Adapting to Drought: Lessons from Long-Term Experiments and Ranchers' Experiences

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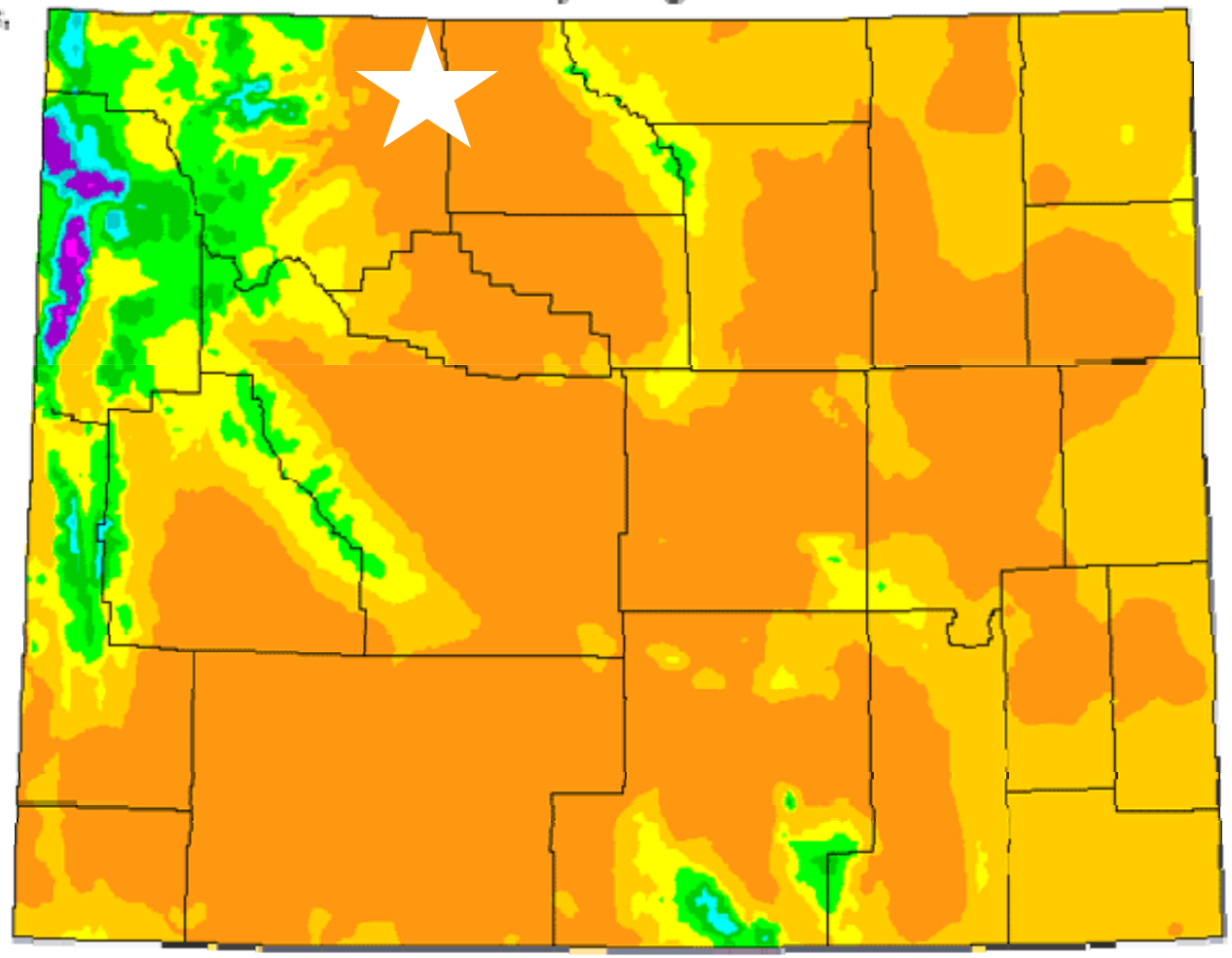
Average Annual Precipitation
Wyoming

Legend (in inches)

Under 14	46 to 54
14 to 22	54 to 62
22 to 30	62 to 70
30 to 38	Above 70
38 to 46	



This is a map of annual precipitation averaged over the period 1961-1990. Station observations were collected from the NOAA Cooperative and USDA-NRCS SnoTel networks, plus other state and local networks. The PRISM modeling system was used to create the gridded estimates from which this map was made. The size of each grid pixel is approximately 4x4 km. Support was provided by the NRCS Water and Climate Center.

For information on the PRISM modeling system, visit the SCAS web site at http://www.ocs.orst.edu/prism

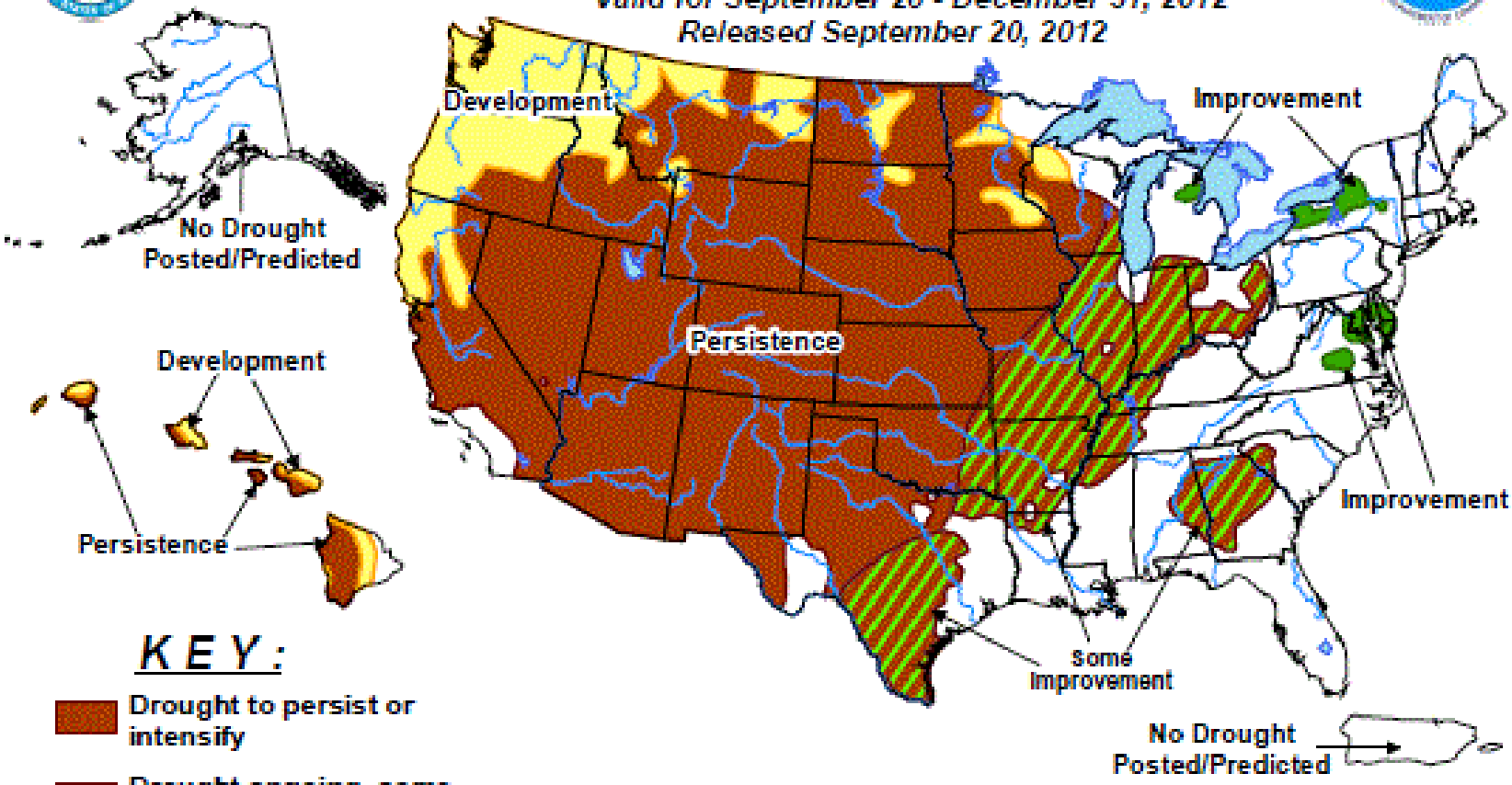
The latest PRISM digital data sets created by the SCAS can be obtained from the Climate Source at http://www.climatesource.com

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for September 20 - December 31, 2012

Released September 20, 2012



KEY:

- Drought to persist or intensify
- Drought ongoing, some improvement
- Drought likely to improve, impacts ease
- Drought development likely

Depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance. Use caution for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are approximated from the Drought Monitor (D1 to D4 intensity). For weekly drought updates, see the latest U.S. Drought Monitor. NOTE: the green improvement areas imply at least a 1-category improvement in the Drought Monitor intensity levels, but do not necessarily imply drought elimination.

Road Map

1. What do we know about drought's effects on livestock production based on **long-term data**?
2. What **drought management strategies** do Wyoming ranchers use?
3. Which drought management strategies are **successful**?

