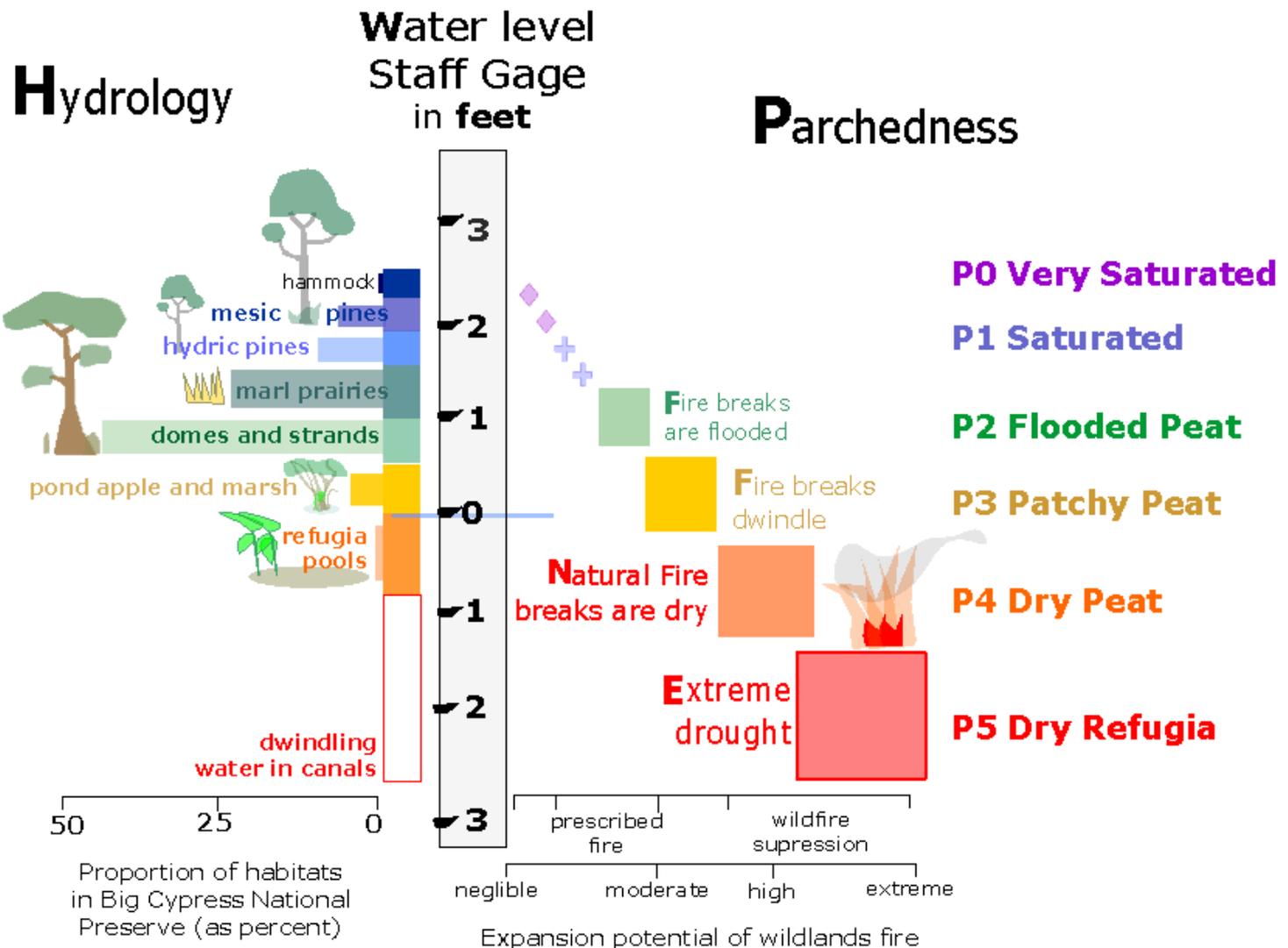
Answer: pond apple forest

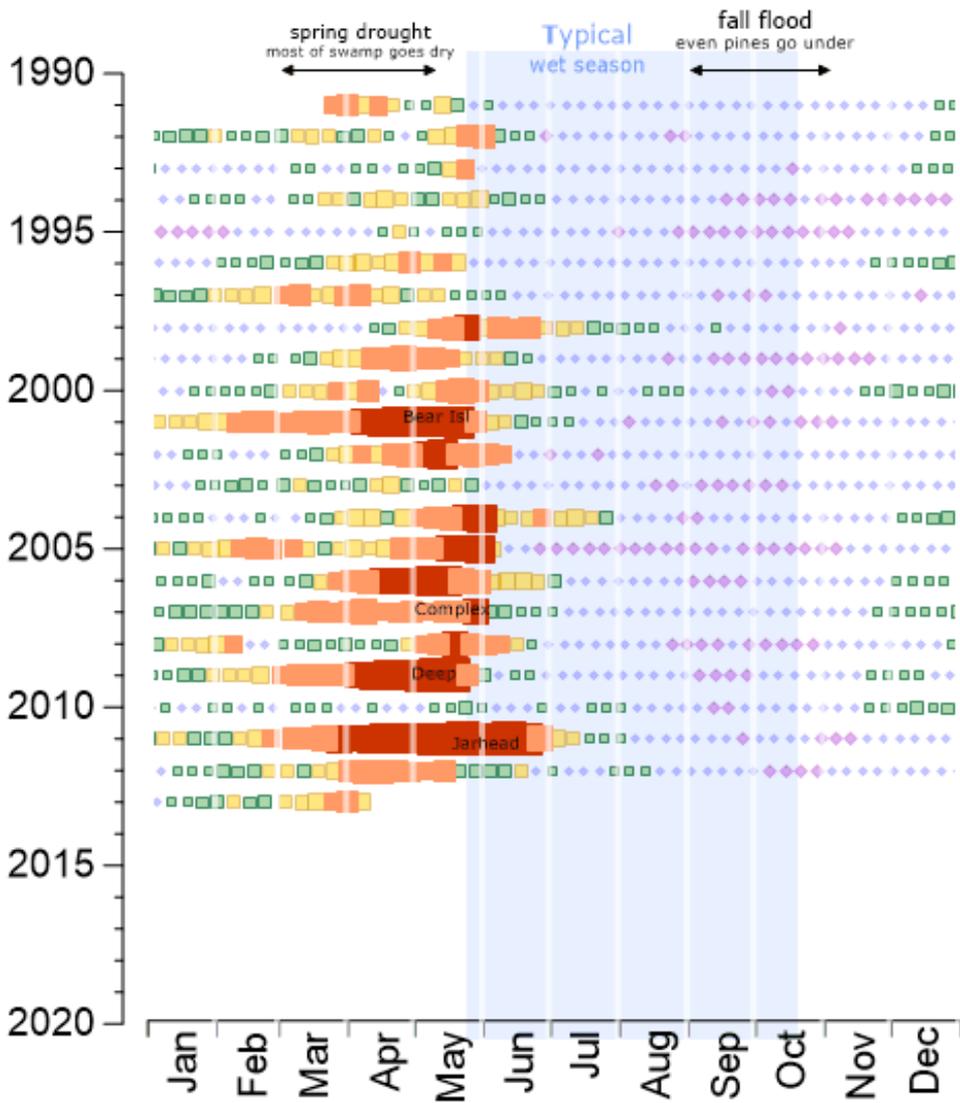
Best place to predict
Parchedness in the swamp?



Answer: pond apple forest

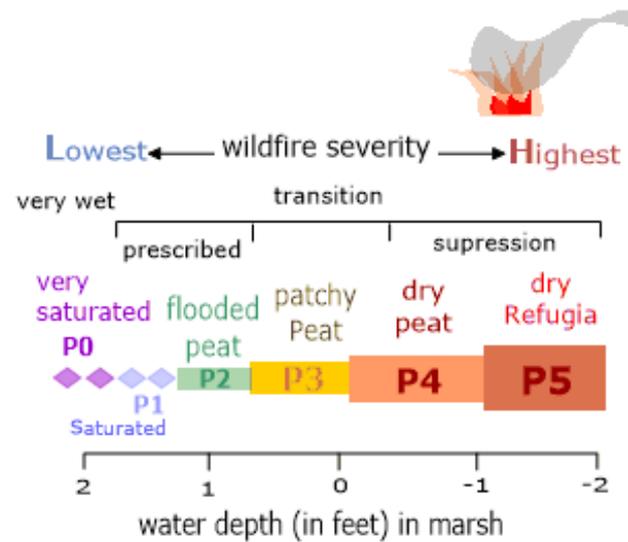
Relationship between Hydrology and Parchedness in Big Cypress National Preserve





