Proactive Drought Management: Putting Tools to Work

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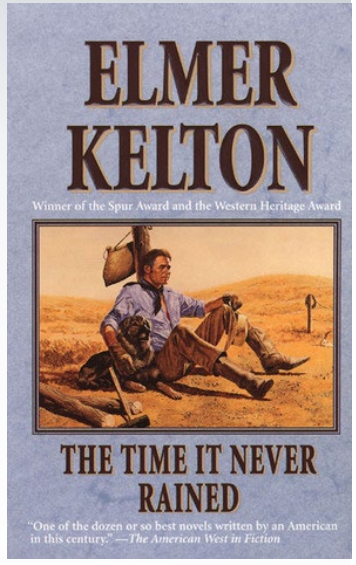
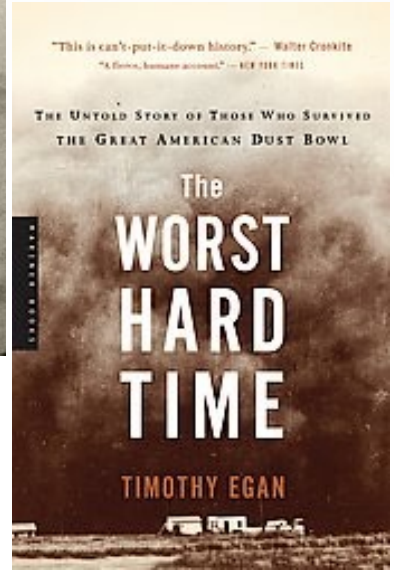
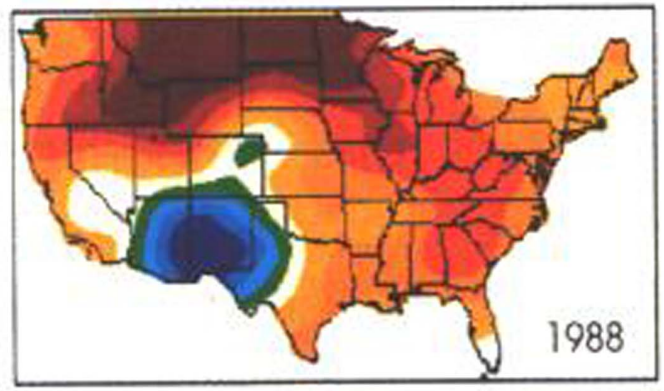
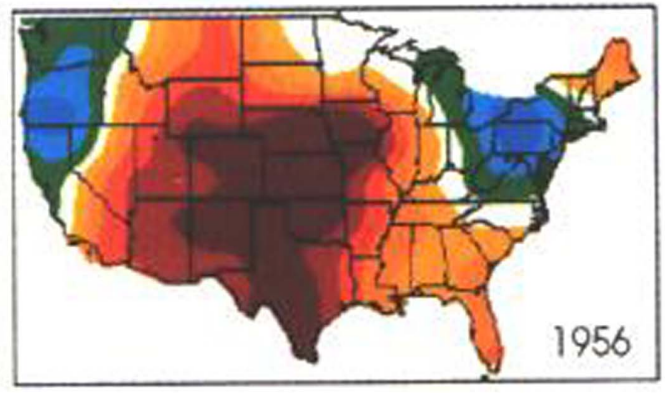
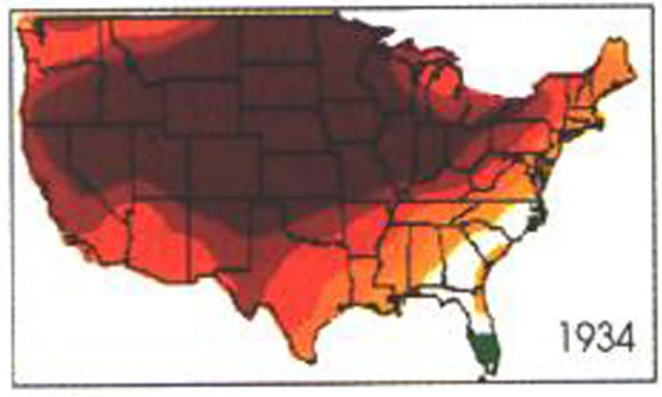
20th Century Droughts









