Rangeland Management and Erosion Prevention Workshop
Thursday, September 5, 2019
Heritage Ranch

Changing Forage Conditions and Drought (2001-2019), Production and Nutrients

Royce Larsen
UC Cooperative Extension

Thank you to all that have helped on this project, and to all the landowners

Phyllis Diller “We Californians are constantly accused of not having seasons, but we do”.

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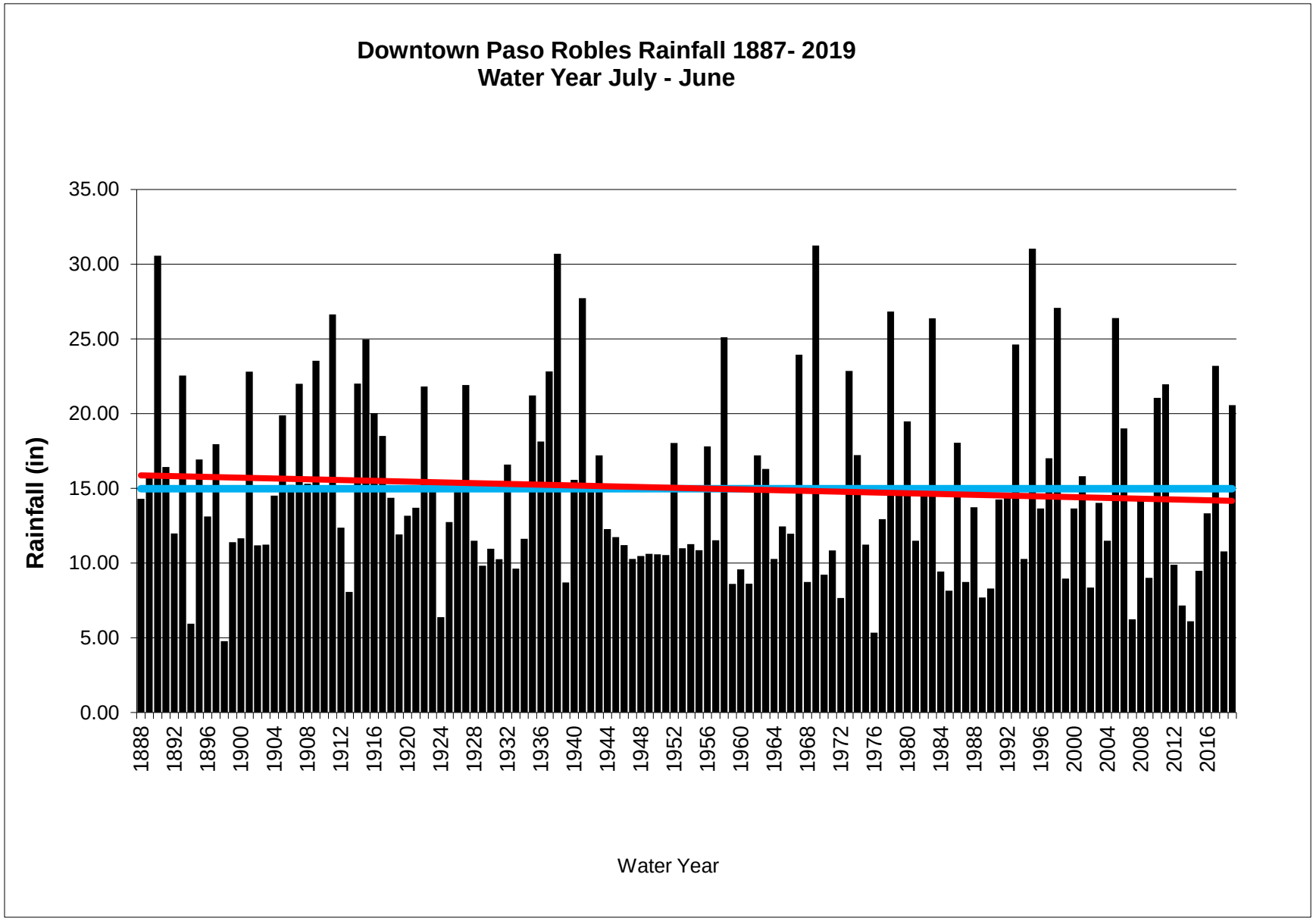
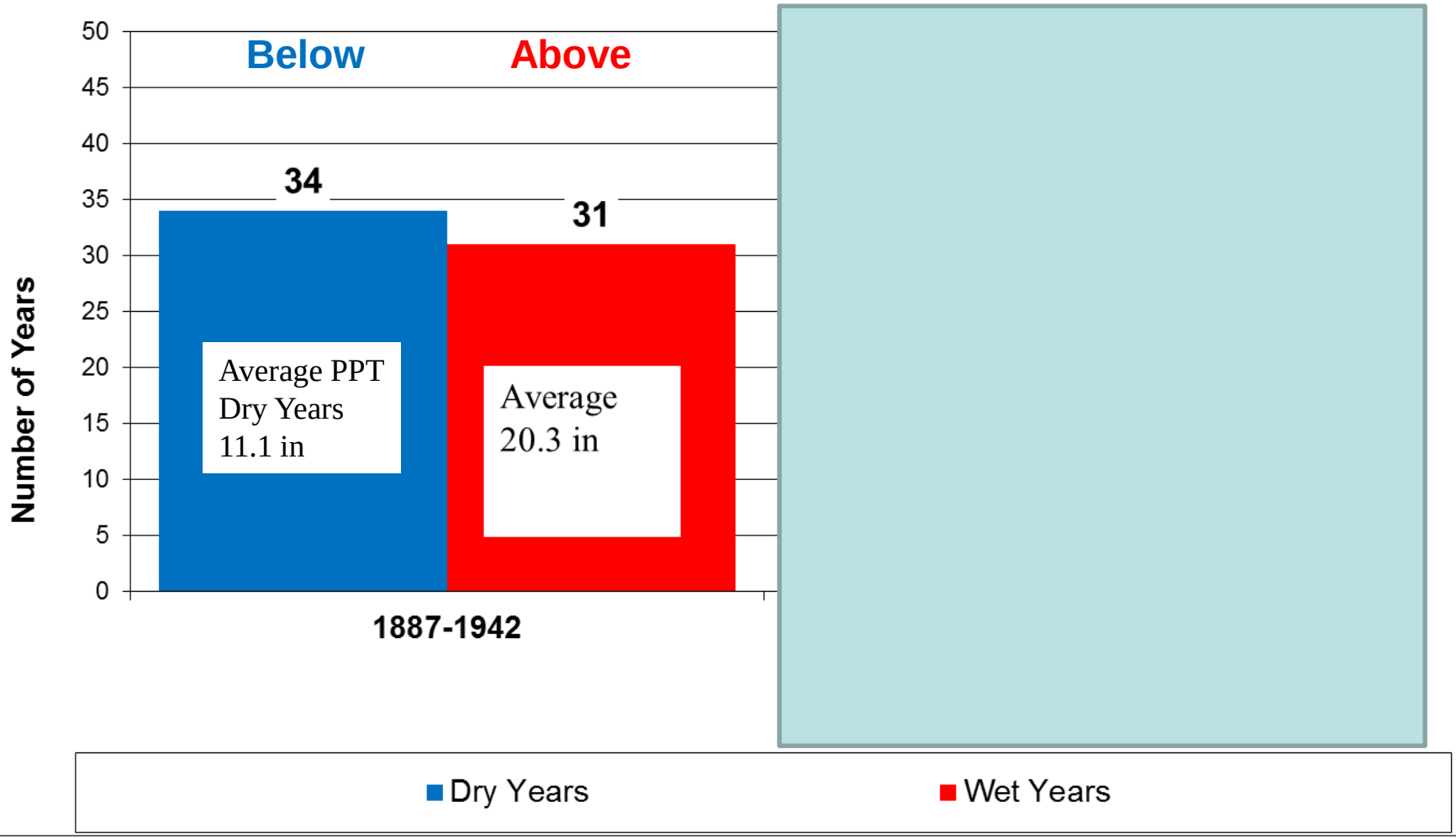
“We have fire, flood, mud, and drought”.