Historical Calendar showing
Wetland Parchnness Severity

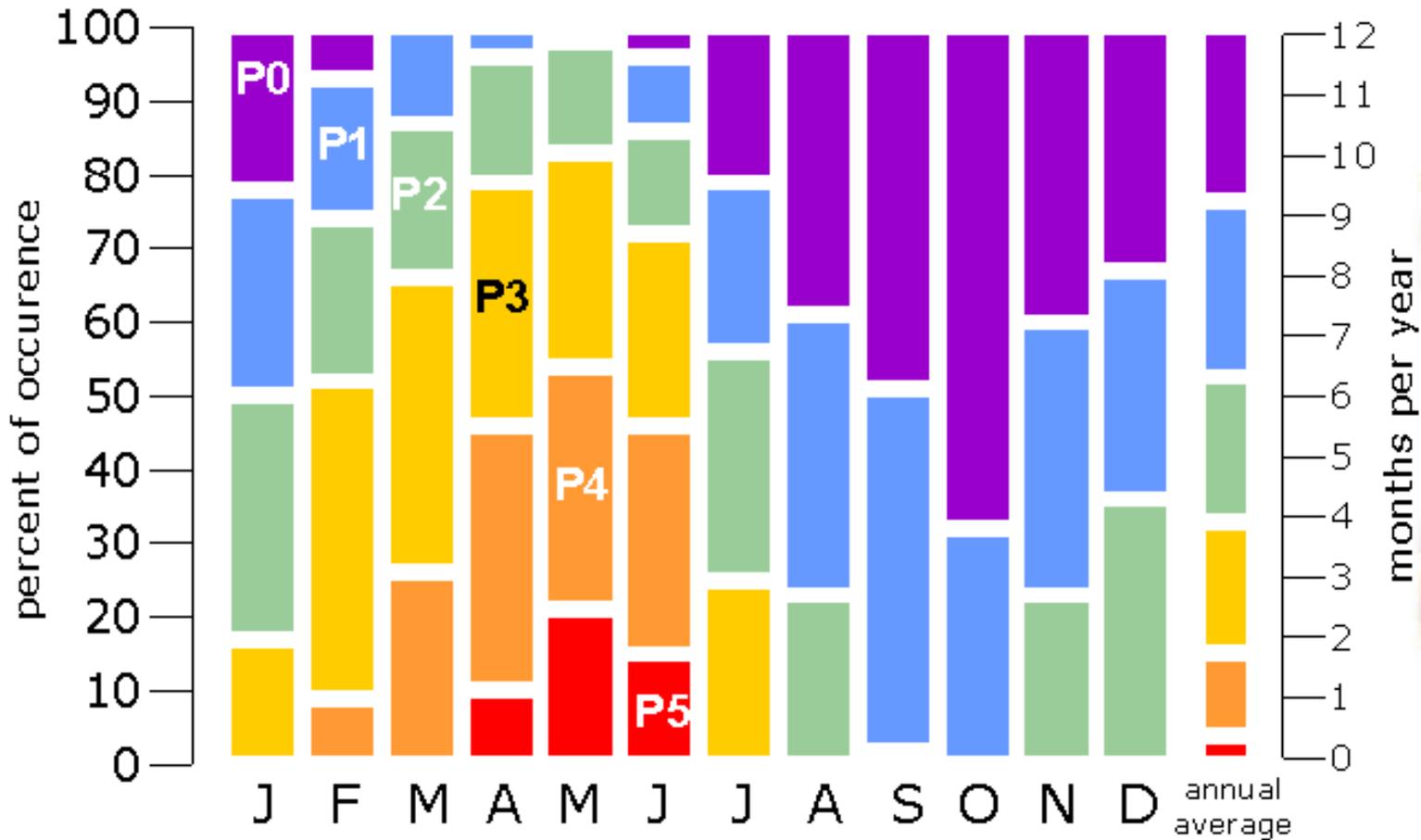
in Big Cypress Preserve
 Preserve-wide
 1991 to present