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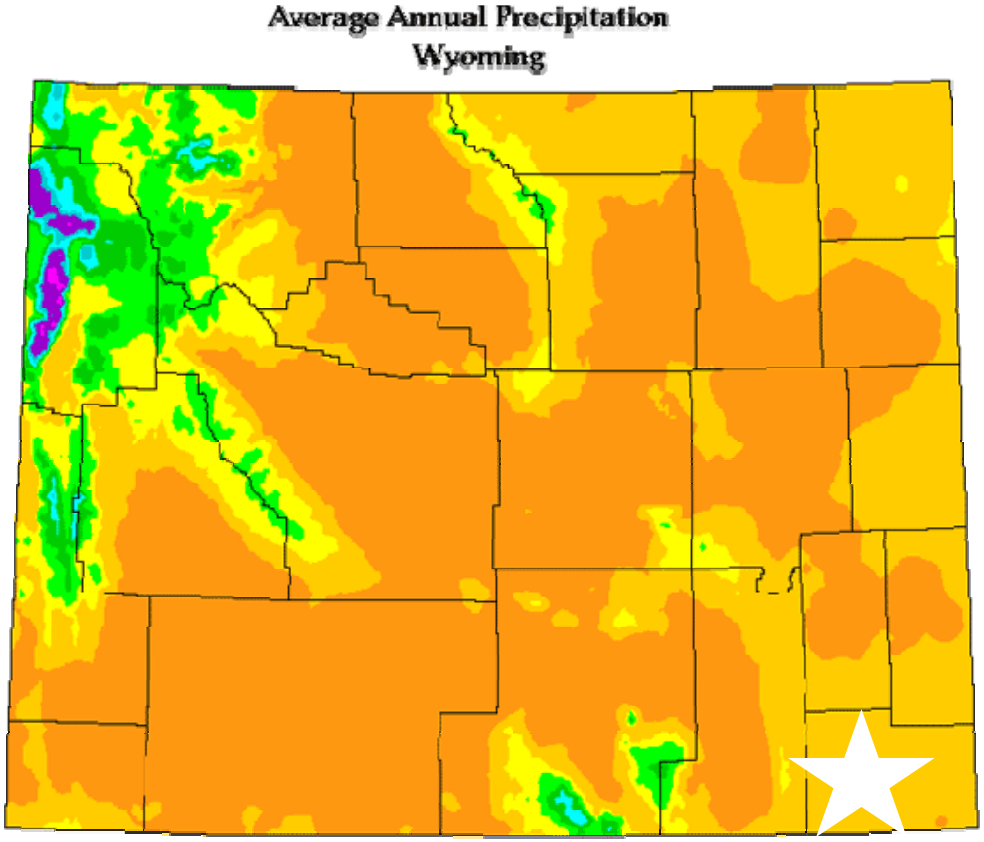
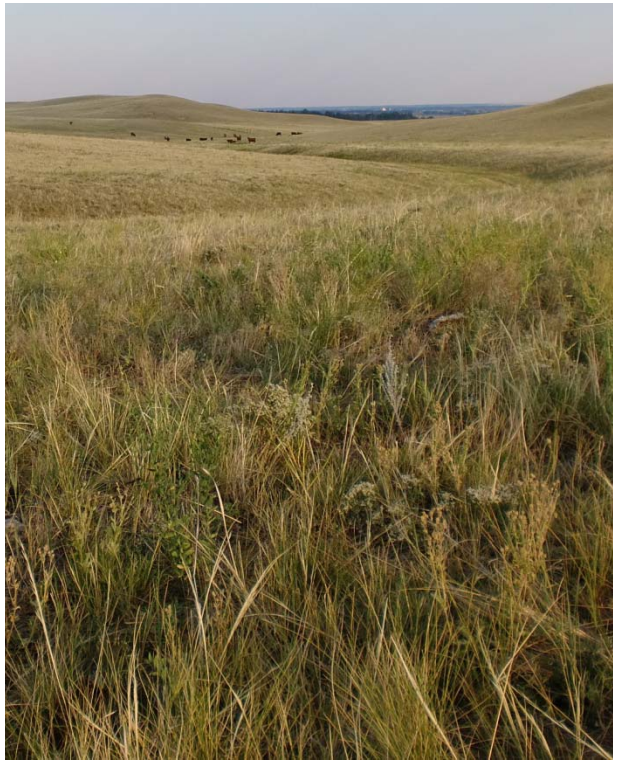
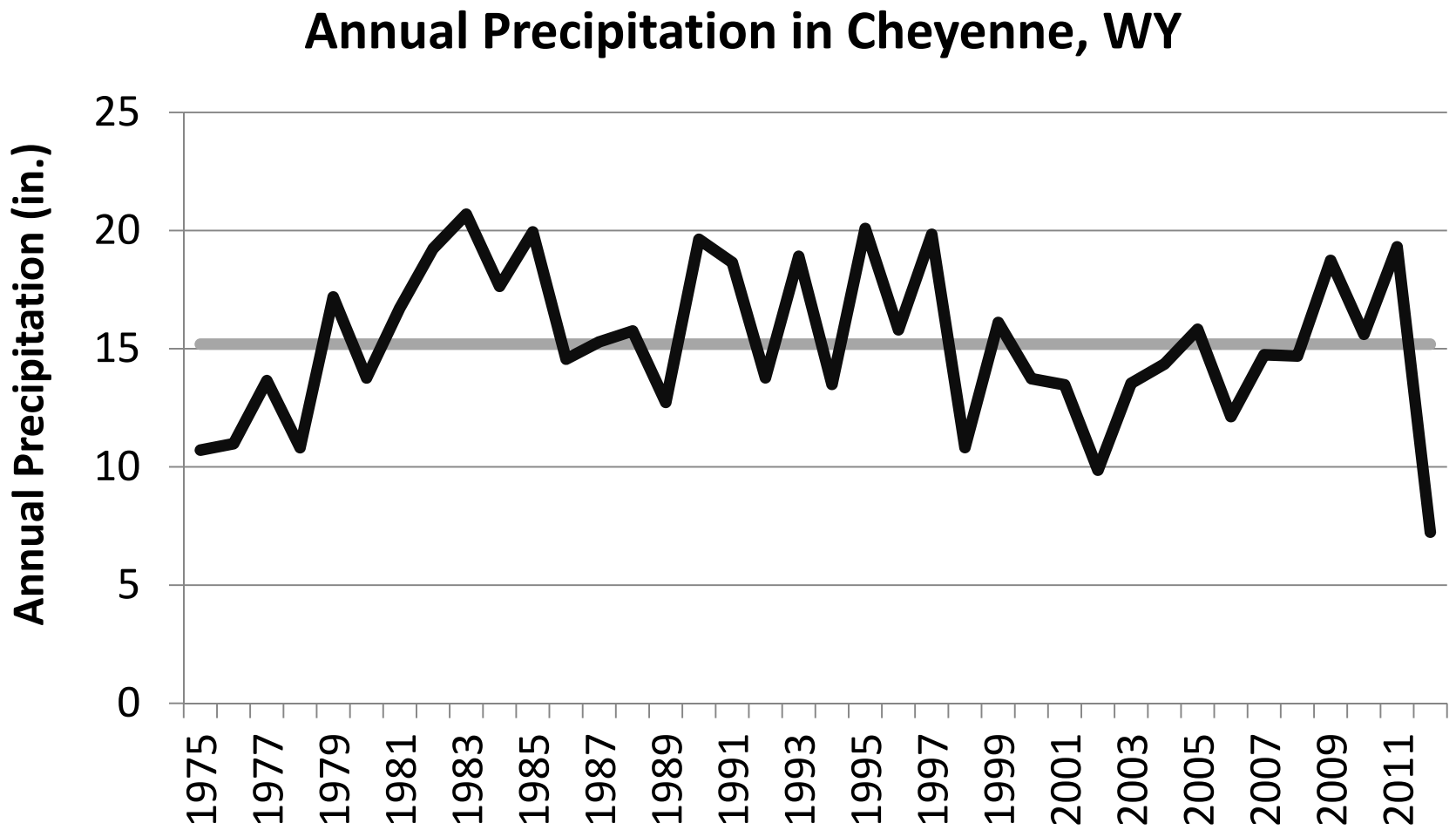