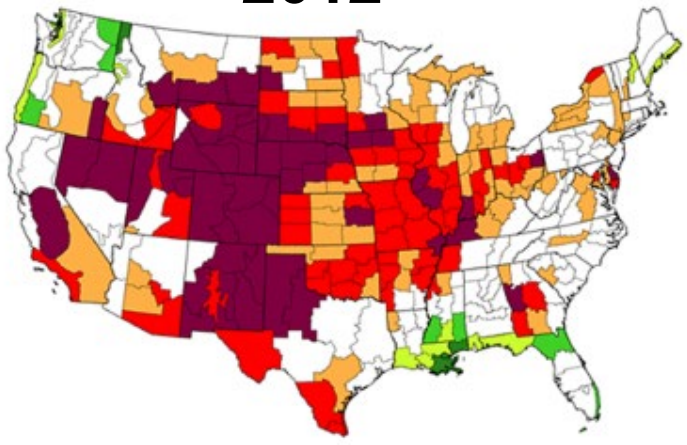


Woodhouse and Overpeck, 1998

2012 and current

2012

A



B

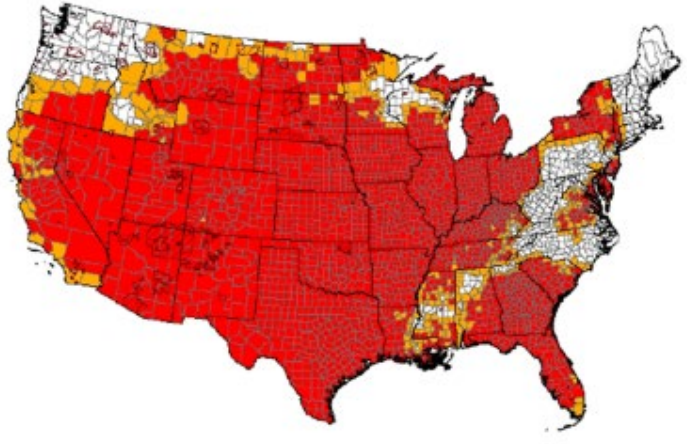


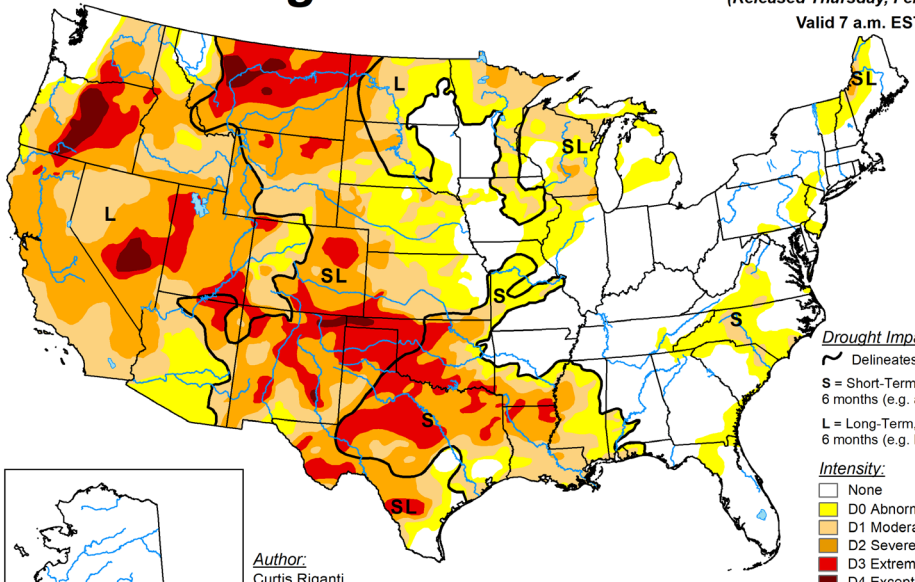
Fig. 1. (A) Much of the United States experienced drought (orange: moderate; red: severe; purple: extreme) in August 2012 according to the Palmer Drought Index, an indicator of long-term drought. (B) Most US counties were eligible to receive drought disaster assistance after the 2012 drought, shown by drought disaster designations (red) and contiguous areas (yellow) in February 2013. Source: NOAA National Climate Data Center; USDA Farm Services Agency.

U.S. Drought Monitor

February 1, 2022

(Released Thursday, Feb. 3, 2022)

Valid 7 a.m. EST



Drought Impact Types:

Delineates dominant impacts

S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)

L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)

Intensity:

- None
- D0 Abnormally Dry
- D1 Moderate Drought
- D2 Severe Drought
- D3 Extreme Drought
- D4 Exceptional Drought

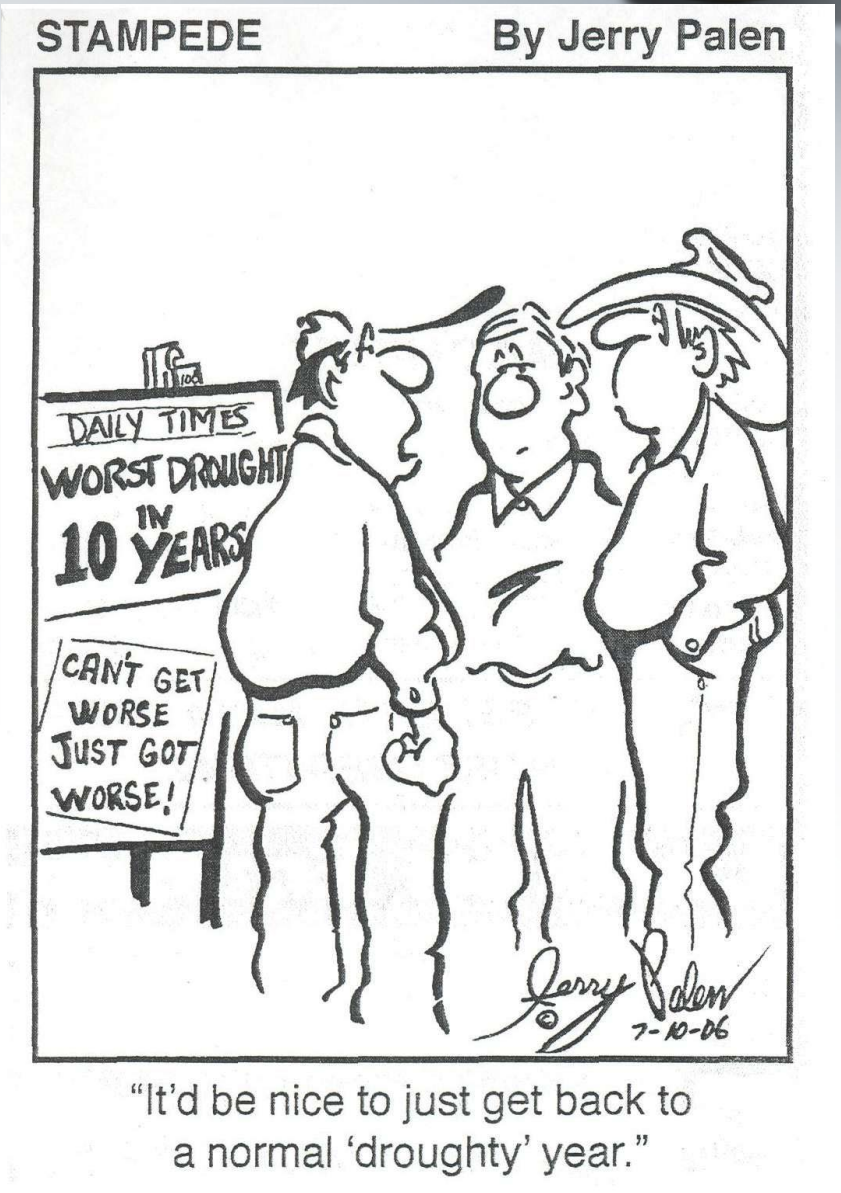
Author:
Curtis Riganti
National Drought Mitigation Center