Landscape based, not just meteorologic

Define probability of parchness by **month**

Monthly Drought Severity

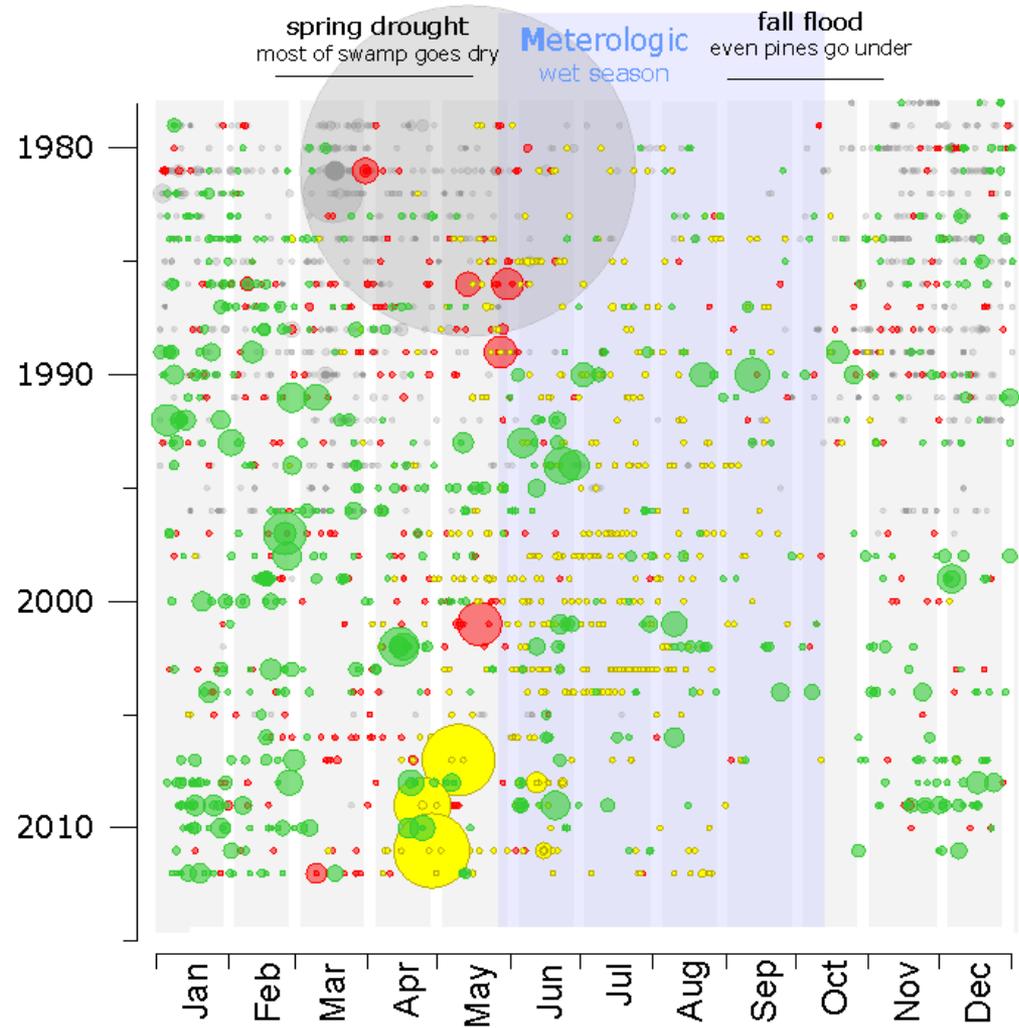


Historical Calendar of Wildlands Fire in Big Cypress Nat'l Preserve



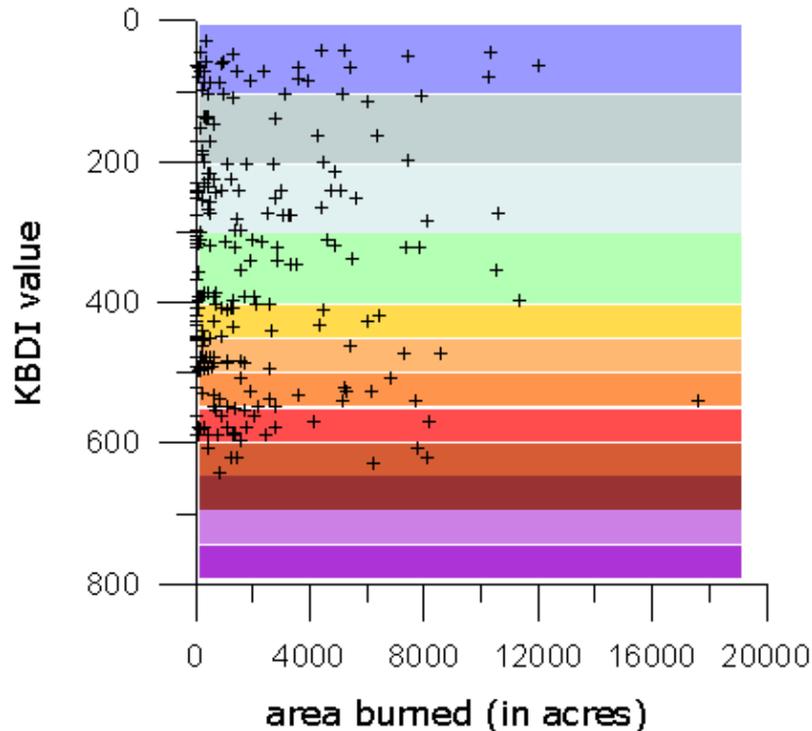