https://www.sfgate.com/technology/businessinsider/article/These-photos-show-how-Southern-California-has-12487116.php

Rainfall Extremely Variable from Year to Year



Downtown Paso Robles Rainfall Information
Dry and Wet Years from1887-1942 and 1943-2017



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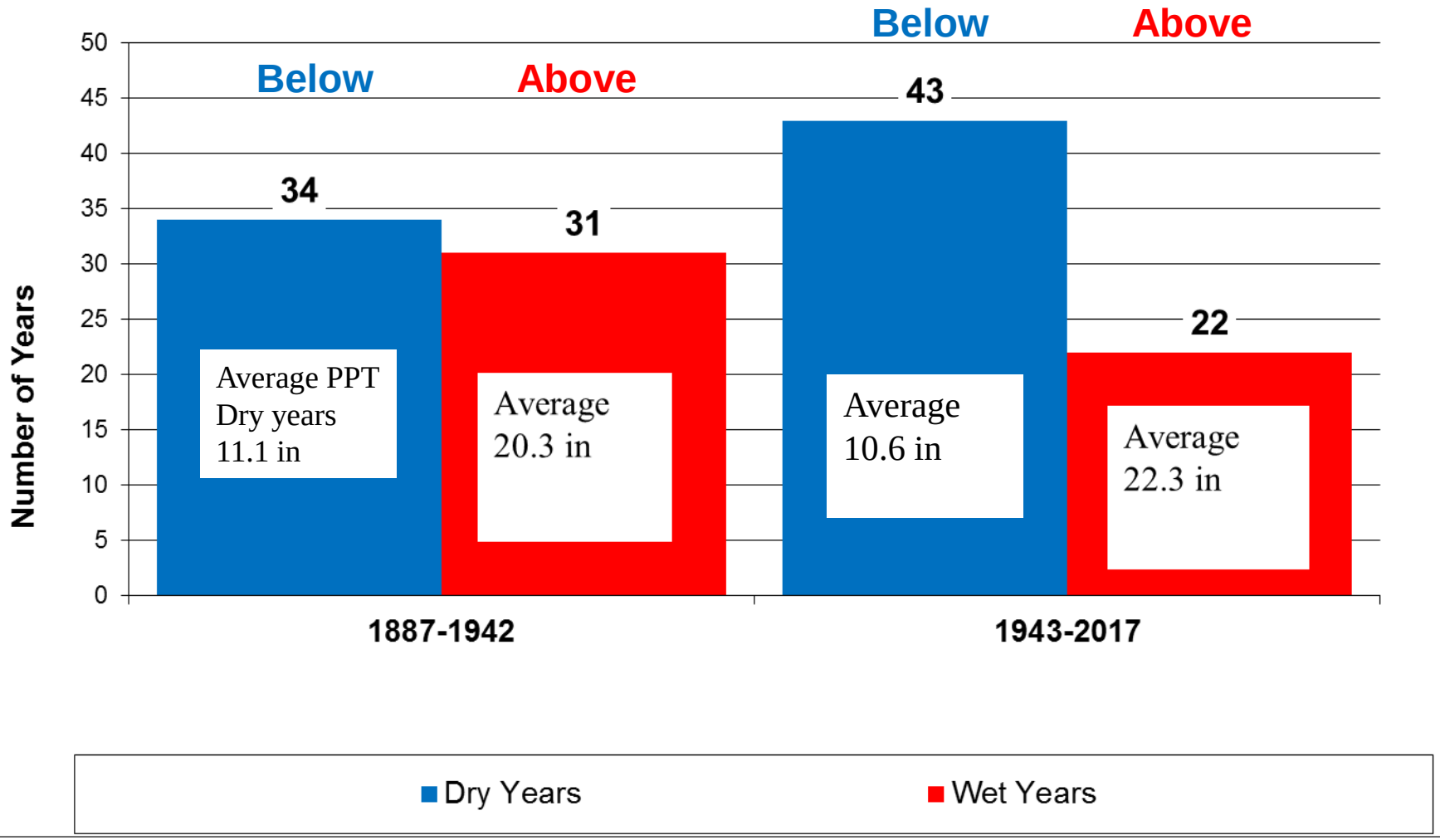
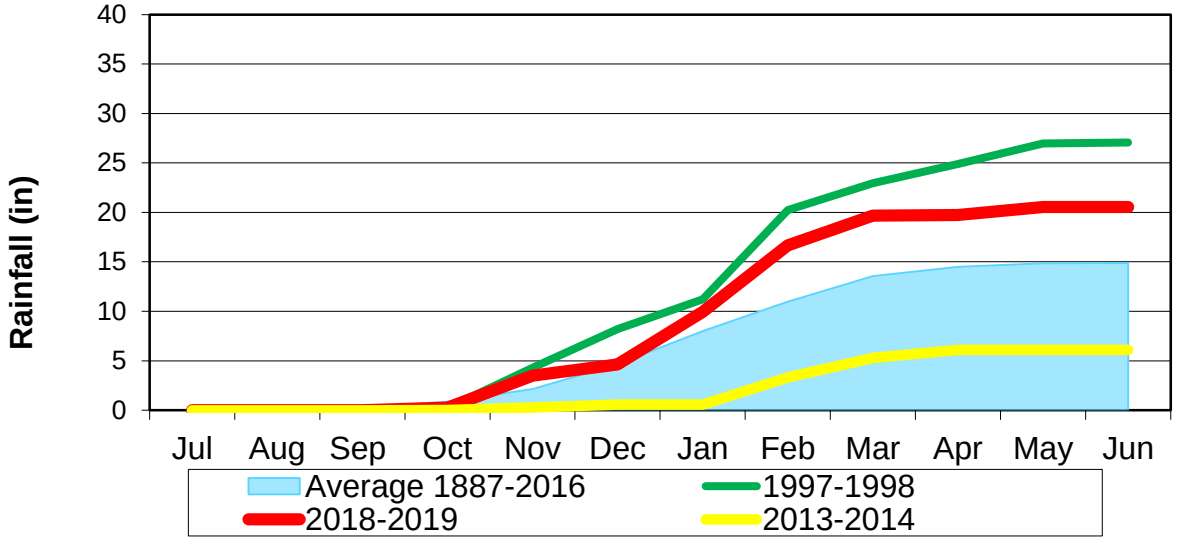
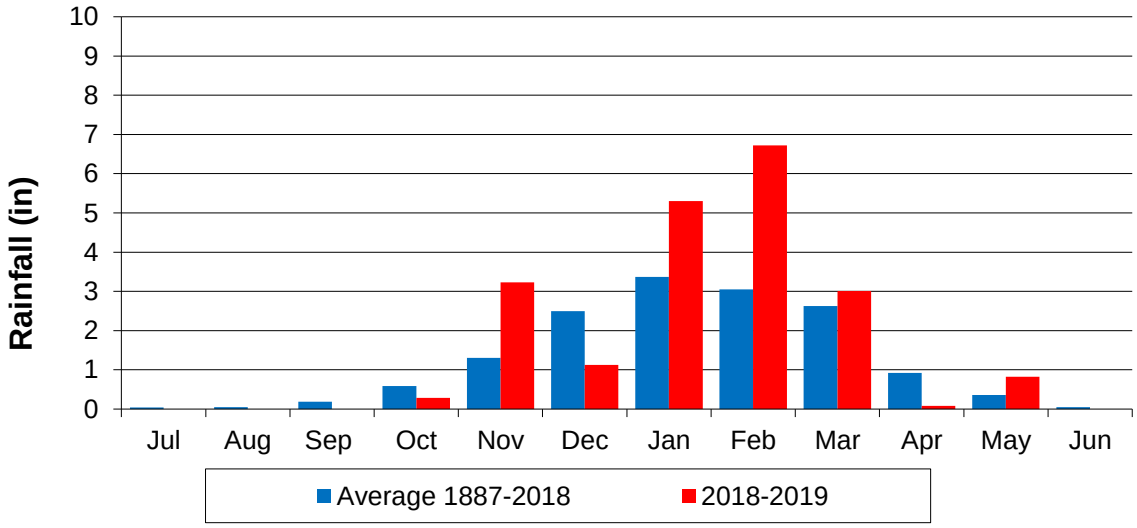