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. For more information on the Drought Monitor, go to https://droughtmonitor.unl.edu/About.aspx

droughtmonitor.unl.edu

Agony and Despair

(From “Hee Haw”)



“It’d be nice to just get back to a normal ‘droughty’ year.”

What Drought Management Strategies do Ranchers Use?

Drought Planning

How many producers had a drought management plan?

60%

4 in 10 producers do not have a drought plan

How many producers thought drought would be more influential in their management plans in the future than past?

40%

Kachergis et al. *Ecosphere* 5(6):77.
http://dx.doi.org/10.1890/ES13-00402.1

Proactive and reactive drought management strategies

Limited use currently, but potential is high for flexibility

c

Drought preparation

Reserve forage supply

- Stock conserva-tively: 48%
- Rest pastures: 47%
- Grassbank: 22%

Vary stocking rate with forage supply

- Incorporate yearling livestock: 28%
- Use weather predictions to adjust stocking rate: 16%

Ranch

Drought response

Reduce forage demand

- Reduce herd size: 80%
- Wean calves early: 47%
- Sell retained yearling livestock: 24%

Increase forage supply

- Purchase feed: 63%
- Rent additional pasture: 42%
- Move livestock to another location: 27%
- Place livestock in a feedlot: 15%

Increase income

- Apply for government assistance: 23%
- Earn off-farm income: 16%

d

Drought impacts

Grazing capacity	75%	Irrigation water availability	47%
Profitability	54%	Calf weaning weights	36%
Winter feed availability	53%	Livestock reproductive rates	20%

Kachergis et al. *Ecosphere* 5(6):77.

Drought: Preparing?

"…we do have a drought plan, it's kind of pessimistic plan in that you just figure the drought is going to be here periodically and you keep things at a **conservative level**, so when it does come it doesn't hit so hard. Not that we aren't affected, but we aren't affected as much."

"That's why we run a smaller cow herd. That's why we're kind of under stocked."

Drought: Opportunity?

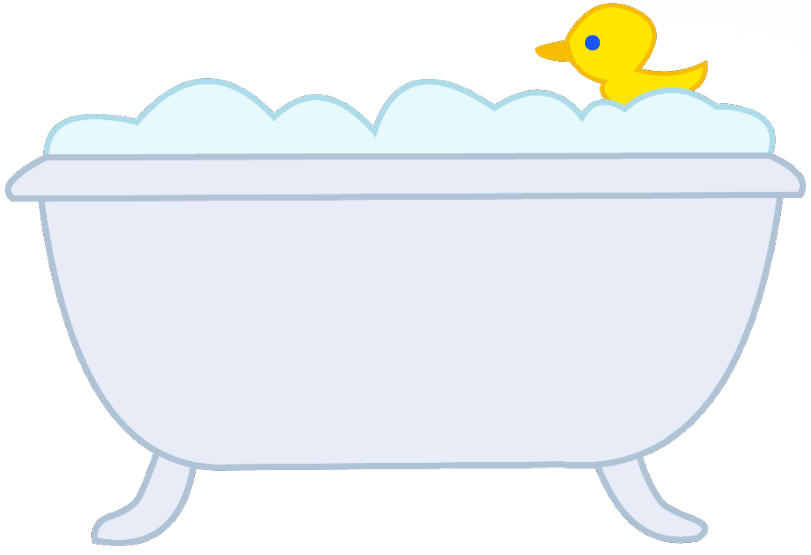
"..instead of seeing it (drought) as an obstacle, you see it as a catalyst to make changes you might not ordinarily do."