When did
management burns
occur in Big Cypress
National Preserve?

relative to
calendar
year

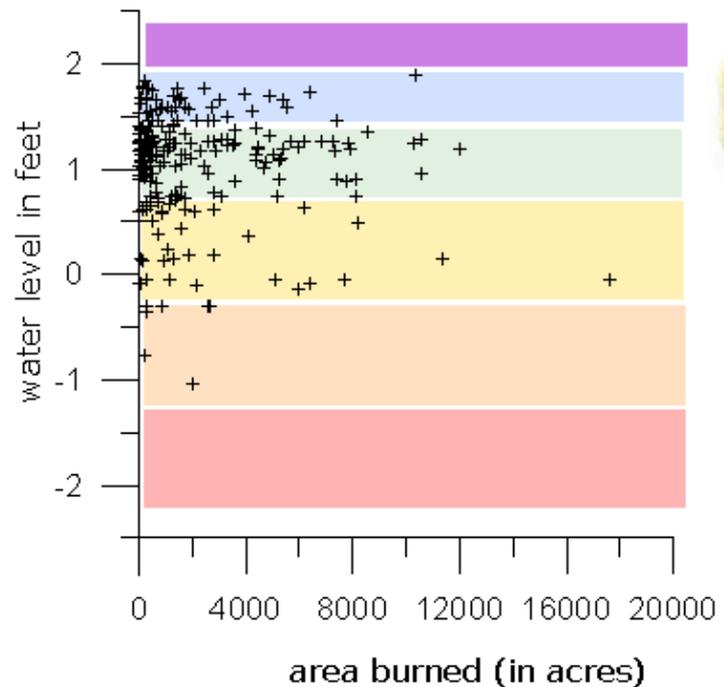


What was the KBDI index and **water level** index during the management burns, 2000-2011?