Yearly precipitation provides important context for managing drought



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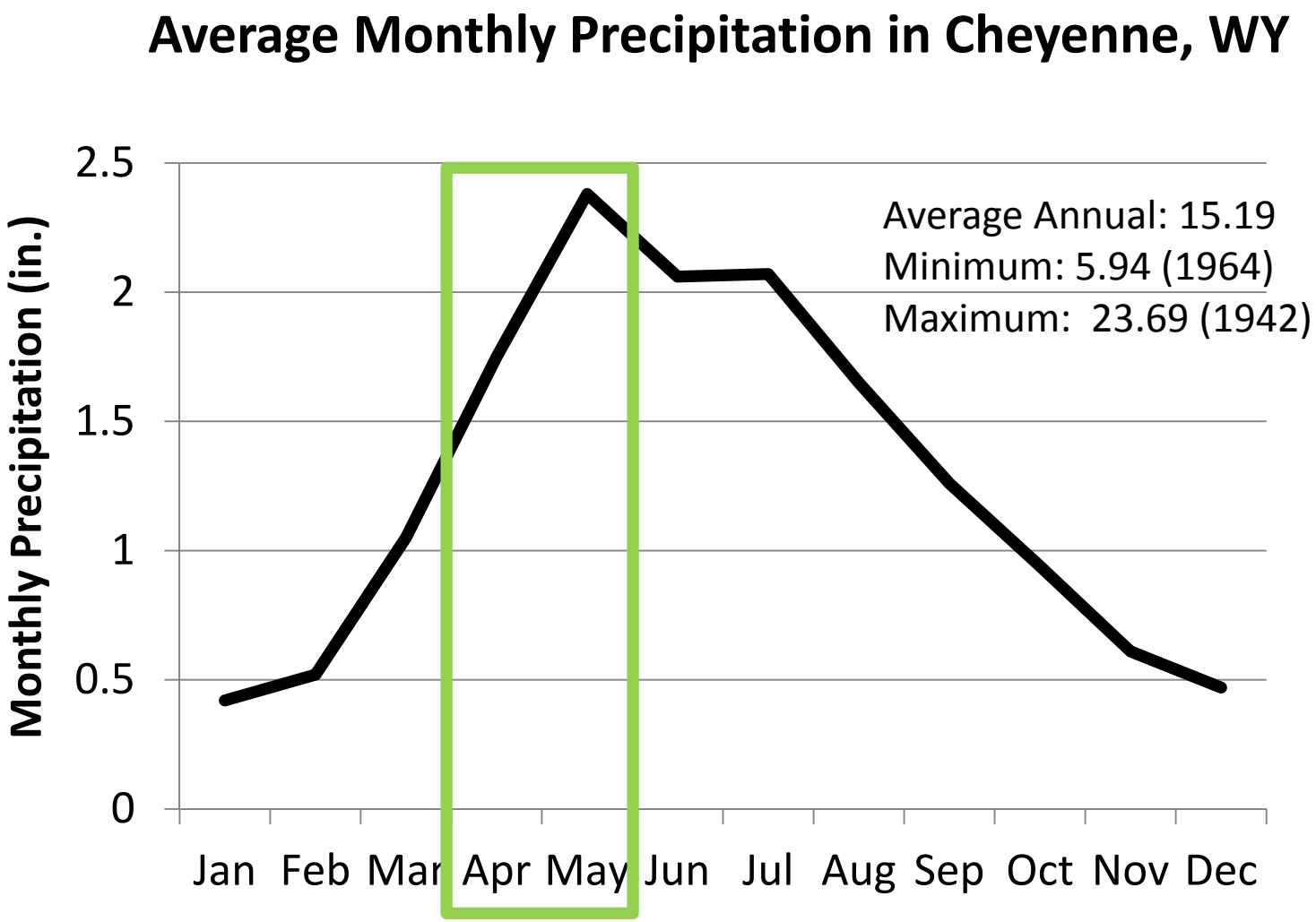

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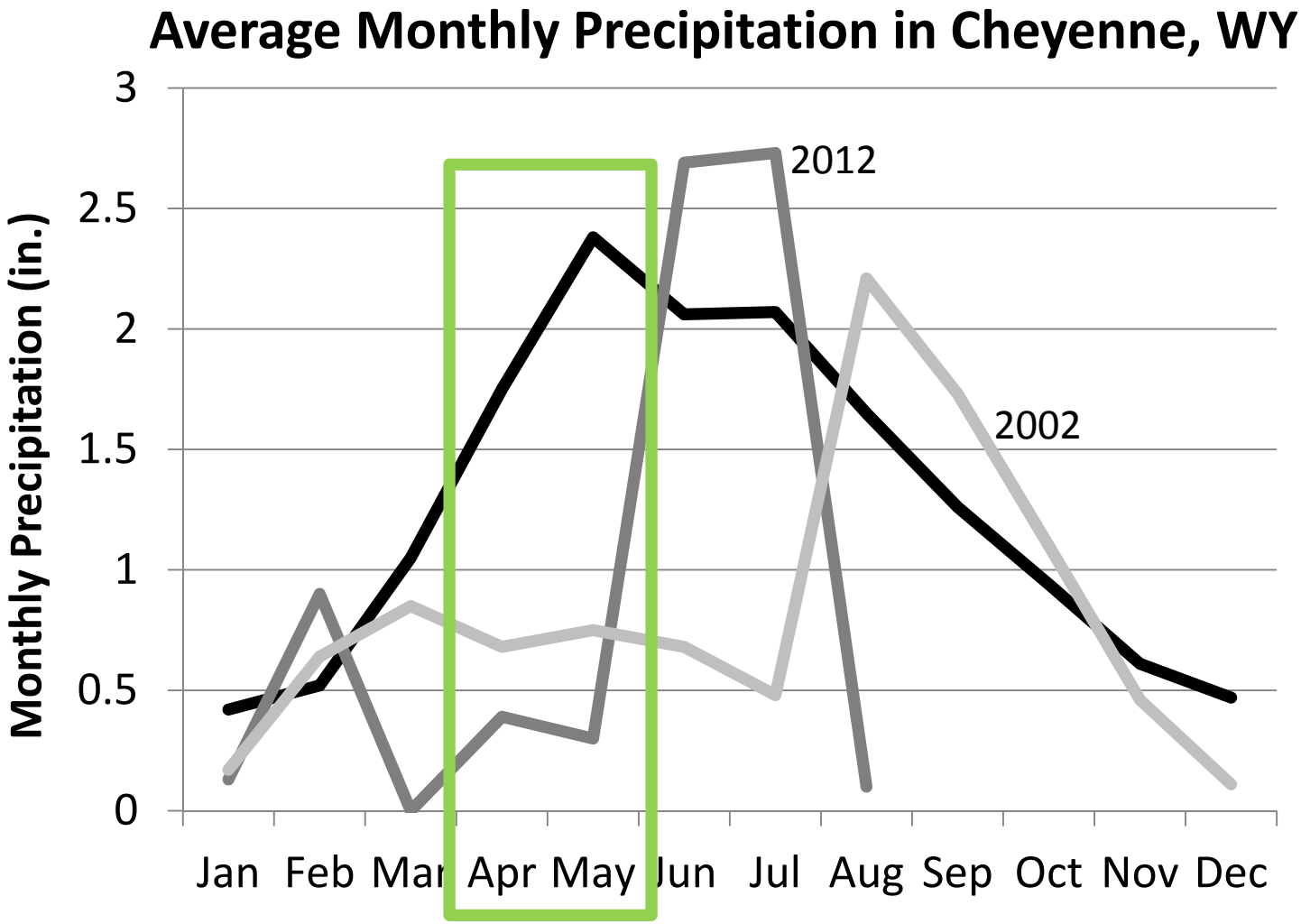
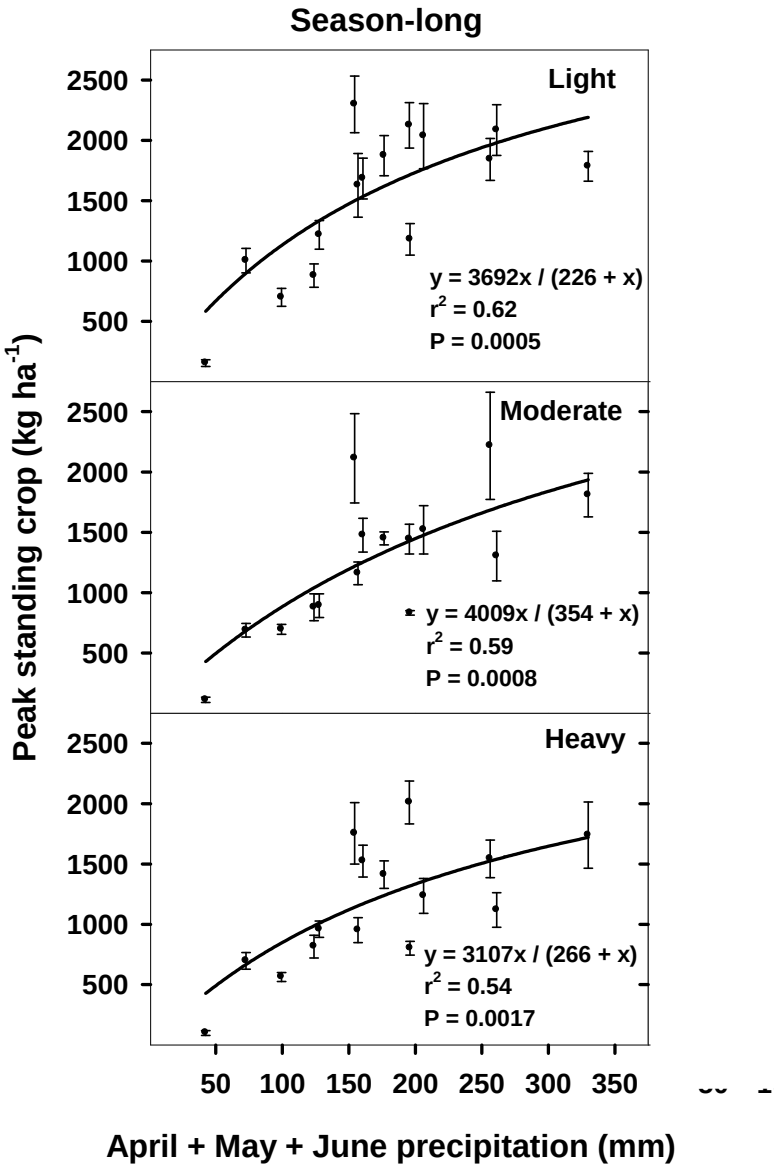