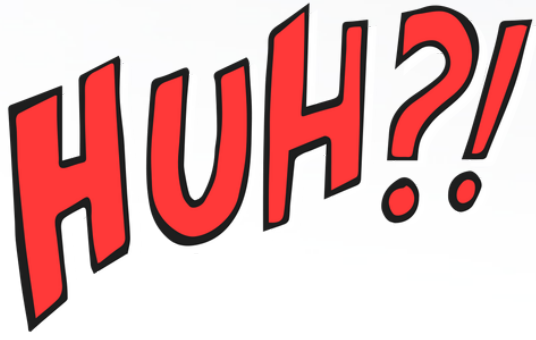
Drought as a Change Agent

"So the last drought was just an expensive education to do something different. I think anybody that went through the last drought and didn't do something before this drought is crazy. And I think most people are doing something."

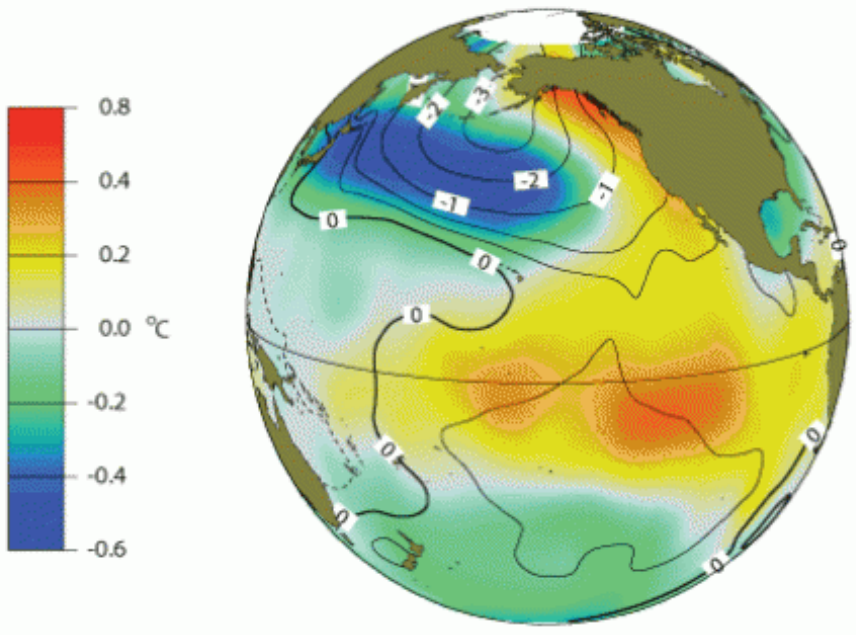
Let’s Have Some Fun

Can the temperature of bathtub water help with proactive drought management?