b. Paso Robles Rainfall
Cumulative Rainfall for Water Year (July-June)
Current Water Year is July 2018-June 2019



a. Paso Robles Rainfall
Monthly Average Distribution For Water Year (July - June)
(Current Water Year July 2018 - June 2019)



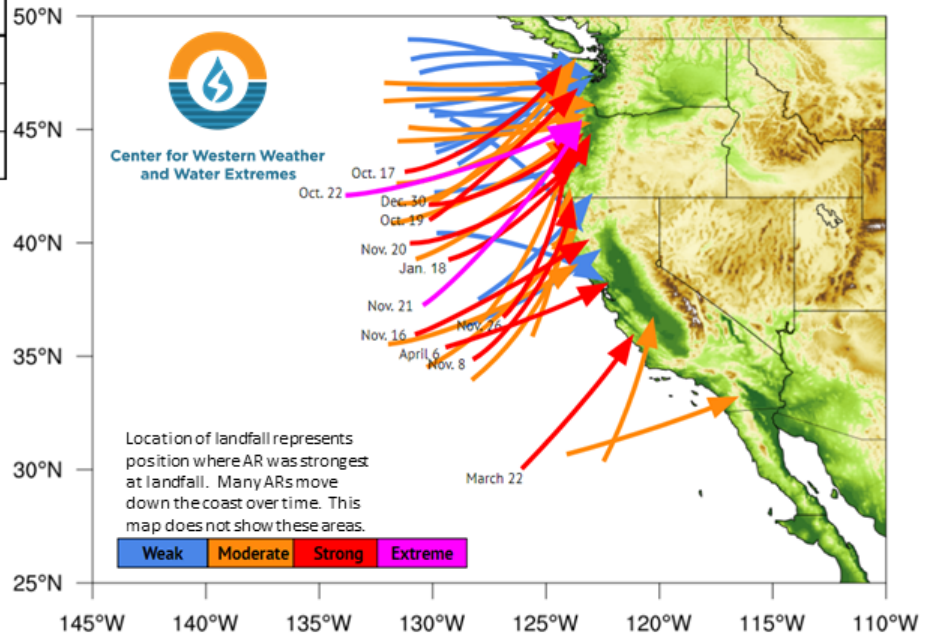
Distribution of Landfalling Atmospheric Rivers on the U.S. West Coast During Water Year 2018 Through April

AR Strength	AR Count*
Weak	16
Moderate	16
Strong	10
Extreme	2
Exceptional	0

Ralph/CW3E AR Strength Scale

- Weak: IVT=250–500 kg m^{-1} s^{-1}
- Moderate: IVT=500–750 kg m^{-1} s^{-1}
- Strong: IVT=750–1000 kg m^{-1} s^{-1}
- Extreme: IVT=1000–1250 kg m^{-1} s^{-1}
- Exceptional: IVT>1250 kg m^{-1} s^{-1}

- **44** Atmospheric Rivers made landfall on the West Coast during the 2018 water year through April



Center for Western Weather and Water Extremes
SCRIPPS INSTITUTION OF OCEANOGRAPHY AT UC SAN DIEGO

By C. Hecht and F.M. Ralph

Experimental

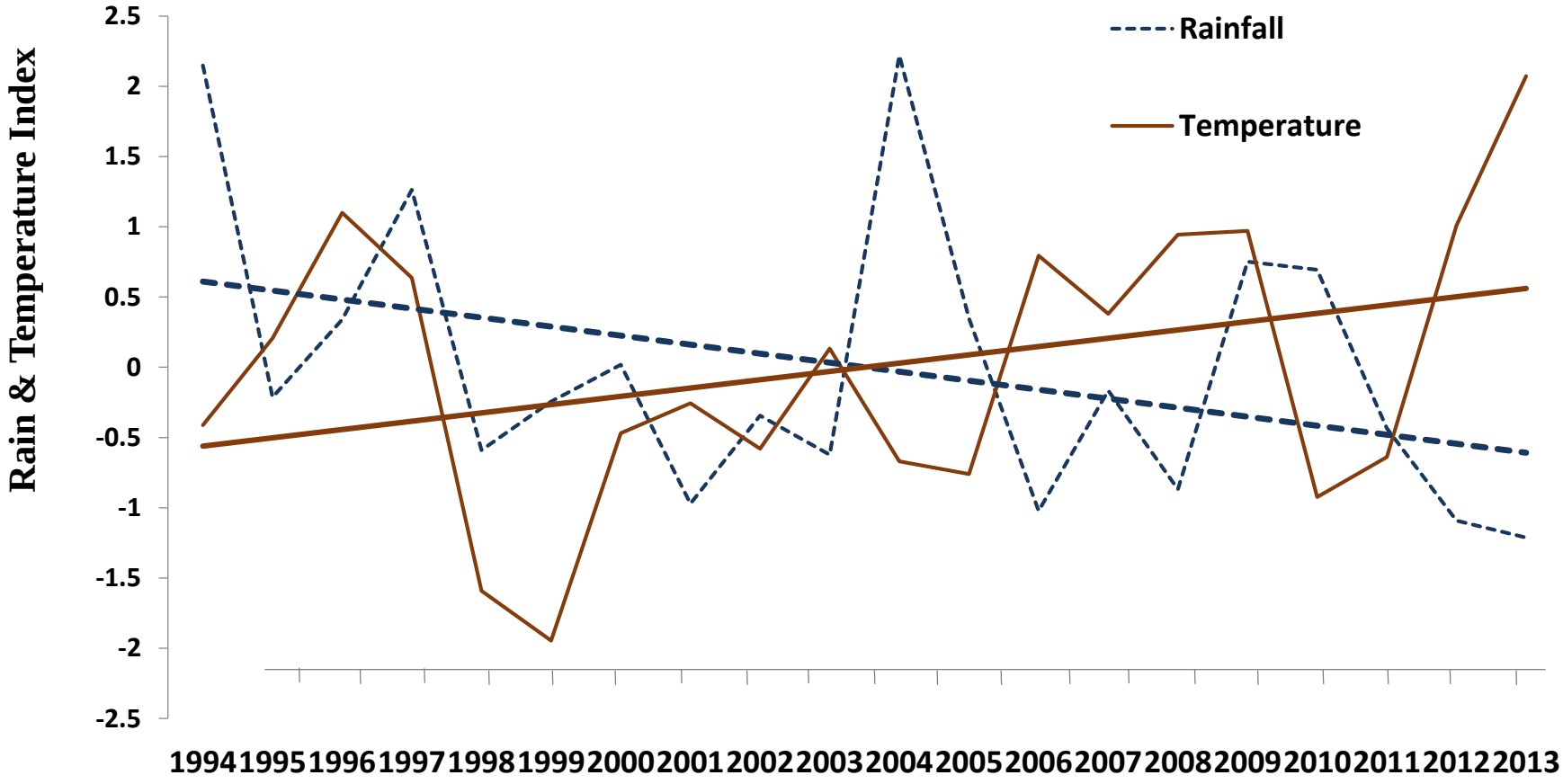
Rainfall Extremely Variable from Site to Site