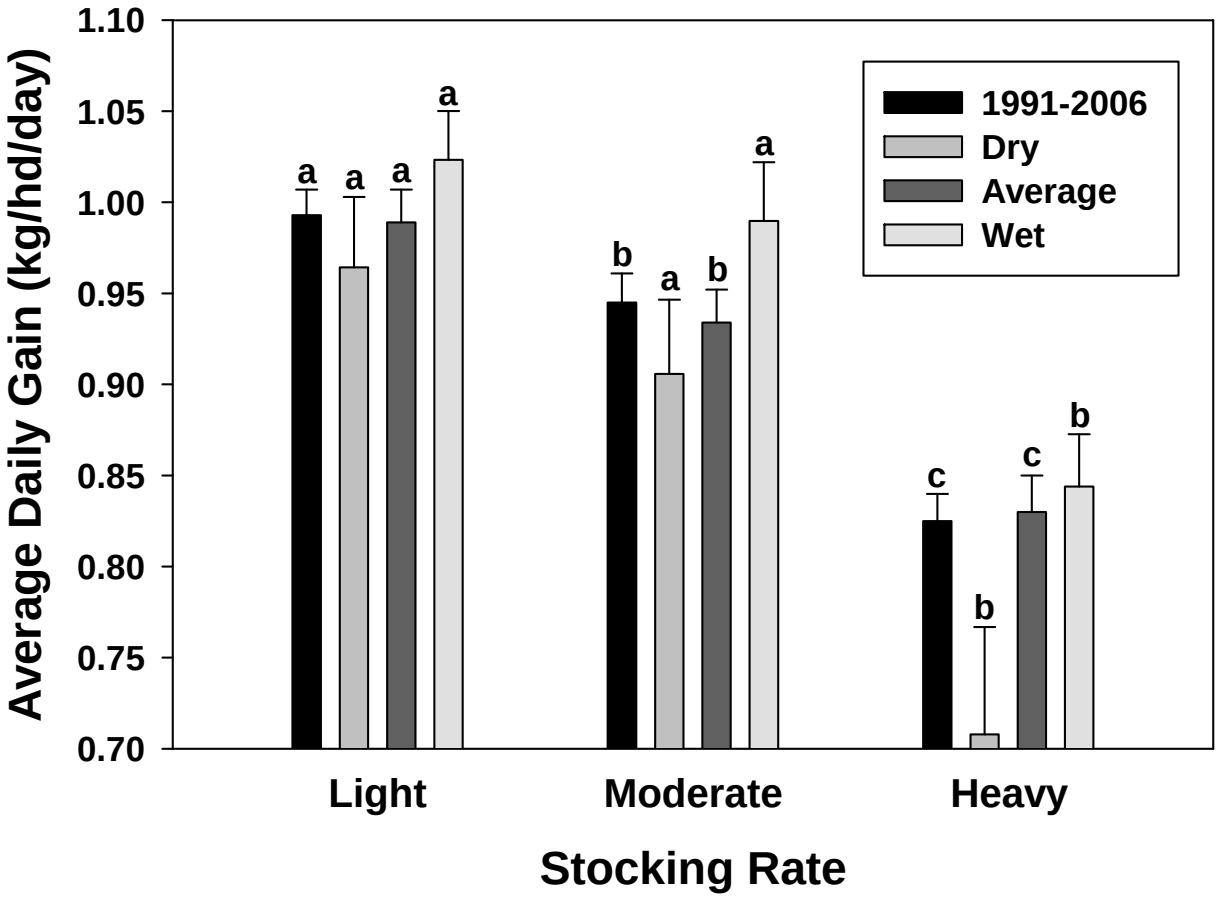
Less rain at certain times means less forage production



Derner and Hart 2007, REM

Drought decreases livestock gains…

…especially at high stocking rates



Derner et al. 2008, Livestock Science

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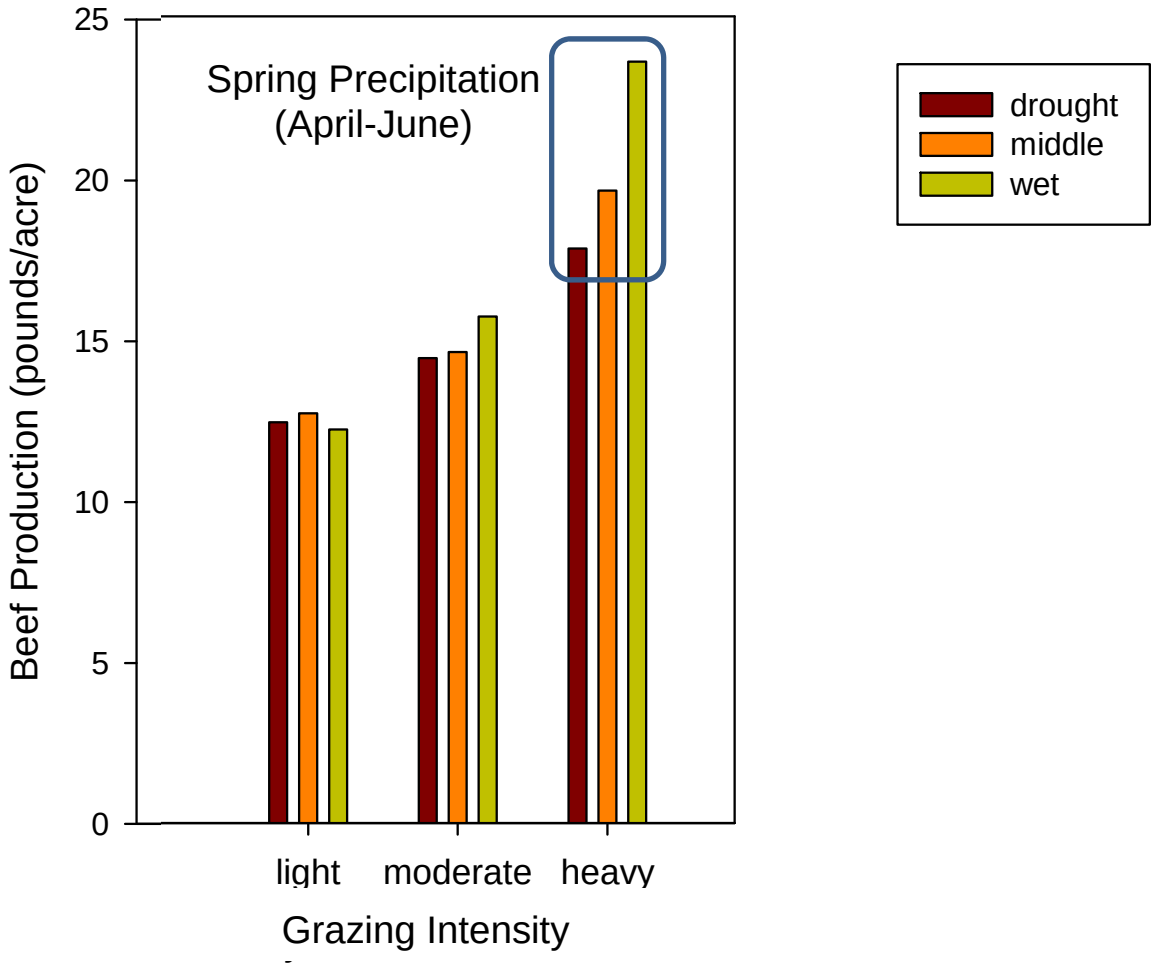
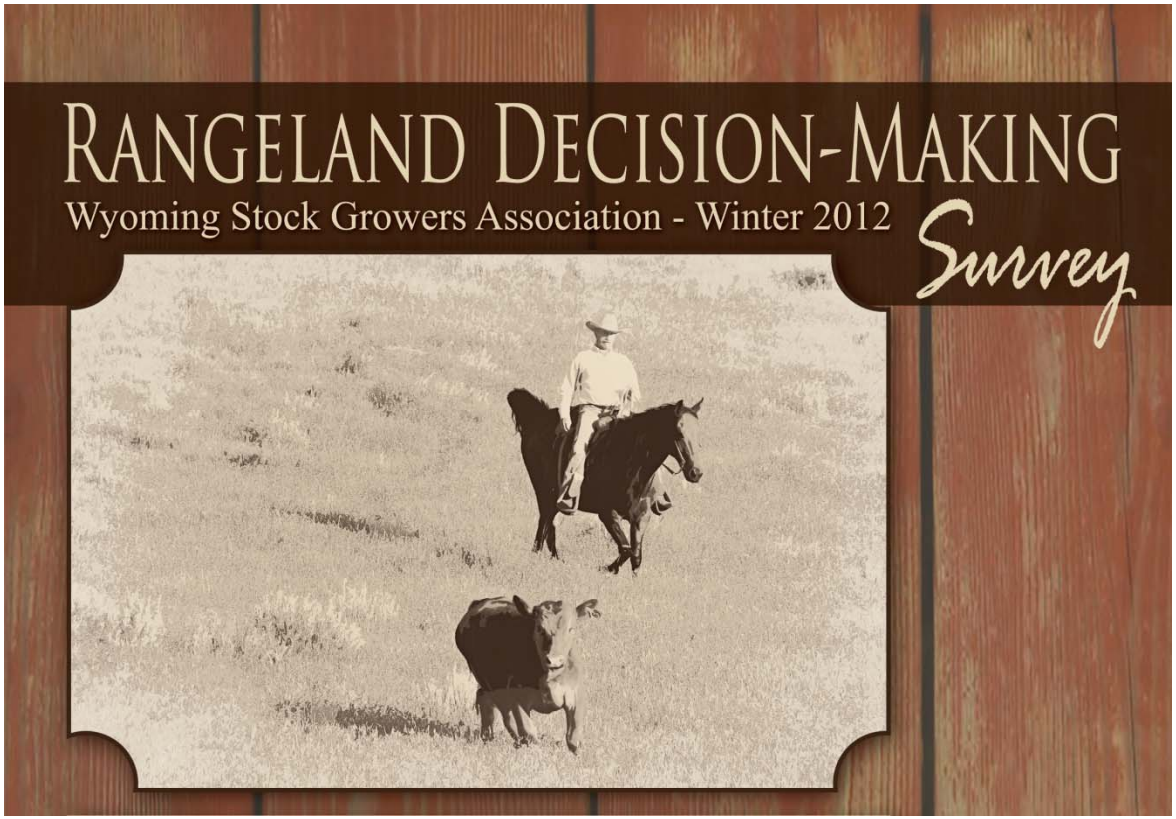
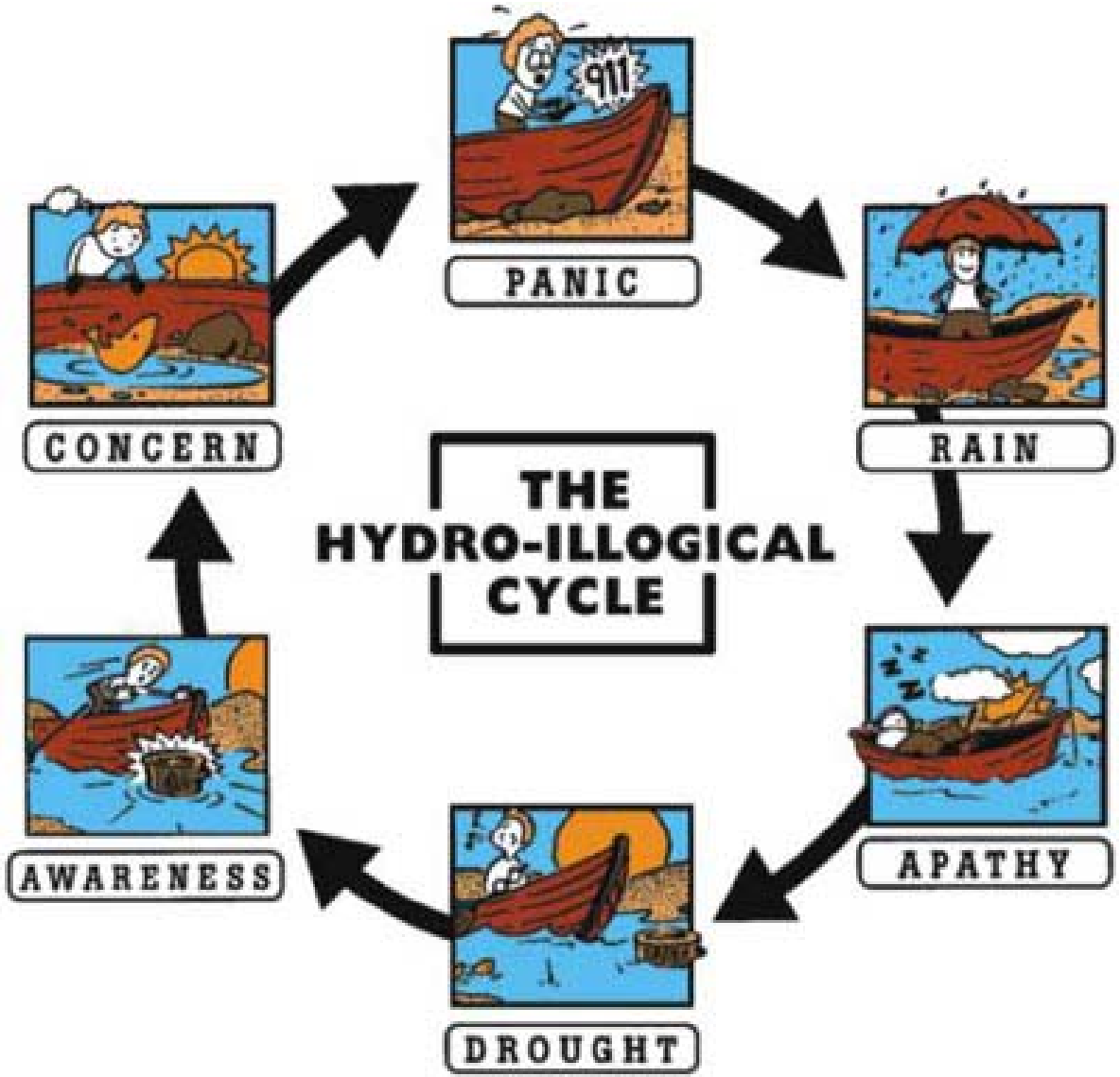