Bathtub Water Explanation

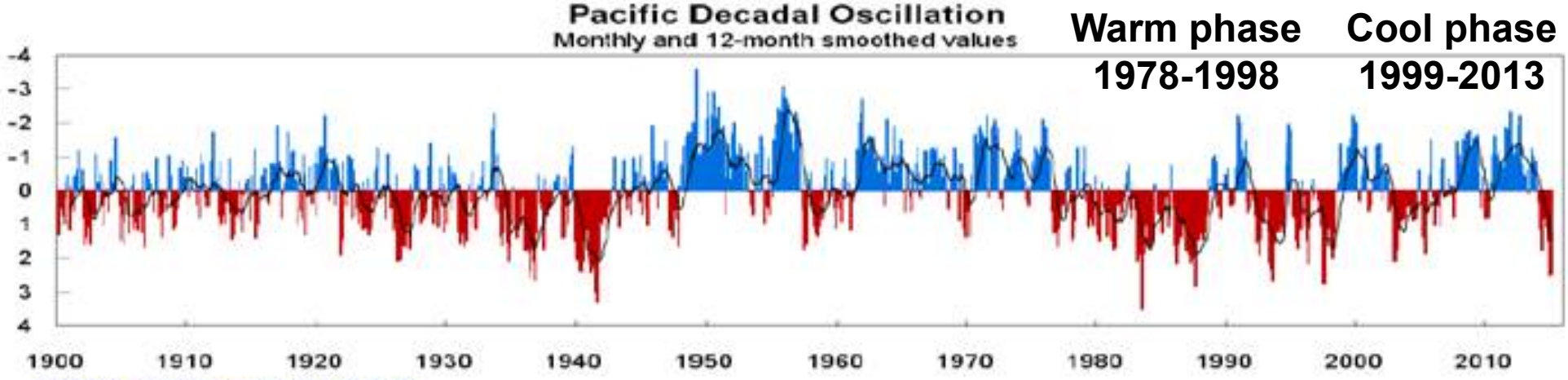


Warm Phase PDO

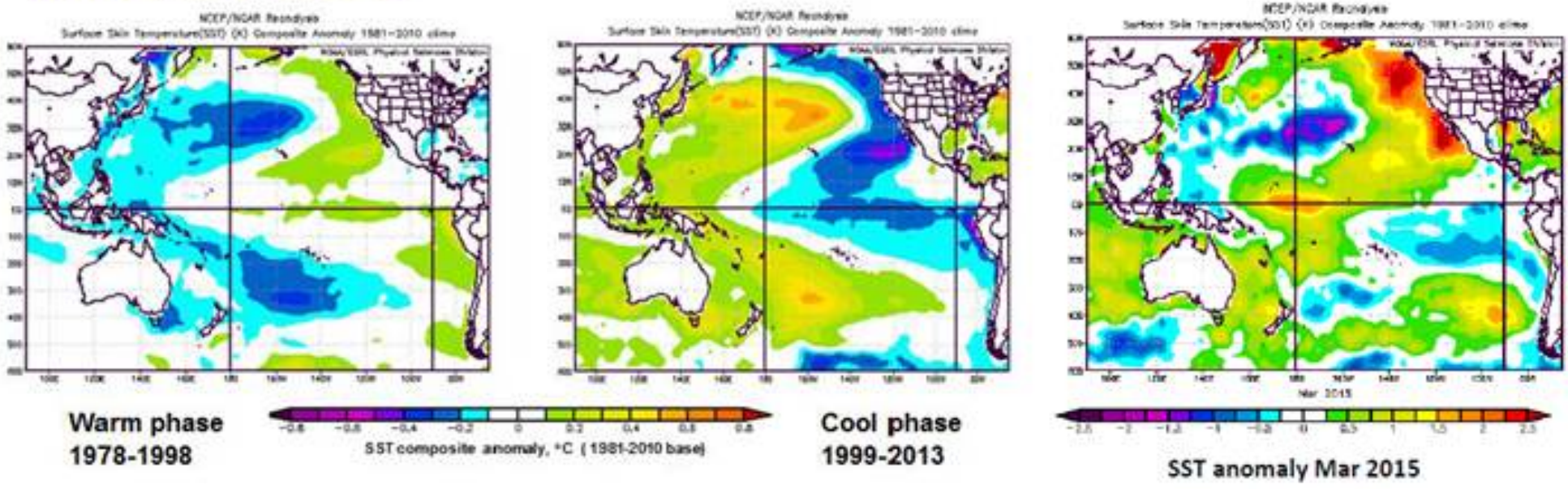
Pacific Decadal Oscillation (PDO)

- Water temperature off the Pacific Northwest coast
- Important why?
  - Warm phase and Cool phase

Pacific Decadal Oscillation



PDO Data http://jisao.washington.edu/pdo/



NCEP/NCAR Reanalysis http://www.esrl.noaa.gov/psd/cgi-bin/data/composites/printpage.pl

ENSO (La Nina: cold & El Nino: warm) Historical Perspectives

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
1950	-1.5	-1.3	-1.2	-1.2	-1.1	-0.9	-0.5	-0.4	-0.4	-0.4	-0.6	-0.8
1951	-0.8	-0.5	-0.2	0.2	0.4	0.6	0.7	0.9	1.0	1.2	1.0	0.8
1952	0.5	0.4	0.3	0.3	0.2	0.0	-0.1	0.0	0.2	0.1	0.0	0.1
1953	0.4	0.6	0.6	0.7	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8
1954	0.8	0.5	0.0	-0.4	-0.5	-0.5	-0.6	-0.8	-0.9	-0.8	-0.7	-0.7
1955	-0.7	-0.6	-0.7	-0.8	-0.8	-0.7	-0.7	-0.7	-1.1	-1.4	-1.7	-1.5
1956	-1.1	-0.8	-0.6	-0.5	-0.5	-0.5	-0.6	-0.6	-0.5	-0.4	-0.4	-0.4
1957	-0.2	0.1	0.4	0.7	0.9	1.1	1.3	1.3	1.3	1.4	1.5	1.7
1958	1.8	1.7	1.3	0.9	0.7	0.6	0.6	0.4	0.4	0.4	0.5	0.6
1959	0.6	0.6	0.5	0.3	0.2	-0.1	-0.2	-0.3	-0.1	0.0	0.0	0.0

1954-1956 period (drought): La Nina was entrenched

ENSO (La Nina: cold & El Nino: warm) Historical Perspectives

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2010	1.5	1.2	0.8	0.4	-0.2	-0.7	-1.0	-1.3	-1.6	-1.6	-1.6	-1.6
2011	-1.4	-1.2	-0.9	-0.7	-0.6	-0.4	-0.5	-0.6	-0.8	-1.0	-1.1	-1.0
2012	-0.9	-0.7	-0.6	-0.5	-0.3	0.0	0.2	0.4	0.4	0.3	0.1	-0.2
2013	-0.4	-0.4	-0.3	-0.3	-0.4	-0.4	-0.4	-0.3	-0.3	-0.2	-0.2	-0.3
2014	-0.4	-0.5	-0.3	0.0	0.2	0.2	0.0	0.1	0.2	0.5	0.6	0.7
2015	0.5	0.5	0.5	0.7	0.9	1.2	1.5	1.9	2.2	2.4	2.6	2.6
2016	2.5	2.1	1.6	0.9	0.4	-0.1	-0.4	-0.5	-0.6	-0.7	-0.7	-0.6
2017	-0.3	-0.2	0.1	0.2	0.3	0.3	0.1	-0.1	-0.4	-0.7	-0.8	-1.0
2018	-0.9	-0.9	-0.7	-0.5	-0.2	0.0	0.1	0.2	0.5	0.8	0.9	0.8
2019	0.7	0.7	0.7	0.7	0.5	0.5	0.3	0.1	0.2	0.3	0.5	0.5

2011-2012 period (drought): La Nina was entrenched

Back to the Fun

Can the temperature of bathtub water help with proactive drought management?

Where is the Easy Button?