Rainfall SLO County 2016-2017 WY

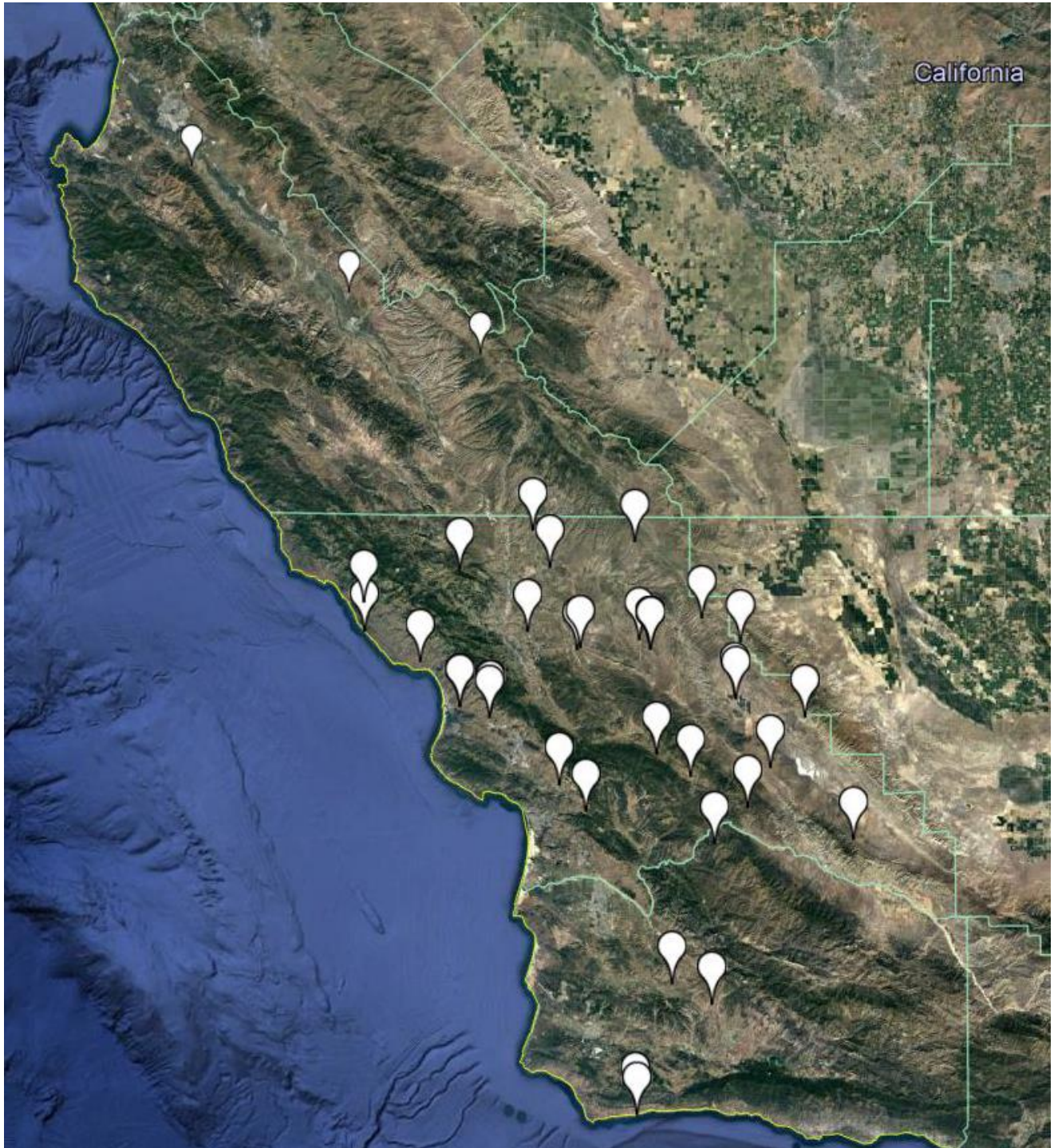
Nacimiento Lake, which sits entirely in San Luis Obispo County went from 33 percent of capacity as of Friday to 46 percent of capacity as of today — a nearly a 15-foot rise in lake level. Lake San Antonio, which is just north of the SLO County line, is at 21 percent. Large watersheds feed both lakes, but Nacimiento Lake, as a rule, will fill up about three times faster than Lake San Antonio, due to the larger size and proximity of its watershed to the Pacific.

"However, different amounts of precipitation that fall in our notoriously complex Central Coast microclimates can play havoc with this rule". *John Lindsey, PG&E Meteorologist, February 6, 2019 Weather Report, Dcpp-weather <dcpp-weather-bounces@pge.com>; on behalf of; Lindsey, John <JCL5@pge.com>*

Annual averages for temperature and rainfall from 1994 to 2014 at the Paso Robles City Weather Station.



Tietje et al.



Plot locations across MO, SLO and SB Counties, Started in 2001 with 6 sites, we are now up to over 40 sites.