Derner et al. unpublished data

2. What **drought management strategies** do Wyoming ranchers use?





"…you can be an optimist and run a place like there will never be a drought or you can be more of a realist and figure you know the drought is going to happen and have that kind of be your norm."

Drought Impacts

During the last drought, which of the following were impacted more severely than expected?

Grazing capacity	75%
Profit	54%
Winter feed	53%
Irrigation water	47%
Weaning weights	36%
Reproductive rates	20%

Managing for Drought Impacts

Pro-active – 81%

Save grass – stock conservatively (48%), rest pastures (47%)

Reactive – 100%

Cut numbers– reduce herd size (80%), wean early (47%)

Find feed – buy feed (63%), rent more pastures (27%)

3. Which drought management strategies are **successful**?

Cheyenne, 2002 Drought

Drought as an opportunity to change

"I think one of the things that drought does, if you're a manager, instead of seeing it as an obstacle, you see it as a catalyst to make changes you might not ordinarily do."

"So the last drought was just 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."

Prepare: Stock conservatively

"…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."

Prepare: Maintain flexible stocking rates

OPTIMAL RANGELAND STOCKING DECISIONS UNDER STOCHASTIC AND CLIMATE-IMPACTED WEATHER

JOHN P. RITTEN, W. MARSHALL FRASIER, CHRISTOPHER T. BASTIAN, AND STEPHEN T. GRAY

Economics of Flexible Versus Conservative Stocking Strategies to Manage Climate Variability Risk

L. Allen Torell,[1] Subramanian Murugan,[2] and Octavio A. Ramirez[3]

- It is more profitable to stock higher when there is more forage and destock when there is less
- Stockers provide more flexibility with a greater profit margin than cow-calf pairs

Prepare: Yearlings provide flexibility

"...if you have more of a diverse type of livestock your options of being able to de-stock are so much easier so when you have this abrupt drought...when you have a diverse group of cattle so that you know, you're not looking at trying to get rid of pairs, which is hard to do right now. Yearlings are a lot easier to unload, so that's just another reason I have gone the way I'm going is it makes you more flexible in those decisions."

Prepare: Reserve forage by resting pastures

"One [drought management strategy] is leaving certain pastures, complete rest, knowing on a drought that I may not actually be able to leave them as a full rest. But I will have that added forage towards the end of the year that might make the difference of coming through. And of course if it's had the whole season to grow and mature even then you at least still gave it the chance to fully grow and mature and go to seed before using it."

Respond: Reduce numbers

"Like this year, as fast as we went through the first couple pastures…I started selling cattle the first of May…You know if you don't have the moisture by the 15th of April you're probably in trouble. We were really dry at that point so we said we would start selling the yearlings now. Then we culled, got rid of all the dries we would normally keep shortly thereafter…We sold all the cows with really young calves, one that hadn't calved in like five or six years... so while you're working with your grass you have to be working with your inventory at the same time."

Richard Mohr Collection

Respond: Monitor, and move livestock according to available forage

"…if you get to recognizing the country well enough you pretty well know by April if you're not looking so good."

"[During drought] we actually use some of the fall pastures earlier, and we'll get out of the early spring pastures earlier. Sometimes we'll choose to go to some of our forest lands later. Or in some cases, and this is one of those years, we'll go up earlier if the conditions are right…That gives us the ability to rebound on some of this."