Simple Decision Tree

(1998-2013)

PDO Phase

COLD

ENSO Phase

La Niña | Neutral | El Niño

Local Precipitation Amount

Low | Average | High

Decrease (Light) | Decrease (Light) | Maintain (Moderate) | Increase (Heavy) | Uncertain

(2014-present)

WARM

La Niña | Neutral | El Niño

Low | Average | High

Decrease (Light) | Decrease (Light) | Maintain (Moderate) | Increase (Heavy) | Increase (Heavy)

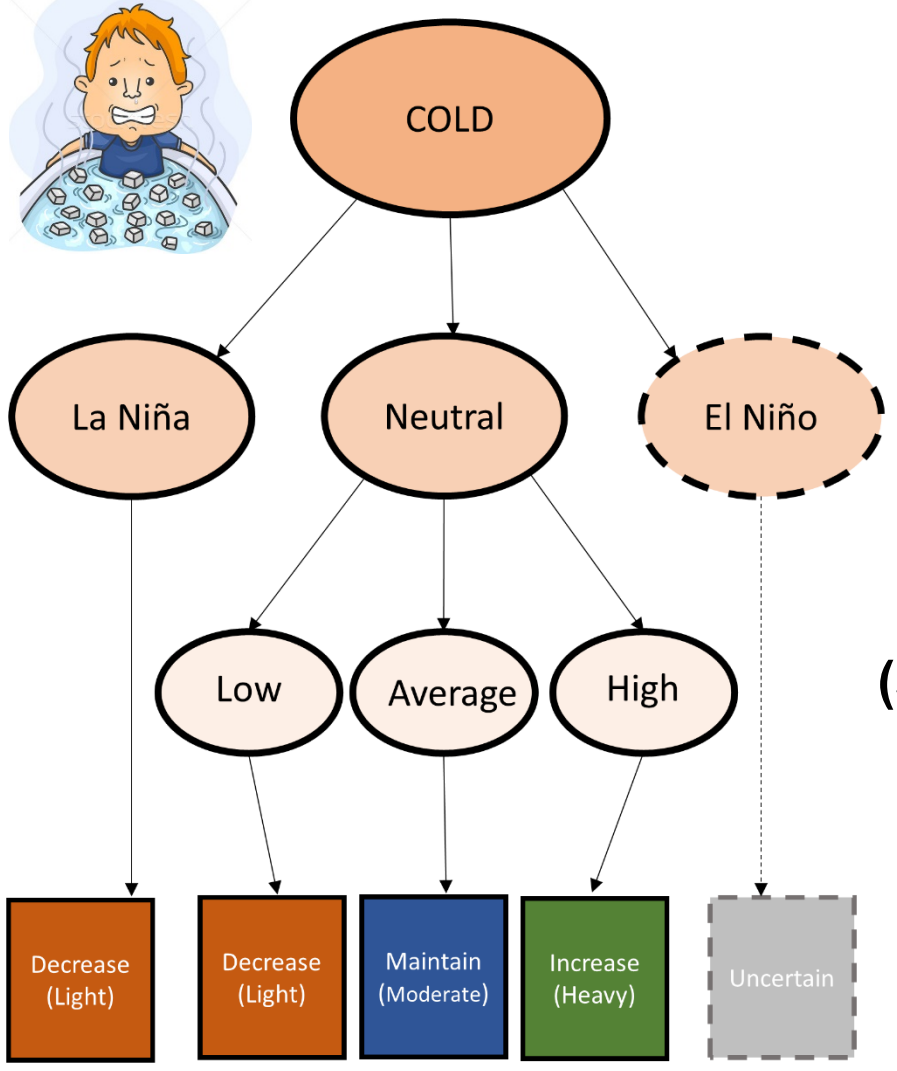
Simple Decision Tree

(1998-2013)