Site Setup

4 exclosures per site

- Recording rain gauge
- Temperature Sensor
- Non-recording rain gauge
- Time lapse camera

Other Data

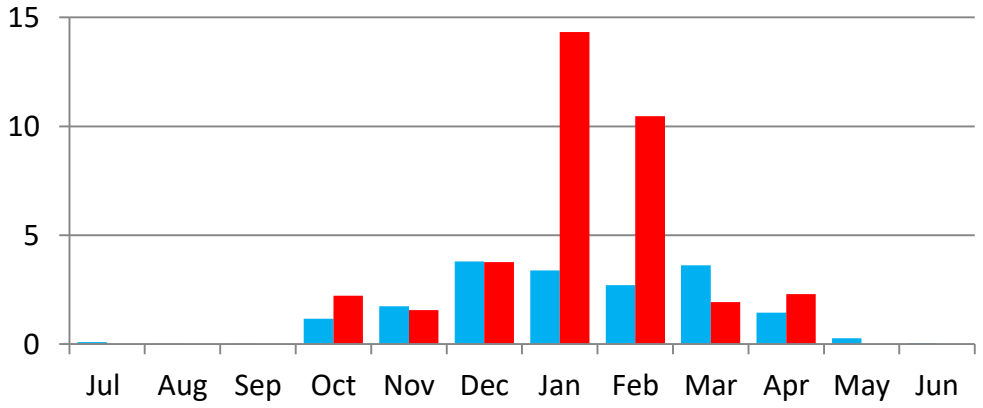
- Peak production (spring)
- Species composition
- Germination dates
- Time to peak production
- RDM (fall)