Comparison of KBDI and Water levels as a Suitability Index for Management Burns



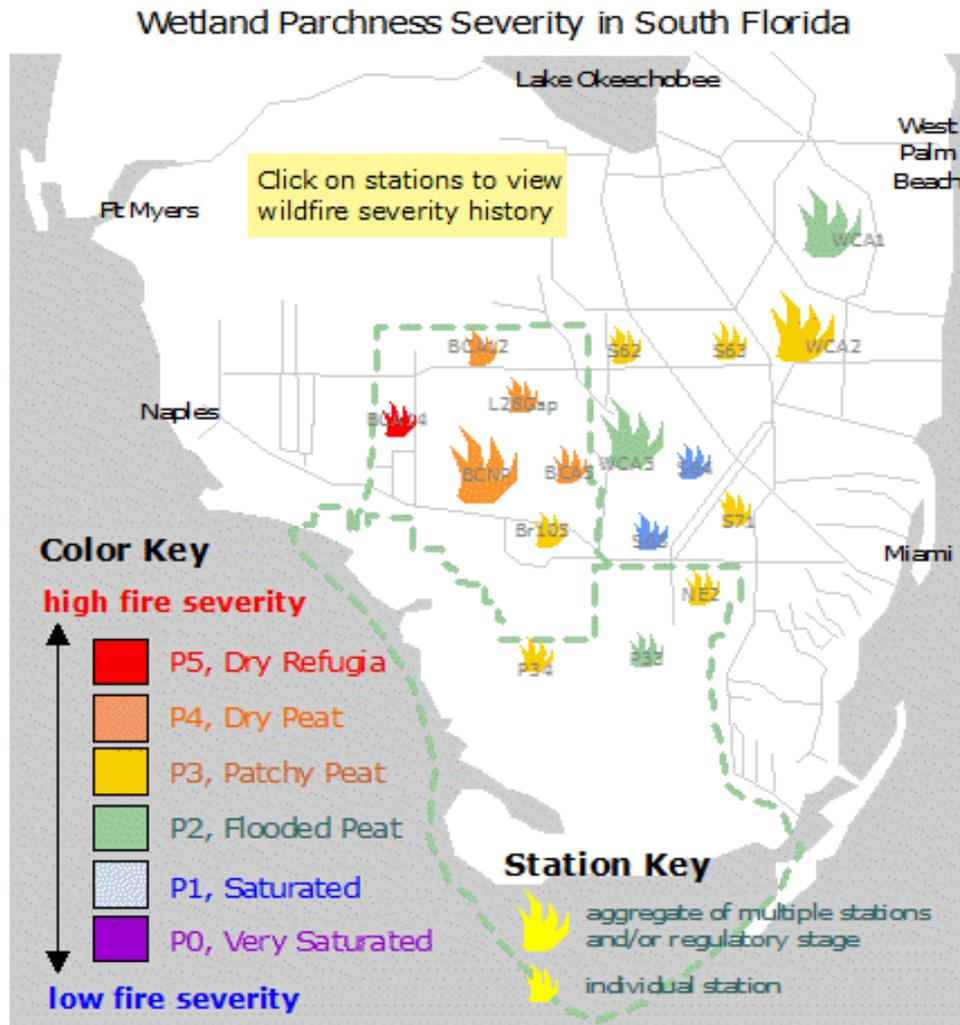
- Poor correlation, management burns occur over a wide range of KBDI values