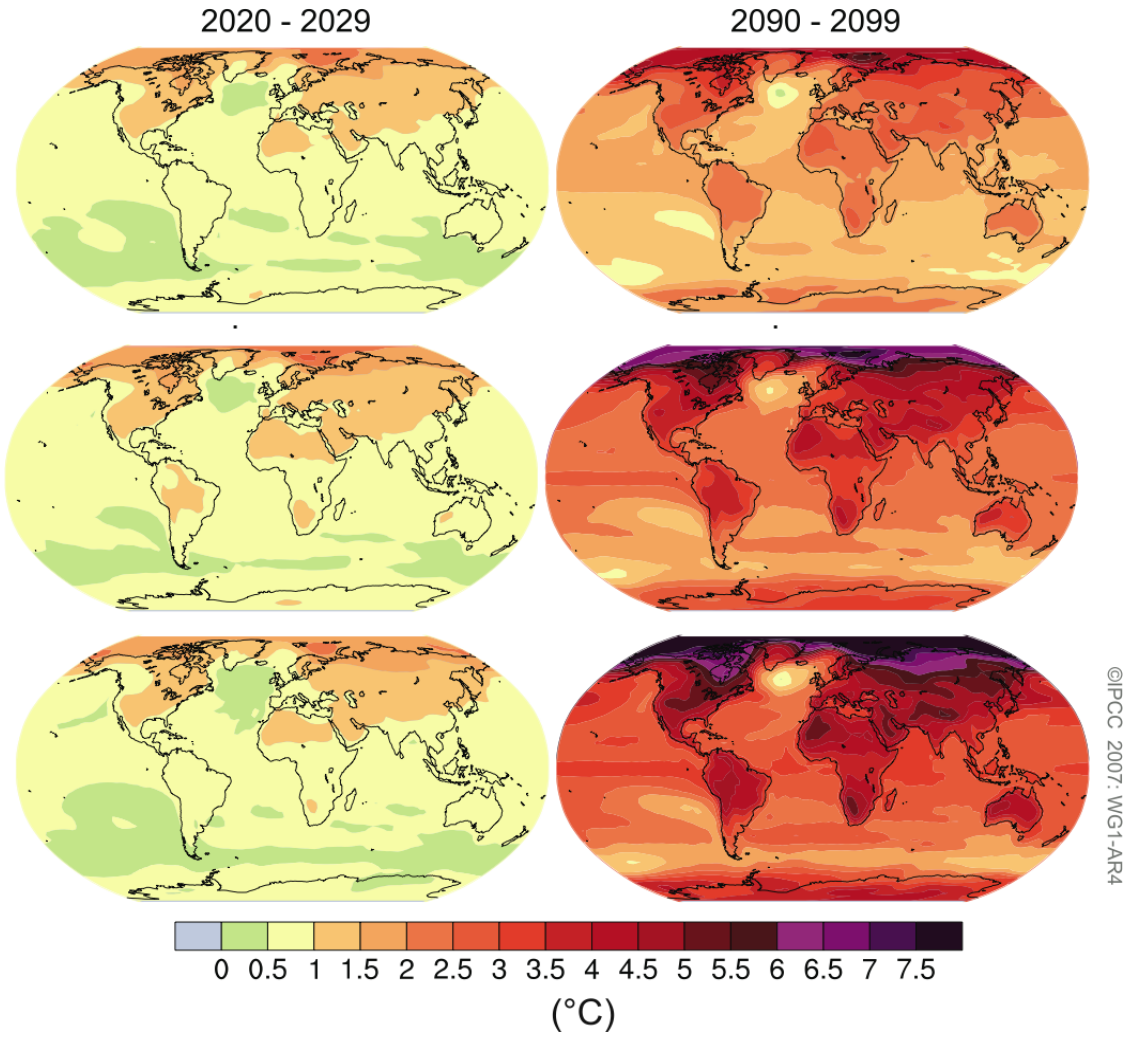
Conclusions

- Precipitation timing matters – make decisions at critical dates
- Drought impacts on livestock gains and production are greater at higher stocking rates
- Many producers have similar drought responses – doing something different can give you an advantage
- Drought can be an opportunity to make changes to your operation – increase flexibility

Questions?

Contact: Emily Kachergis
307-772-2433 x 105
Emily.Kachergis@ars.usda.gov

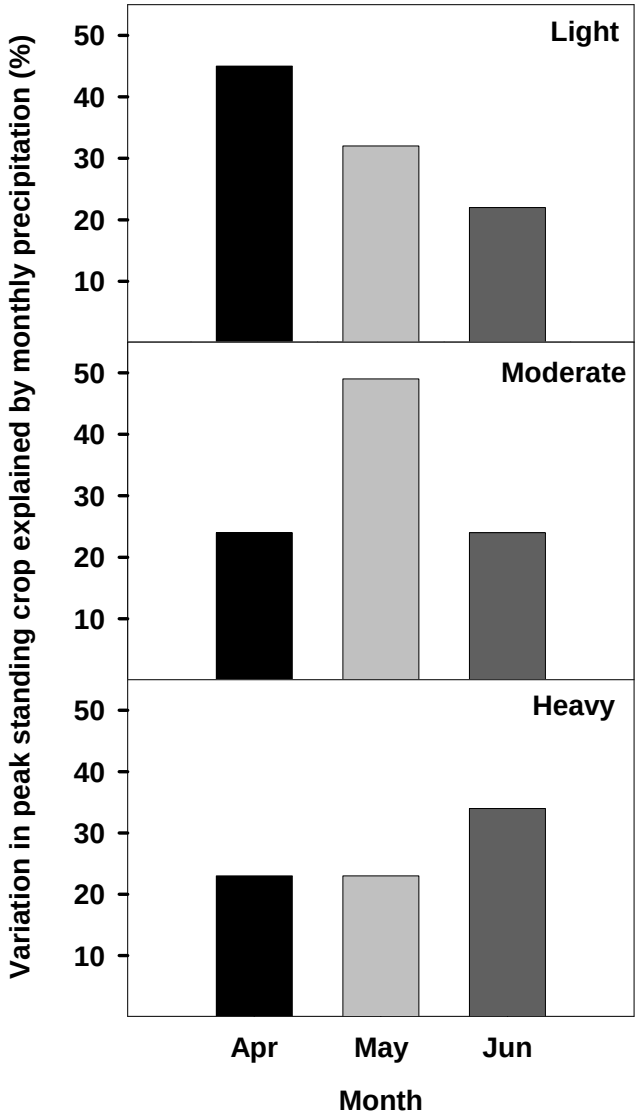
WHAT WE KNOW: Global average surface temperature has increased 0.74 C (1.2 F) in the last hundred years. Rate of warming has doubled in the past 50 years.



Predictions indicate future accelerated & extreme warming.

IPCC 2007: WG1-AR4

Rain interacts with stocking rate to determine forage production



Derner and Hart 2007, REM

Prepare: Maintain flexible stocking rates

Optimal Rangeland Stocking Decisions Under Stochastic and Climate-Impacted Weather

John P. Ritten, W. Marshall Frasier, Christopher T. Bastian, and Stephen T. Gray

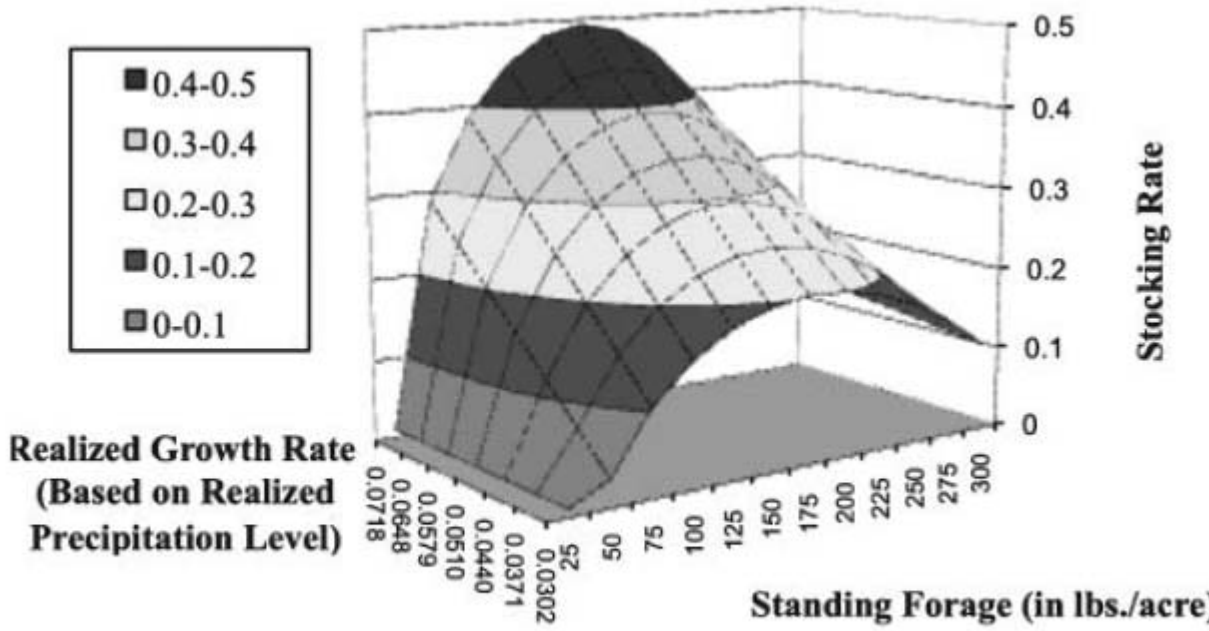


Figure 1. Optimal stocking rates across standing forage and weather realizations.

Prepare: Maintain flexible stocking rates

Economics of Flexible Versus Conservative Stocking Strategies to Manage Climate Variability Risk

L. Allen Torell,[1] Subramanian Murugan,[2] and Octavio A. Ramirez[3]

Table 4. Summary of scenario results for economic variables, herd sizes, and forage use.

		Scenario				
		Conservative upper stocking rate allowed: 615 AUY[1]			Flexible upper stocking rate allowed: no max	
	Units	1	2	3	4	5
Enterprises allowed[2]		Cow–calf	Multiple	Multiple	Cow–calf	Multiple
Forage variability (SD)[3]		200	200	0	200	200
Land, forage use, and optimal average herd size						
Optimal average total AUY	AUY	541	537	615	682	870
Optimal average cow herd AUY	AUY	541	270	518	682	213
Optimal average yearling AUY[4]	AUY	0	267	97	0	657
Economic variables						
Annual gross sales	$ total	192 229	520 803	345 959	240 790	1 224 941
Variable costs	$ total	93 182	413 805	201 032	127 349	1 065 799
Total costs[5]	$ total	137 103	457 726	244 953	171 270	1 109 720
Annual net returns						
Average	$ total	55 126	63 076	101 006	69 520	115 221
Average	$ · AUY^{-1}	102	117	164	102	132
SD	$ total	79 855	70 719	47 265	109 580	165 104
Frequency of negative	%	22	18	0.2	26	25