Annual Rangelands
In California, Mediterranean Climate

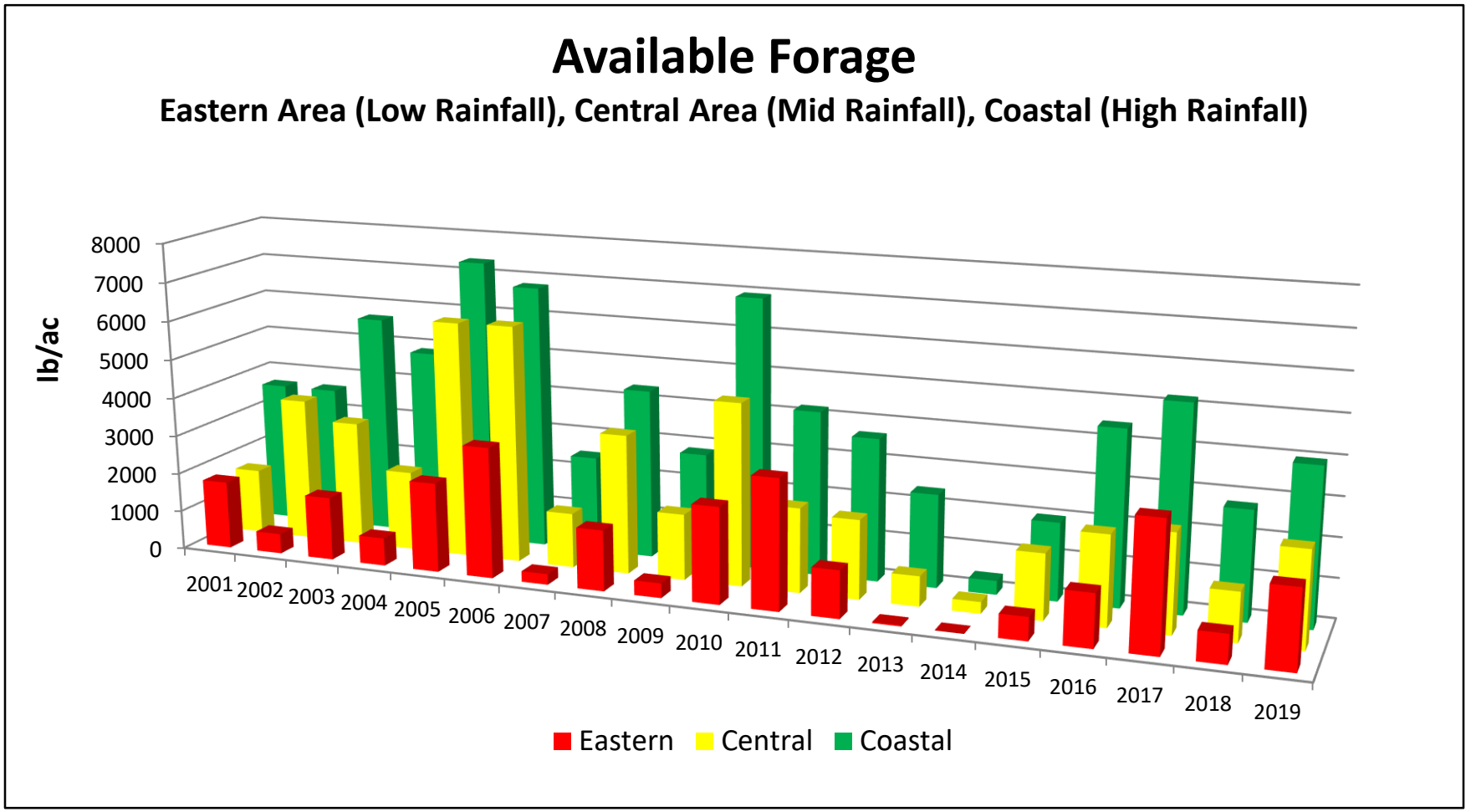
Drivers

PPT, Temp, Timing, RDM

Pozo Site,
2016-2017 WY,
36.5” Rainfall
Avg 16.9 in



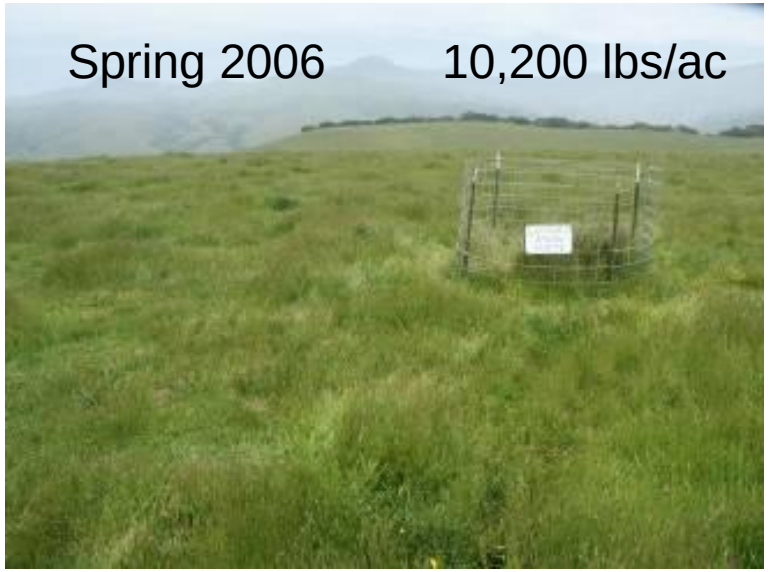
Changes in Forage Production

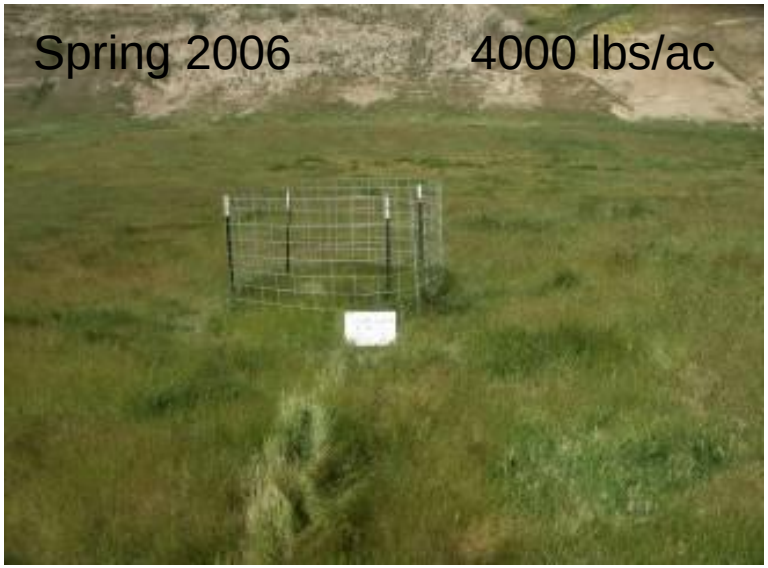


60-70% of Livestock Sold or Moved in 2014

Changing Forage Conditions and Drought

Wet Year





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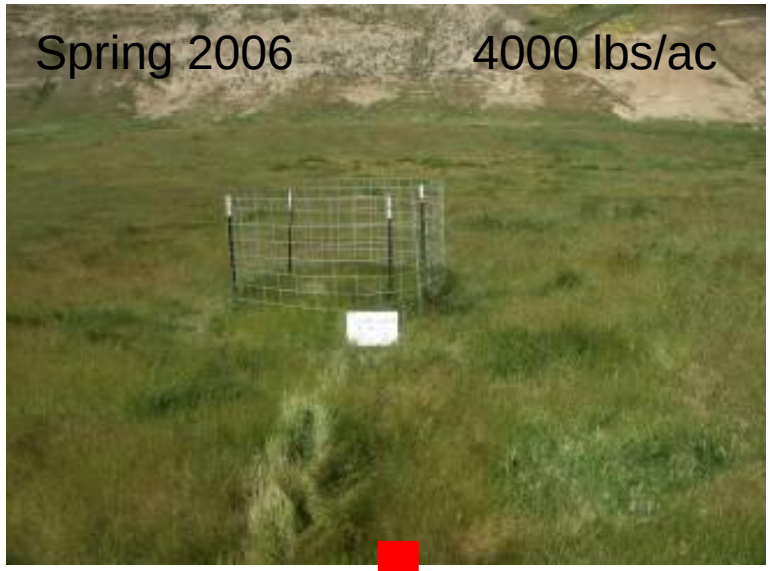
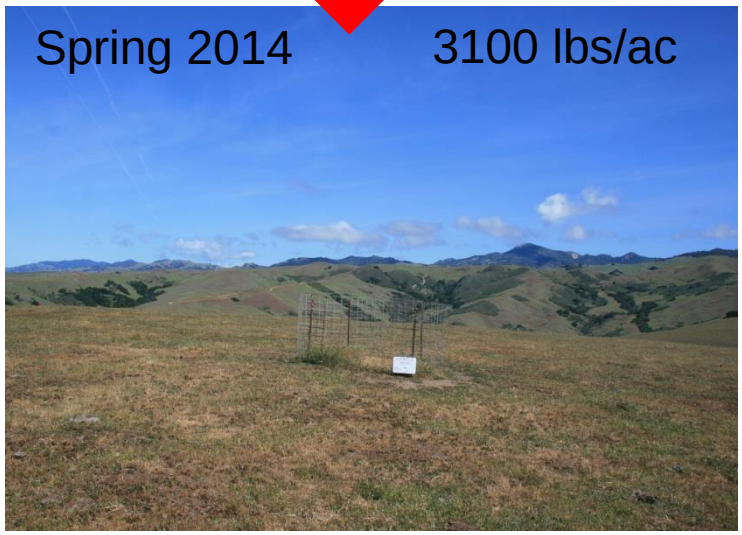
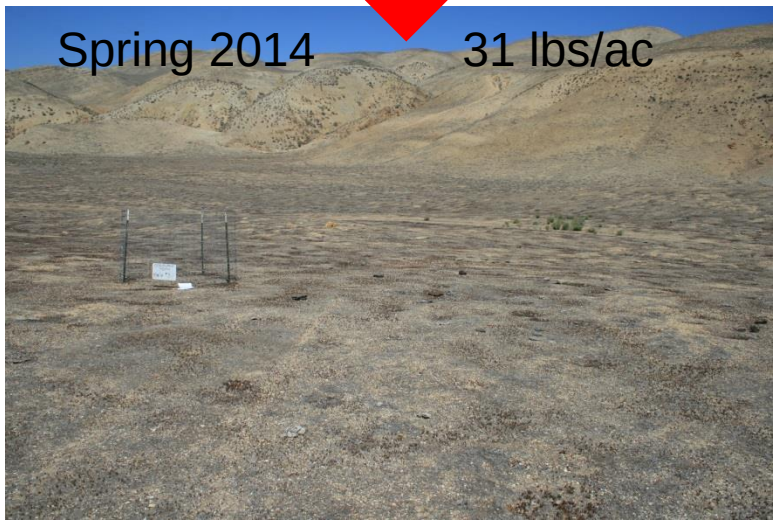
Wet Year