- Stronger correlation, management burns occur between 0 and 2.0 ft

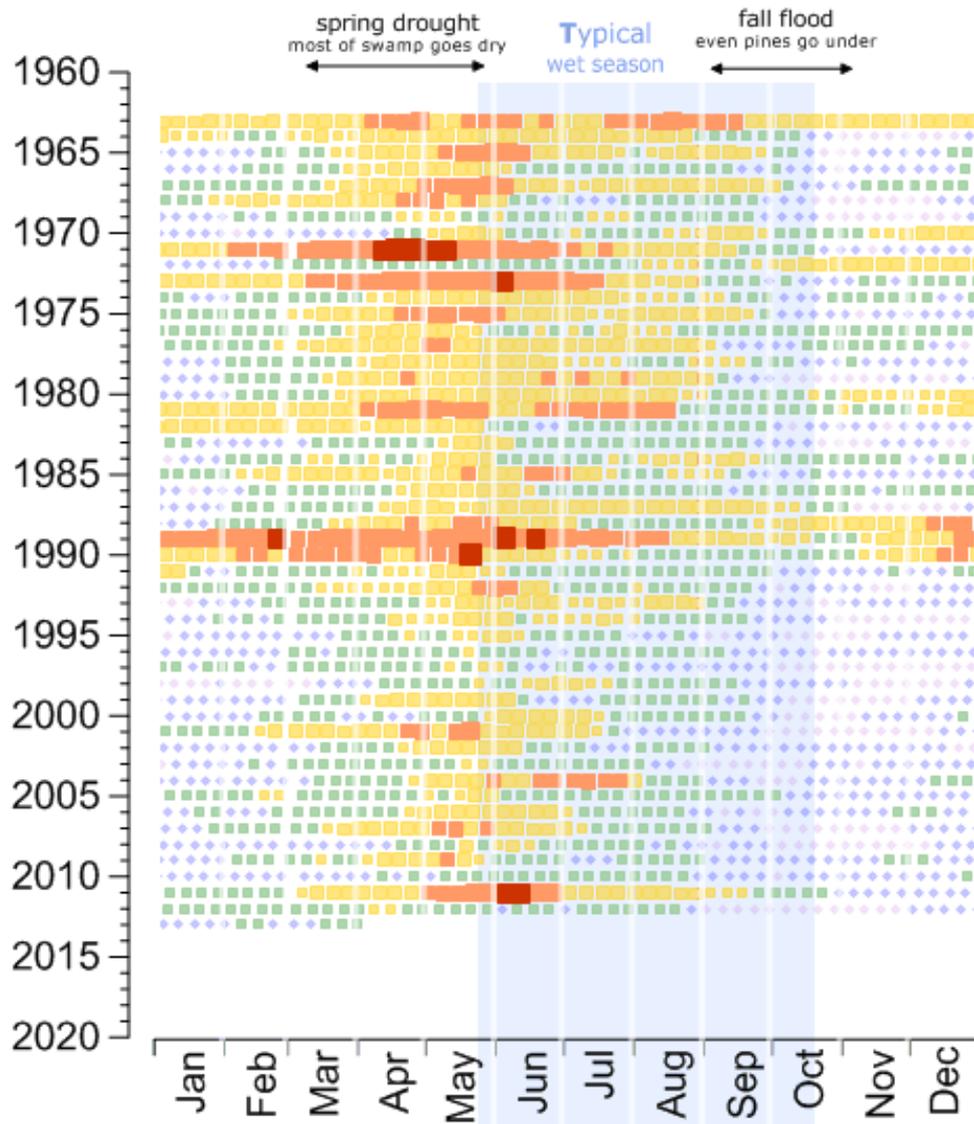


Application of Water-Level based Drought Index Across **Everglades**

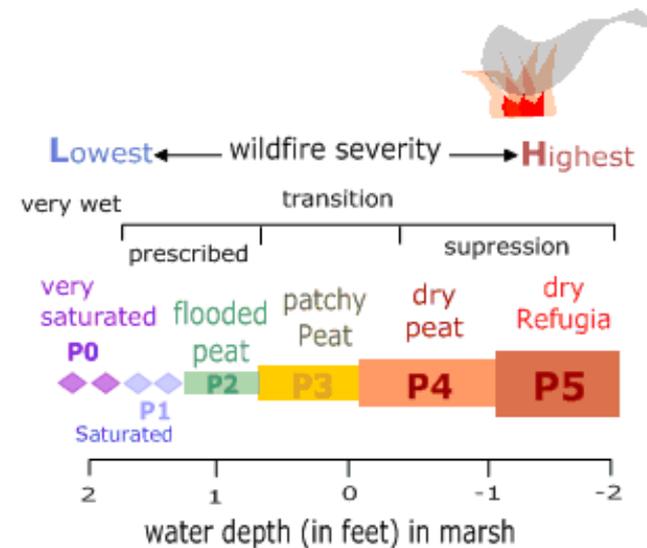


From **Side Bare** of Go Hydrology! website

Water Conservation Area 1 Loxahatchee



Historical Calendar showing
Wetland **Parchness** Severity
in Water Conservation Area 1
using Regulatory Stage
1963 to present





Advantages of Parchedness

- Simple to convey
- Practical to use
- Historically comparable
- Geographically precise

But how do
we **prevent** it?