PDO Phase

ENSO Phase

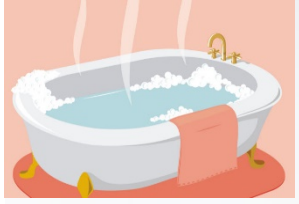
Local Precipitation Amount

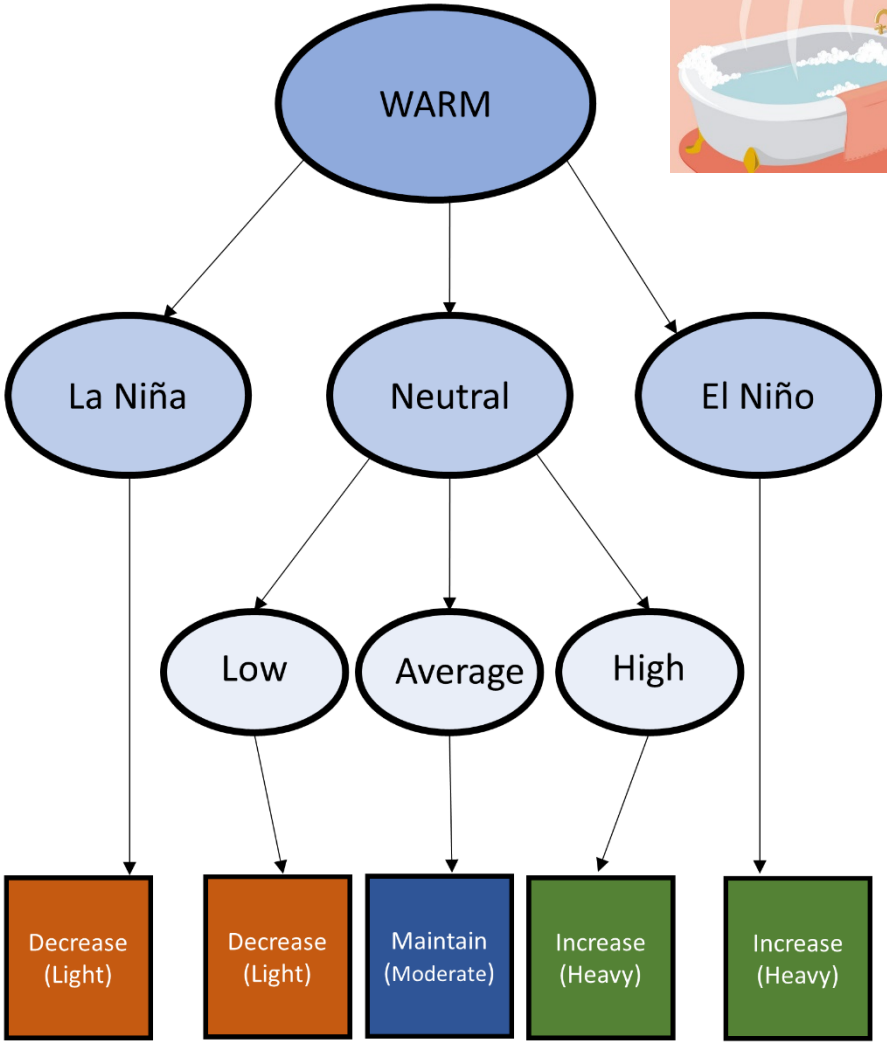


(spring months)

Simple Decision Tree

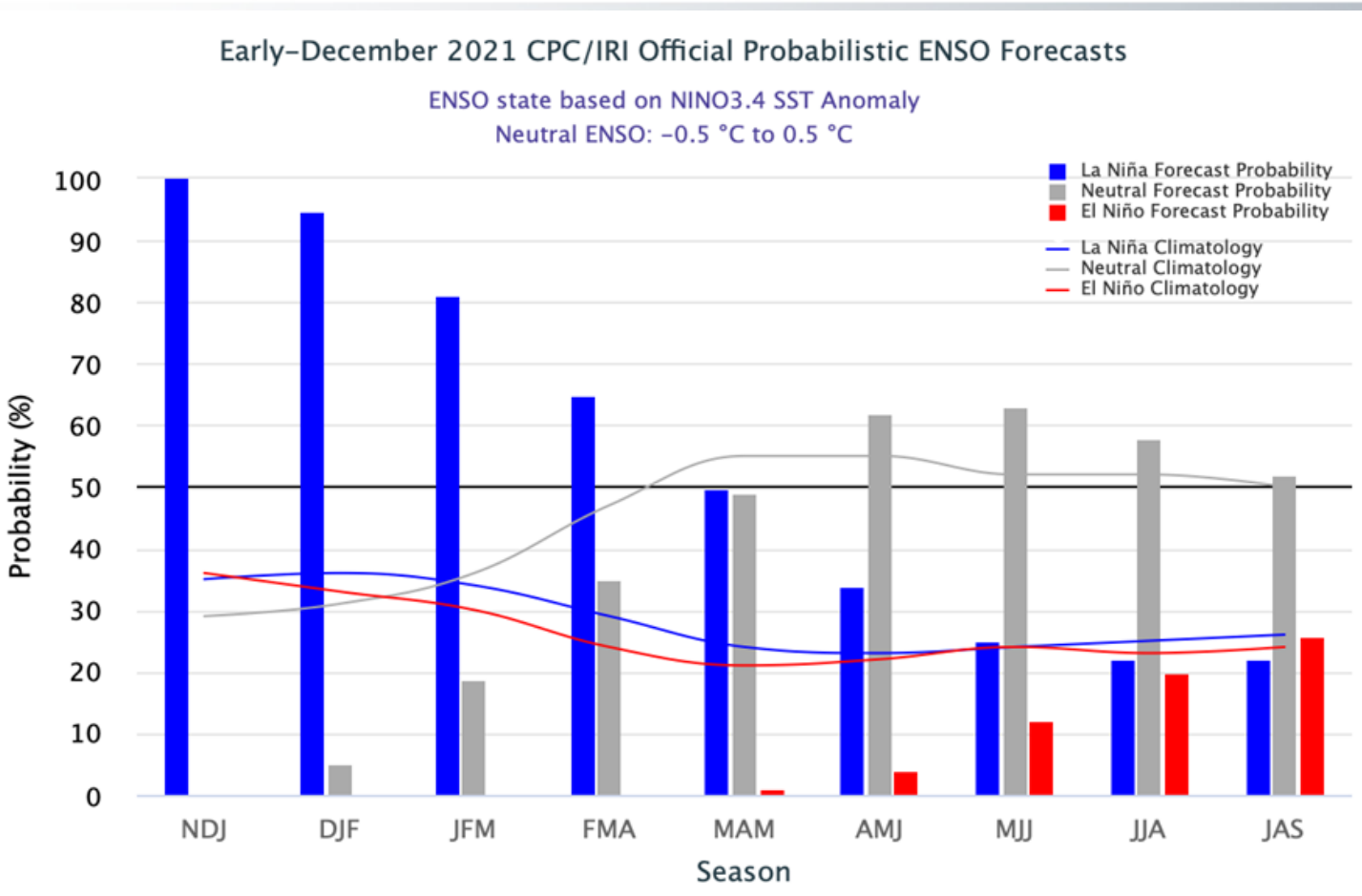
(2014-present)