Coast **Variation from Coastal To Eastern** **Eastern**

Dry Year





Easy to determine drought when conditions are this extreme

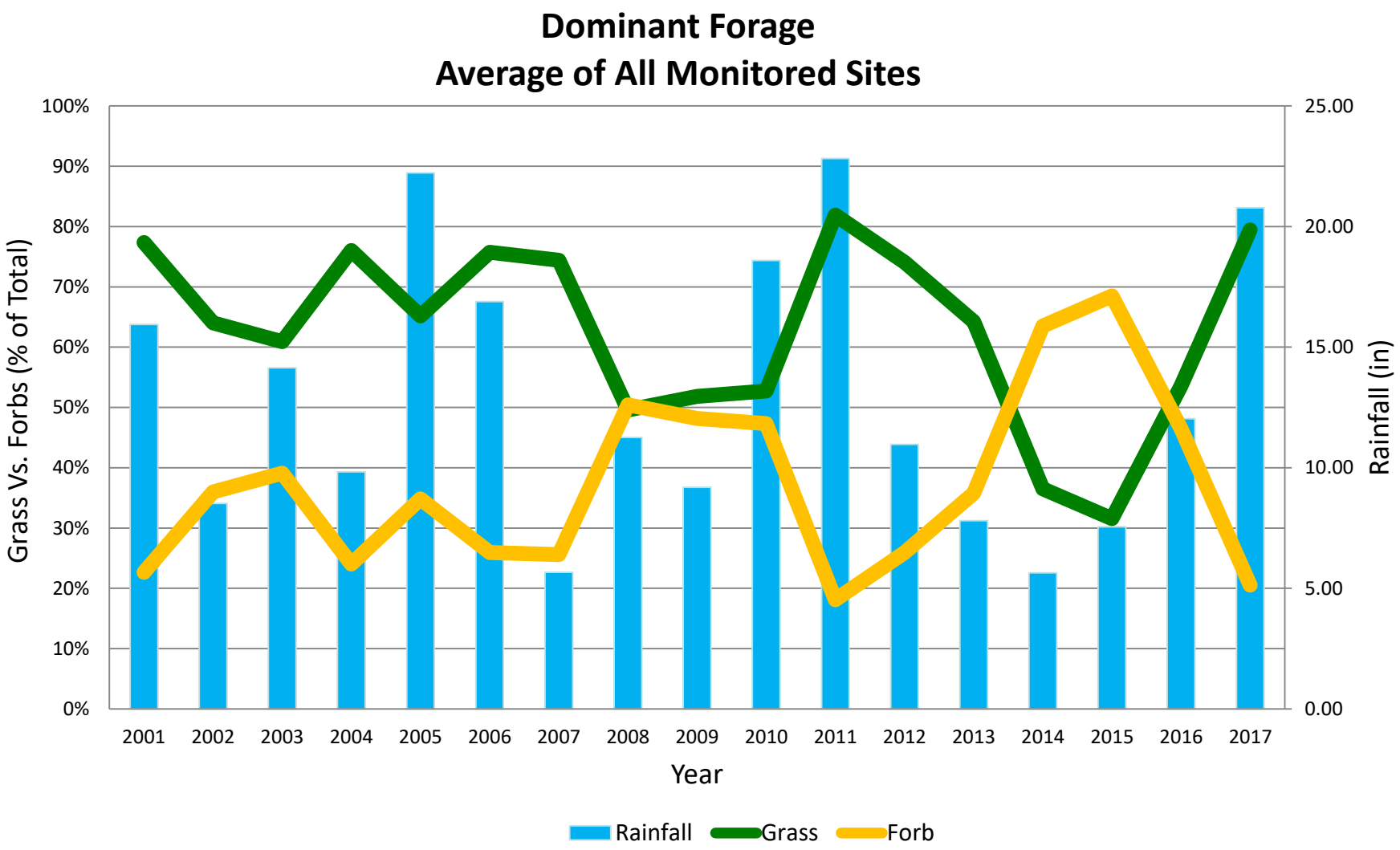
Forage Species Composition Changes

Desired Forage

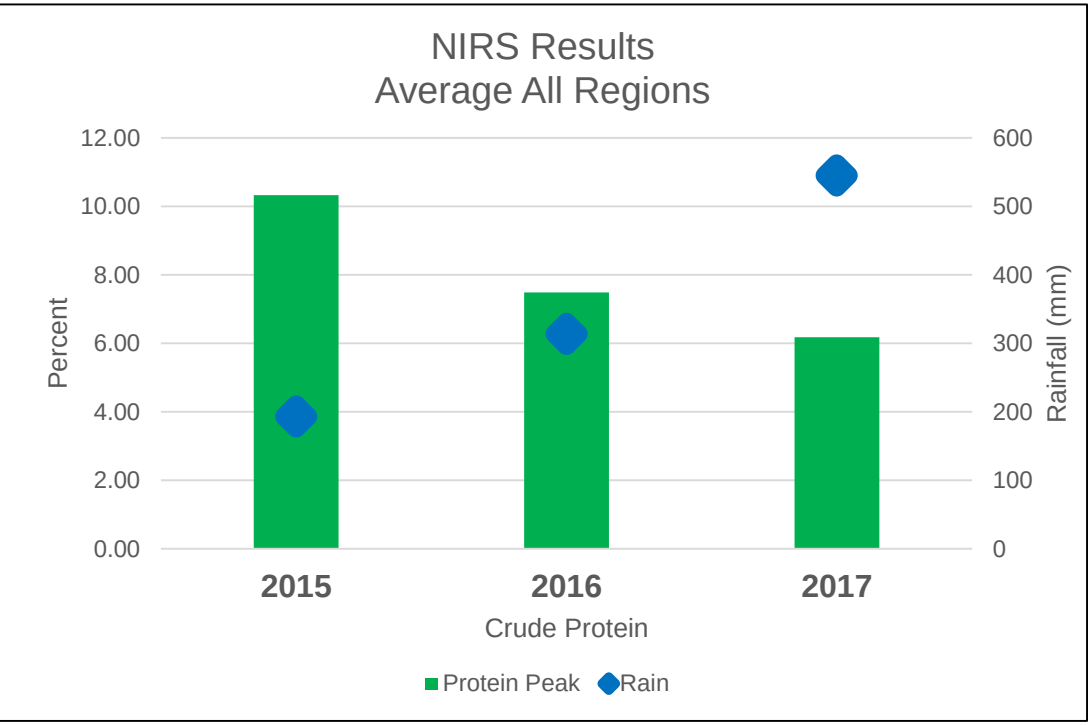
Forbs:
Filaree
Clovers
- Sub Clovers
- Bur Clover
- Acmispon (Deer Vetch)

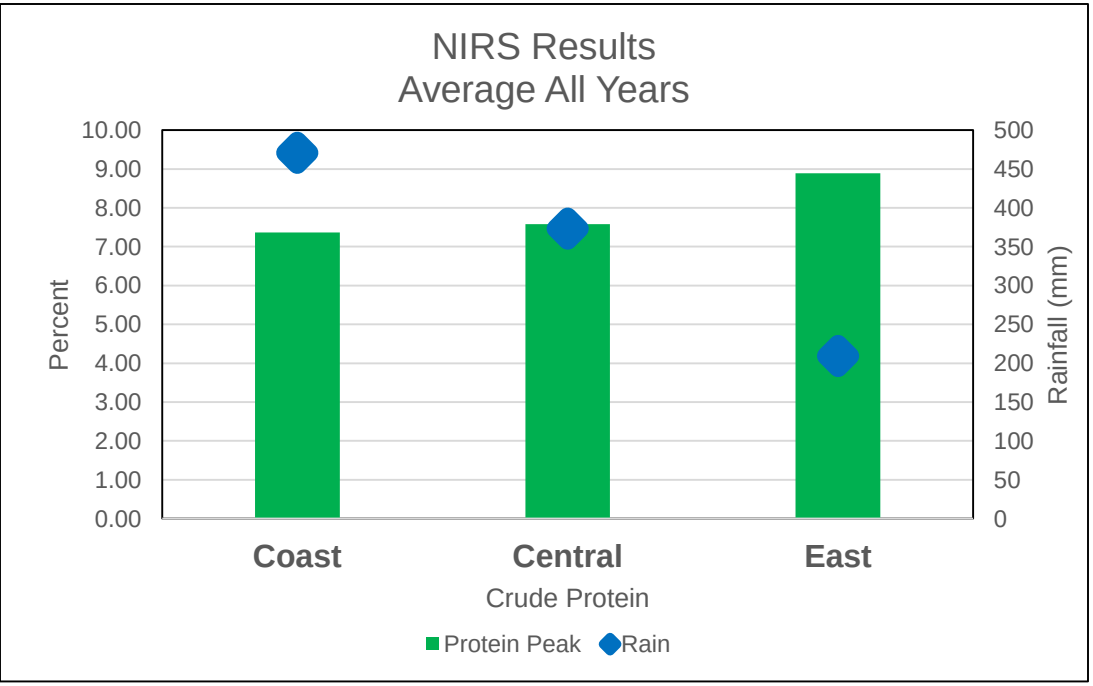
Grasses:
Soft Chess Brome
Annual Fescue
Wild Oats
Ryegrass
False Brome
Foxtail
Purple Needlegrass

Forbs Vs Grass and Rainfall



Forbs dominate during dryer years, while grass dominates during wetter years.