**New Paradigm
for Preventing
Wildfires:**

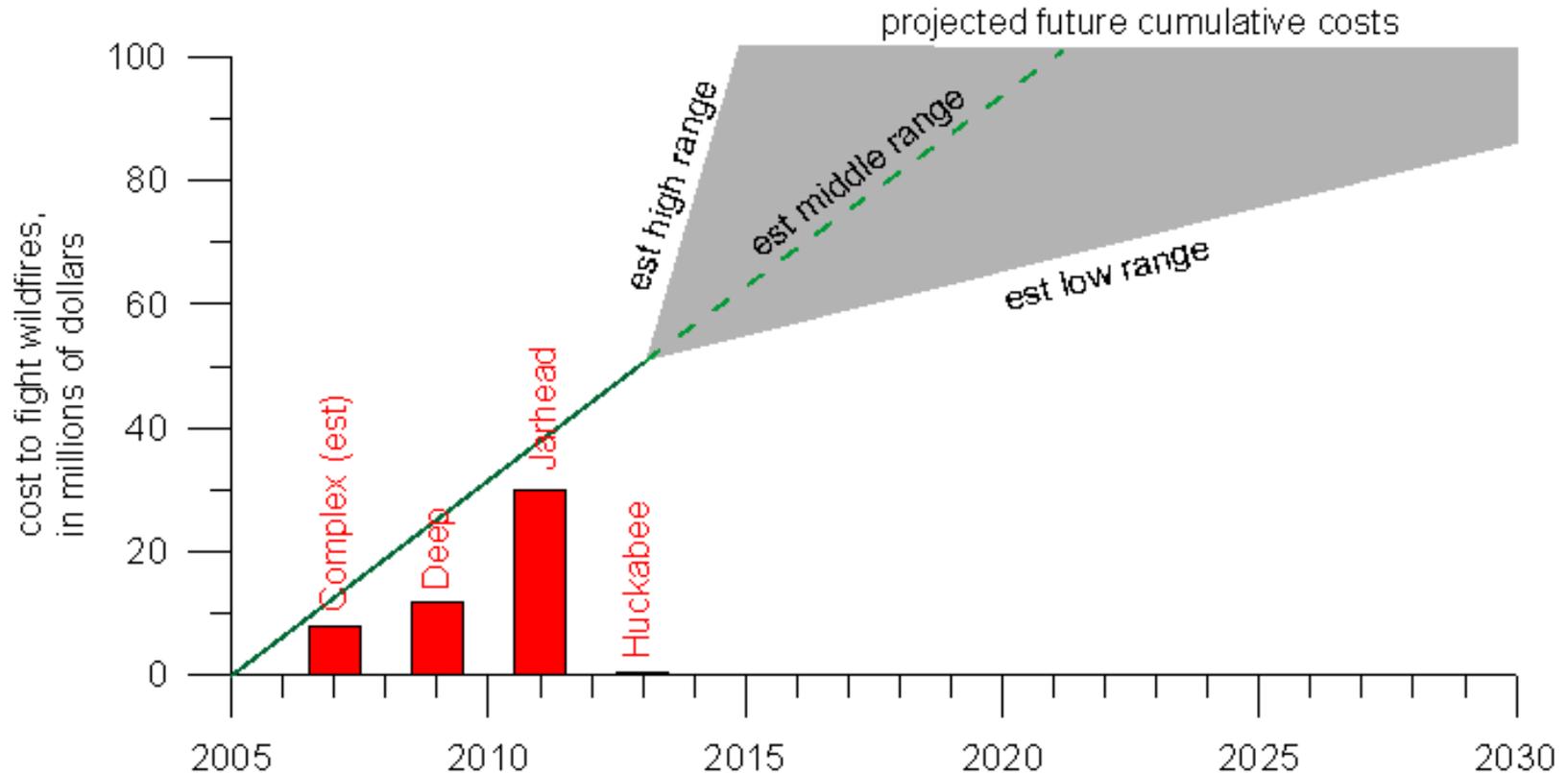
**Add Water
To Ecosystem**

What's **wrong** with this picture?



- Wet season storage **escaping** to tide
- Water not getting into wetlands **across** road
- Legacy and **derelict** infrastructure

Cost to fight wildfires over past 8 years



But **\$0 long-term benefit** towards increasing swamp's natural resilience to fight wildfire

Surprise of the Day



Hydrologic restoration
is actually a **cheap**
and **high return**
investment



Next Steps

How do we
adopt the
parchedness
Index?

How do we
prolong non-
parchedness
in the swamp?

Photo of **non** parchedness