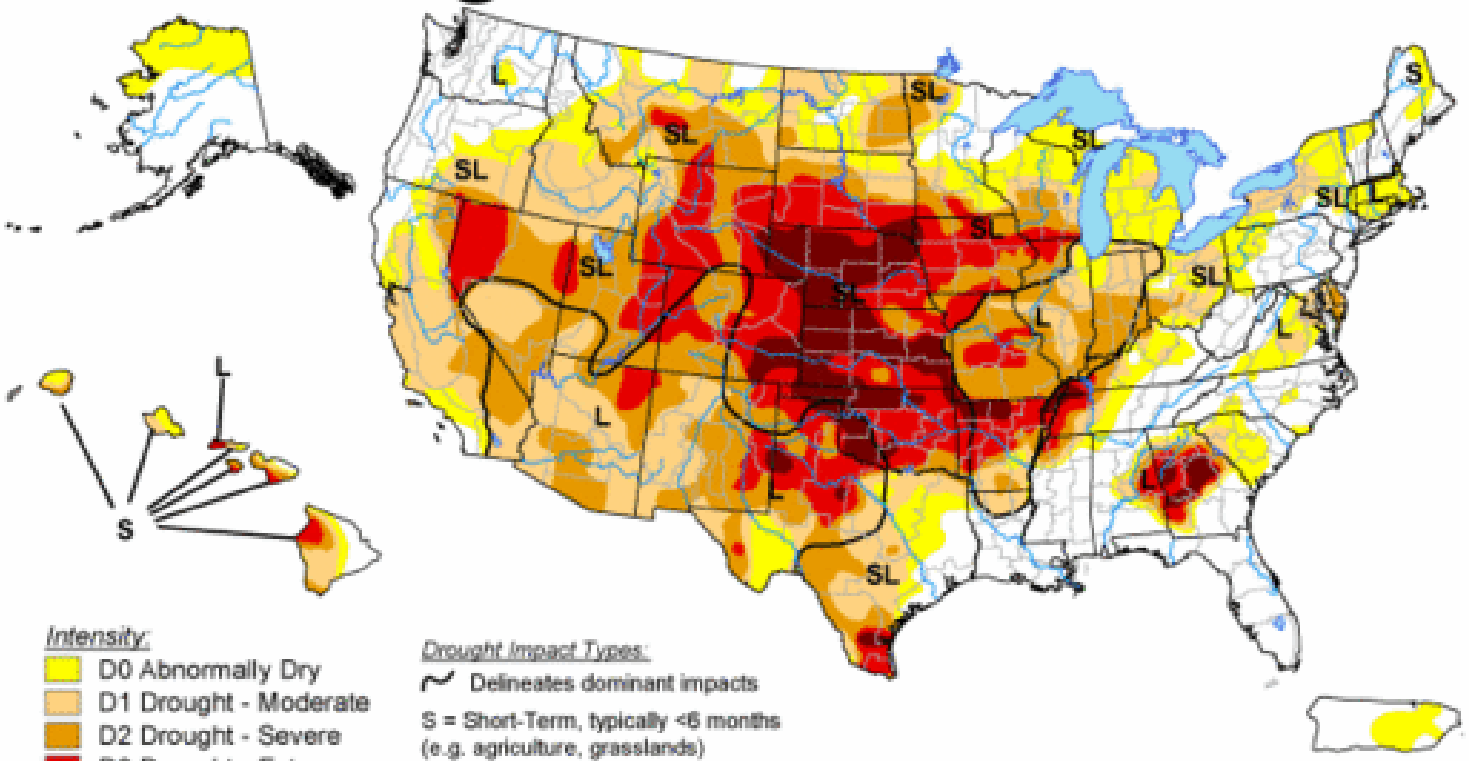
Respond: Monitor as you go

"…if you get to recognizing the country well enough you pretty well know by April if you're not looking so good. We've had years where we've had really good moisture and all of the sudden June it shuts off and dry, I mean that's pretty normal really. If you're not figuring on that then you're not planning very good. The years where you get rain through June and July and you don't dry up until August than that's kind of phenomenal really. That just adds to your benefit though really."

Justin’s slides

U.S. Drought Monitor

September 4, 2012
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, September 6, 2012

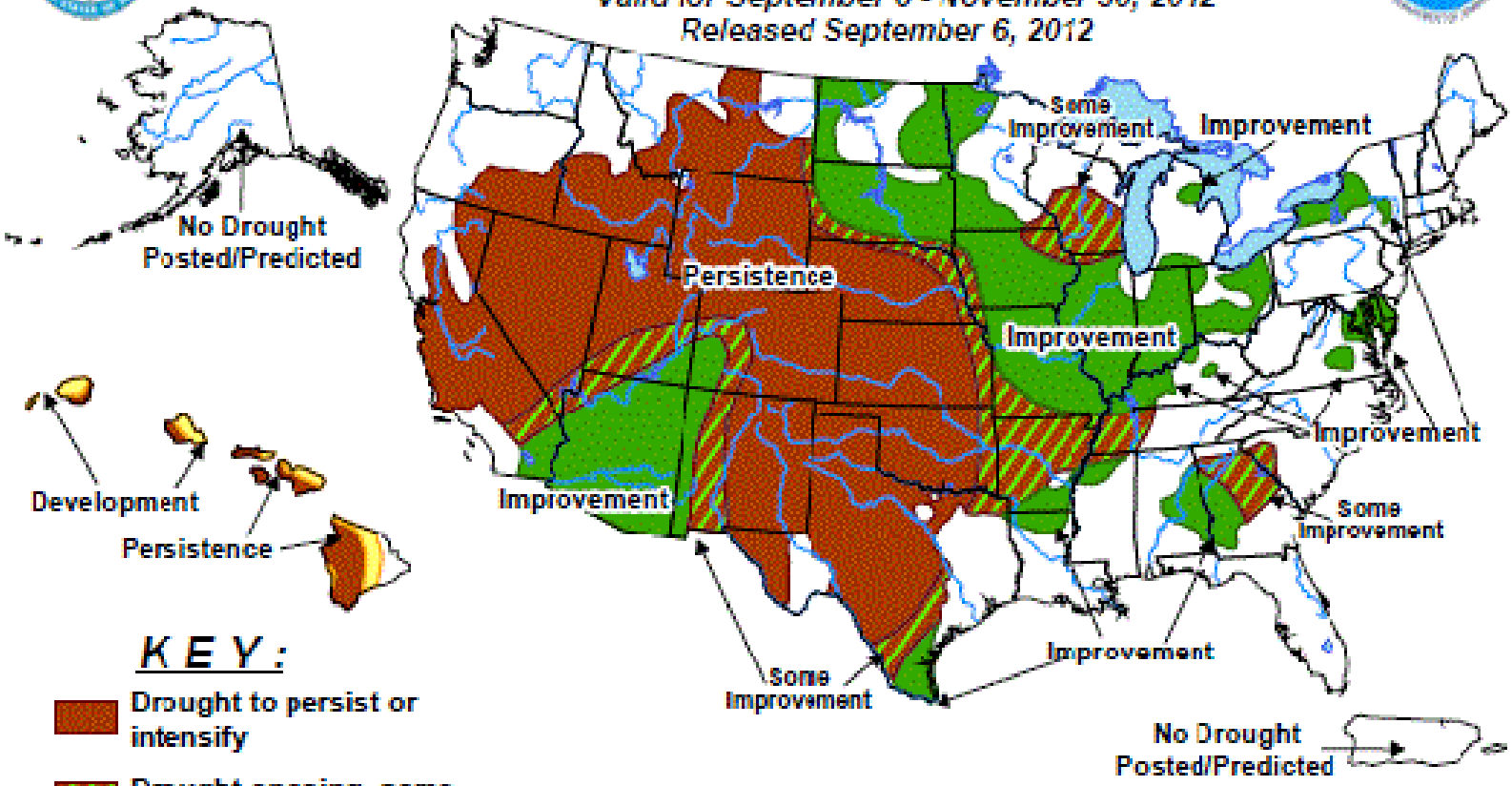
Author: Brian Fuchs, National Drought Mitigation Center