NIRS Results
Average All Regions
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Percent
600
500
400
300
200
100
0
Rainfall (mm)
2015
2016
2017
Crude Protein
Protein Peak
Rain

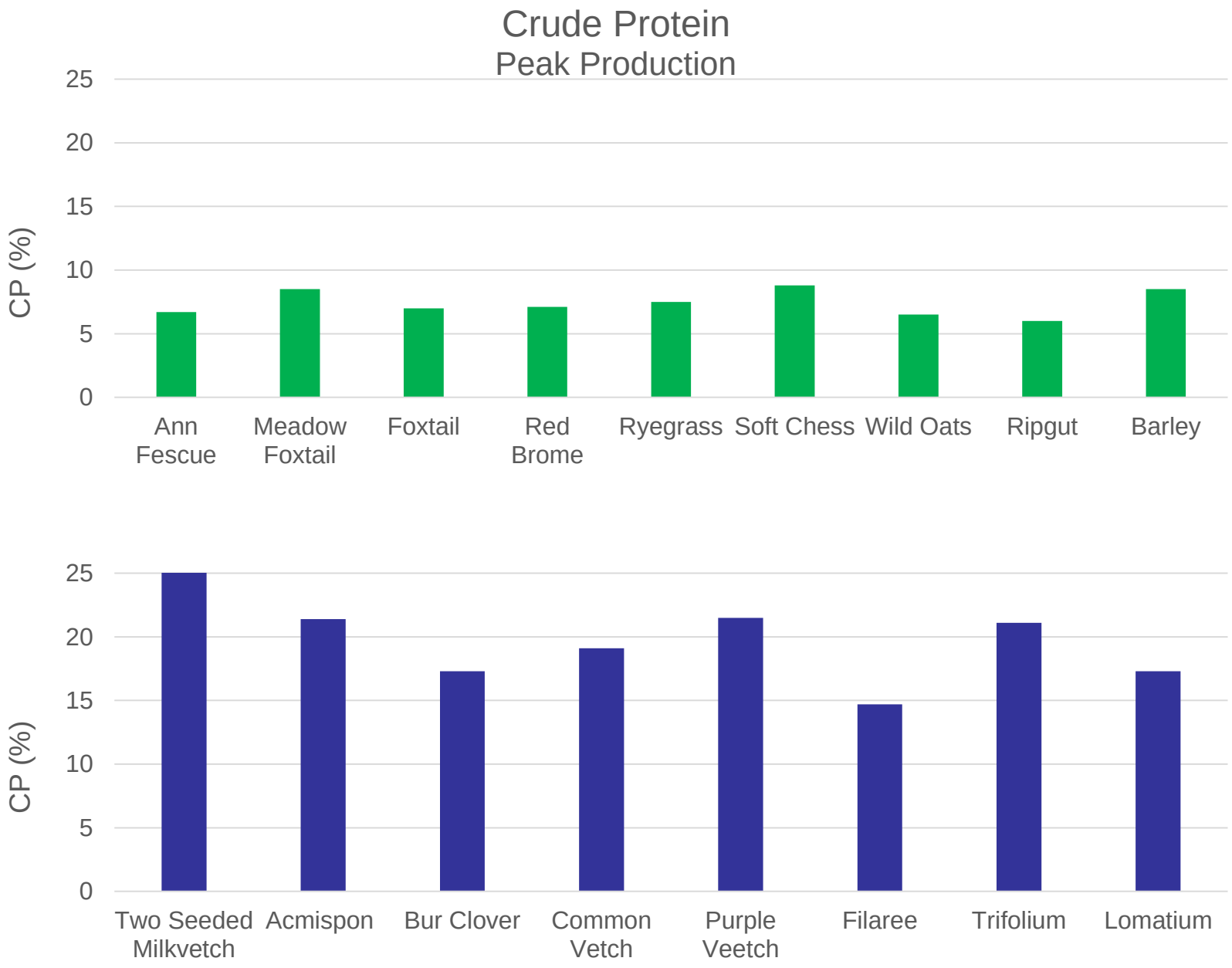

NIRS Results
Average All Years
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Percent
500
450
400
350
300
250
200
150
100
50
0
Rainfall (mm)
Coast
Central
East
Crude Protein
Protein Peak
Rain

NIRS results 2019:

Composite Samples, mixture of annual grasses and forbs

	Crude Protein (%)	
Pre-Peak	10.7	Vegetative State (Feb - Mar)
Peak	9.6	Seeded out, Green, No Shatter (April)
Post-Peak	5.8	Dry, Mostly Shattered (Early May)
Post-Rain	4.3	Following 1 to 1.5 - inch rainfall on dry plants (Late May)

Average of all samples, Partial data set as of August 30, 2019.


Crude Protein
Peak Production
CP (%)
25
20
15
10
5
0
Ann Fescue
Meadow Foxtail
Foxtail
Red Brome
Ryegrass
Soft Chess
Wild Oats
Ripgut
Barley
CP (%)
25
20
15
10
5
0
Two Seeded Milkvetch
Acmispon
Bur Clover
Common Vetch
Purple Veetch
Filaree
Trifolium
Lomatium

Crude Protein
Later Summer Plants

Mustard (Whole) (%)	Mustard (Leaves) (%)	Mustard Stems (%)	Malva (%)	Licorice Plant (%)	Morning Glory (%)	Purple Owls Clover (%)	Spike Weed (%)	Tocalote (%)	YST (%)
17.2	18.9	5	21.4	22.7	15.5	16.5	14.7	13	15

Tar Weed (%)	Coast Tar Weed (%)	Buckwheat (%)	Milk Weed (%)	Narrow Leaf Milkweed (%)	Marestail (%)	Russian Thistle (%)	Prostrate Verbena (%)	Heliotrope (%)	Dove Weed (%)
14.1	13.2	8.7	19.5	21.5	22.3	16.3	11.9	19.1	18.6

Annual Kochia (%)	Blue Curls (%)	Jimson Weed (%)	Curly Dock (%)	Spiny Button Celery (%)	Spanish Moss (%)	Fiddleneck (%)	Loco Weed (%)	Lupin (%)	Poison Hemlock (%)
19.8	16.9	22.8	9.6	9	11.5	11.4	17.7	21	9

Crude Protein
Trees & Shrubs

Chamise (%)	Coyote Brush (%)	Elderberry (%)	Golden Bush (%)	Mulberry (%)	Mule Fat (%)	Willow (%)
18.7	19	19.8	19.9	22.4	23.6	14

Blue Oak (%)	Live Oak (%)	Valley Oak (%)	Sycamore (%)	Almond (%)	Walnut (%)
17	13.4	17.6	17.8	15.6	8.9

But many summer plants are toxic:
Locoweed, Lupine, Fiddleneck, Milkweed, Elderberry, Jimsonweed, Heliotrope, Poison Hemlock, etc.

Available Feed Highly Variable
Nutrition Level Changing? – Forbs Vs Grass, also Forb and Grass Species Changes,

Seeing a lot more of: Red Brome, Ripgut, Foxtail, Black Mustard, Thistles (YST), Fiddleneck, Lupine, Astragulas spp., and Medusahead is coming, others (two seeded milkvetch, peppergrass, tansy mustard)?

Conclusions:

- Temperature
- Precipitation

Last 50 years:

Wet Years Wetter, one out of three are wet, Future?

Dry Years Drier, two out of three are dry, Future?

Temperature Increasing, Future?

"We have fire, flood, mud, and drought".

Ranching is becoming much more complex!