(spring months)

ENSO Status



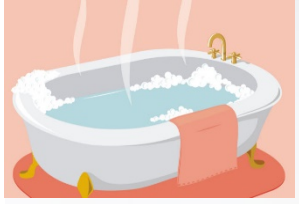
La Nina probability decreasing as spring advances, moving to <u>neutral</u> for spring 2022

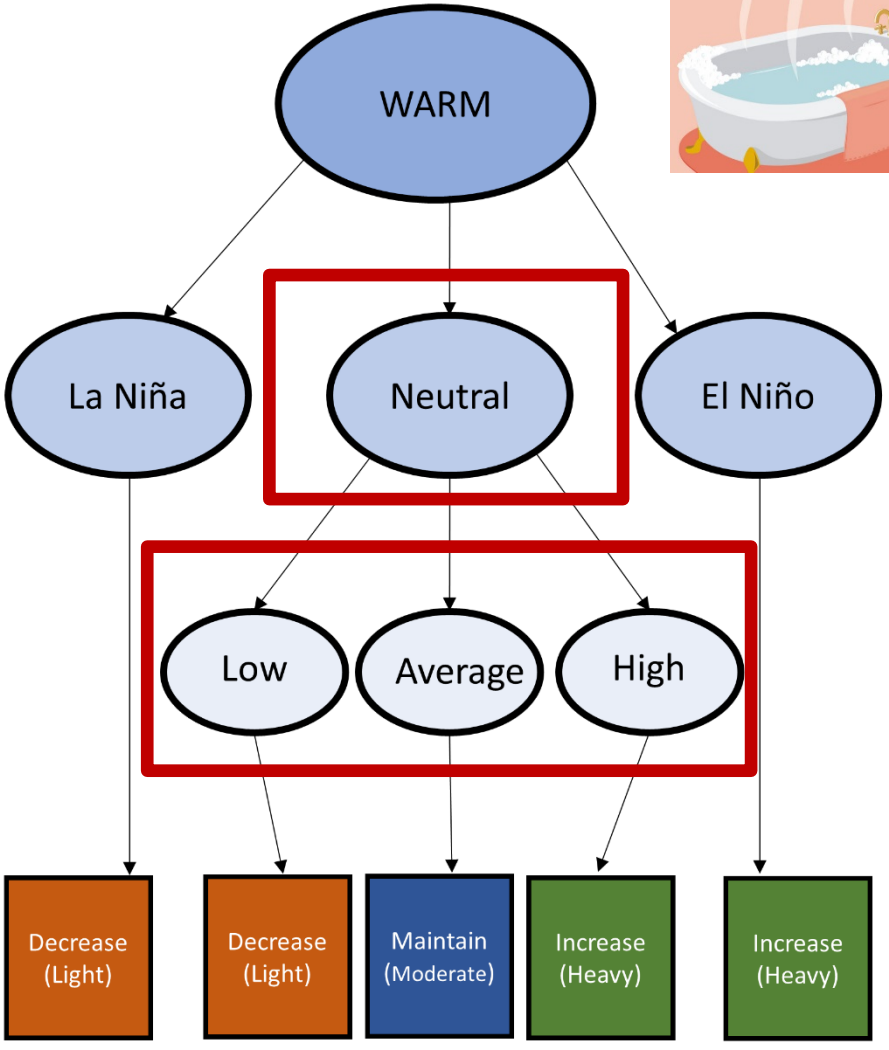
(just like 2020 winter to 2021 spring)

Year	DJF	JFM	FMA	MAM	AMJ	MJJ	JJA	JAS	ASO	SON	OND	NDJ
2020	0.5	0.5	0.4	0.2	-0.1	-0.3	-0.4	-0.6	-0.9	-1.2	-1.3	-1.2
2021	-1.0	-0.9	-0.8	-0.7	-0.5	-0.4	-0.4	-0.5	-0.7	-0.8	-1.0	-1.0

Simple Decision Tree

2022

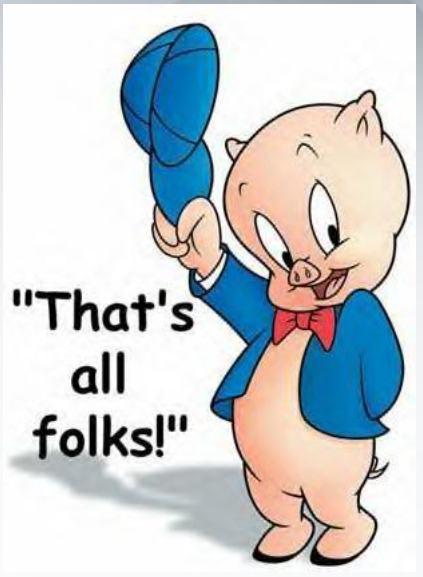




(spring months)

Take Home Message

- **Bathtub water temperatures of the ocean off the Pacific northwest coast (decadal time scales) and equator (ENSO, yearly to several years) can serve as proactive drought management tools for use by ranchers.**



Questions?

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