U.S. Seasonal Drought Outlook

Drought Tendency During the Valid Period

Valid for September 6 - November 30, 2012

Released September 6, 2012



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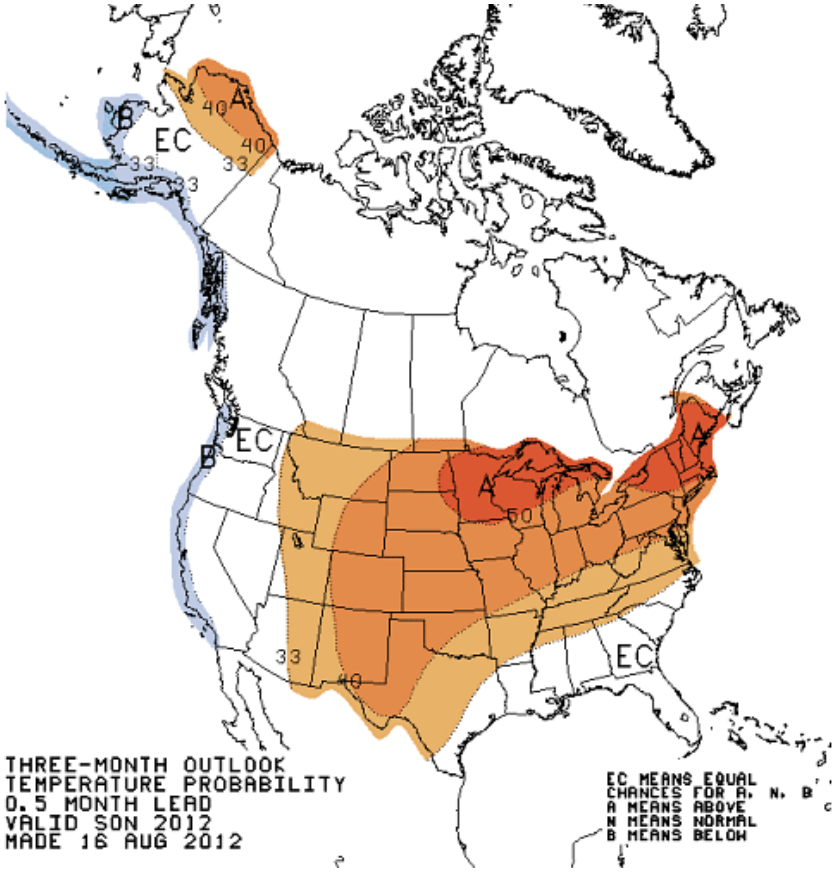
THREE-MONTH OUTLOOK
TEMPERATURE PROBABILITY
0.5 MONTH LEAD
VALID SON 2012
MADE 16 AUG 2012
EC MEANS EQUAL CHANCES FOR A, N, B
A MEANS ABOVE
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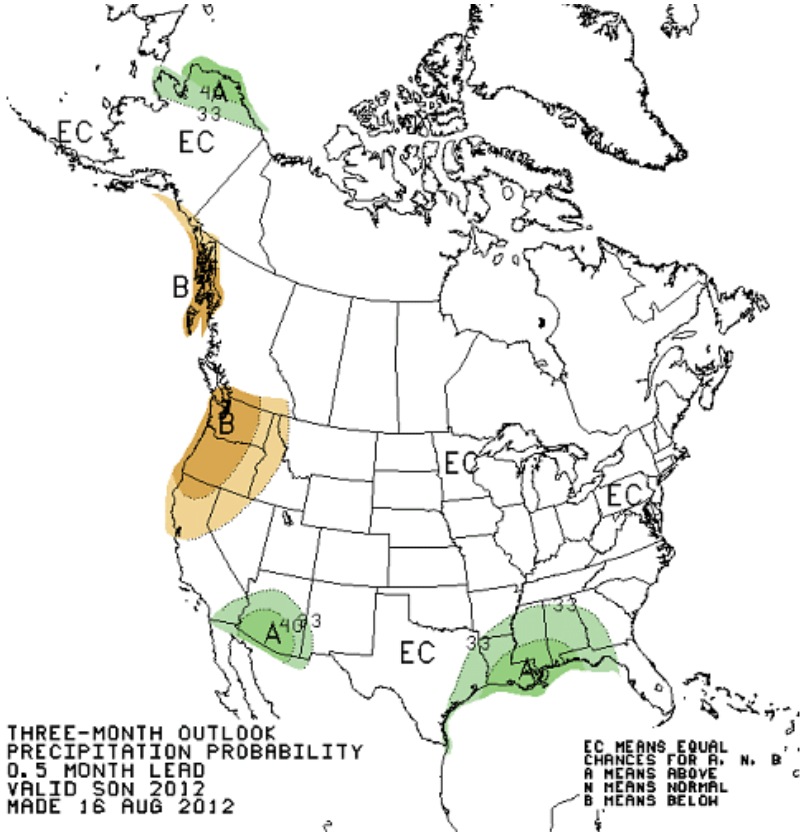
THREE-MONTH OUTLOOK
PRECIPITATION PROBABILITY
0.5 MONTH LEAD
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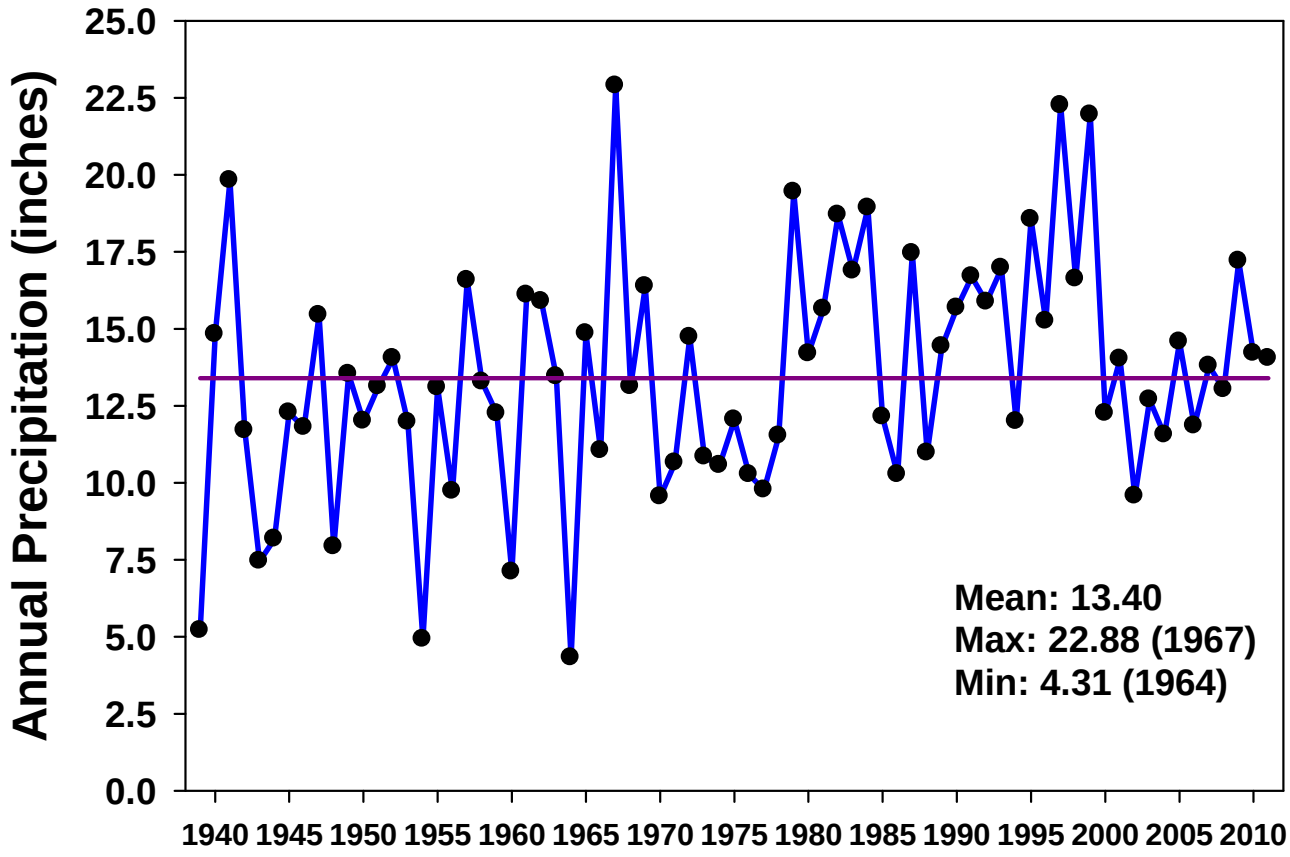
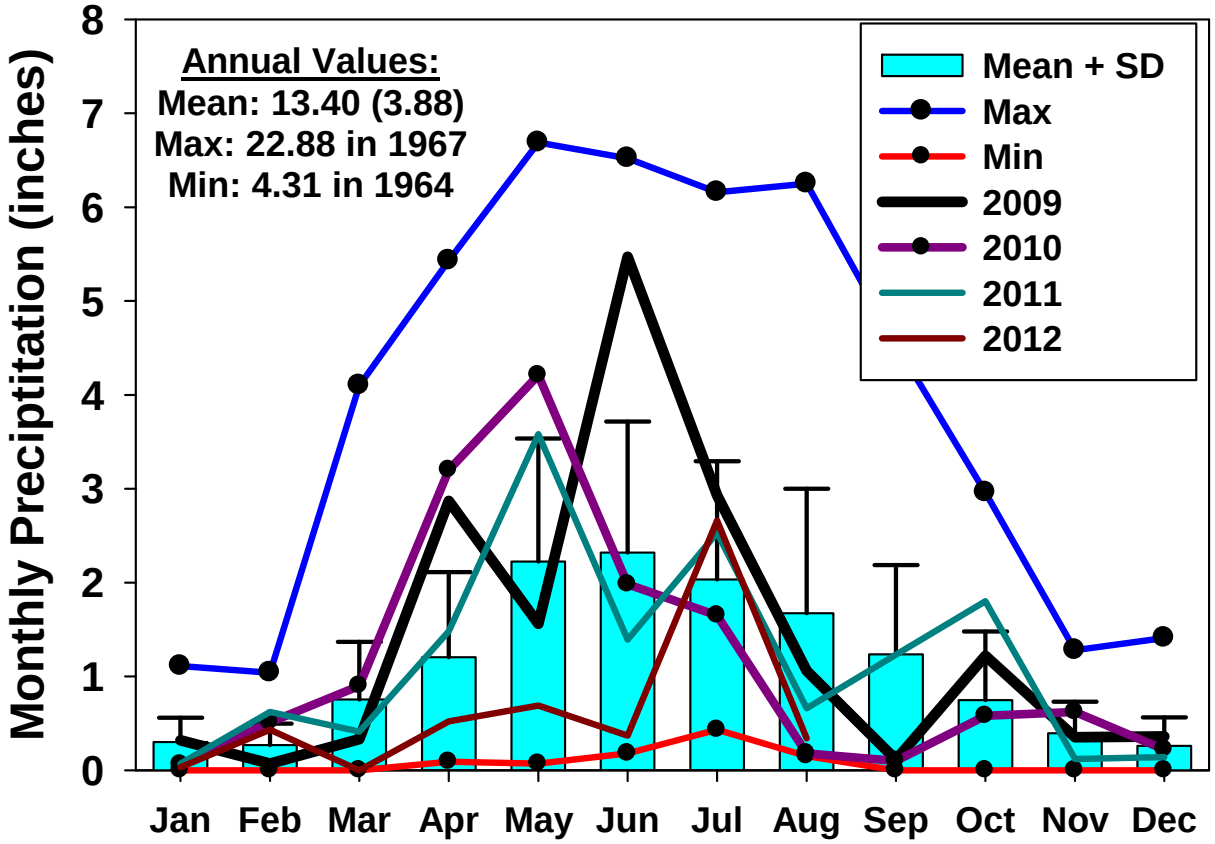
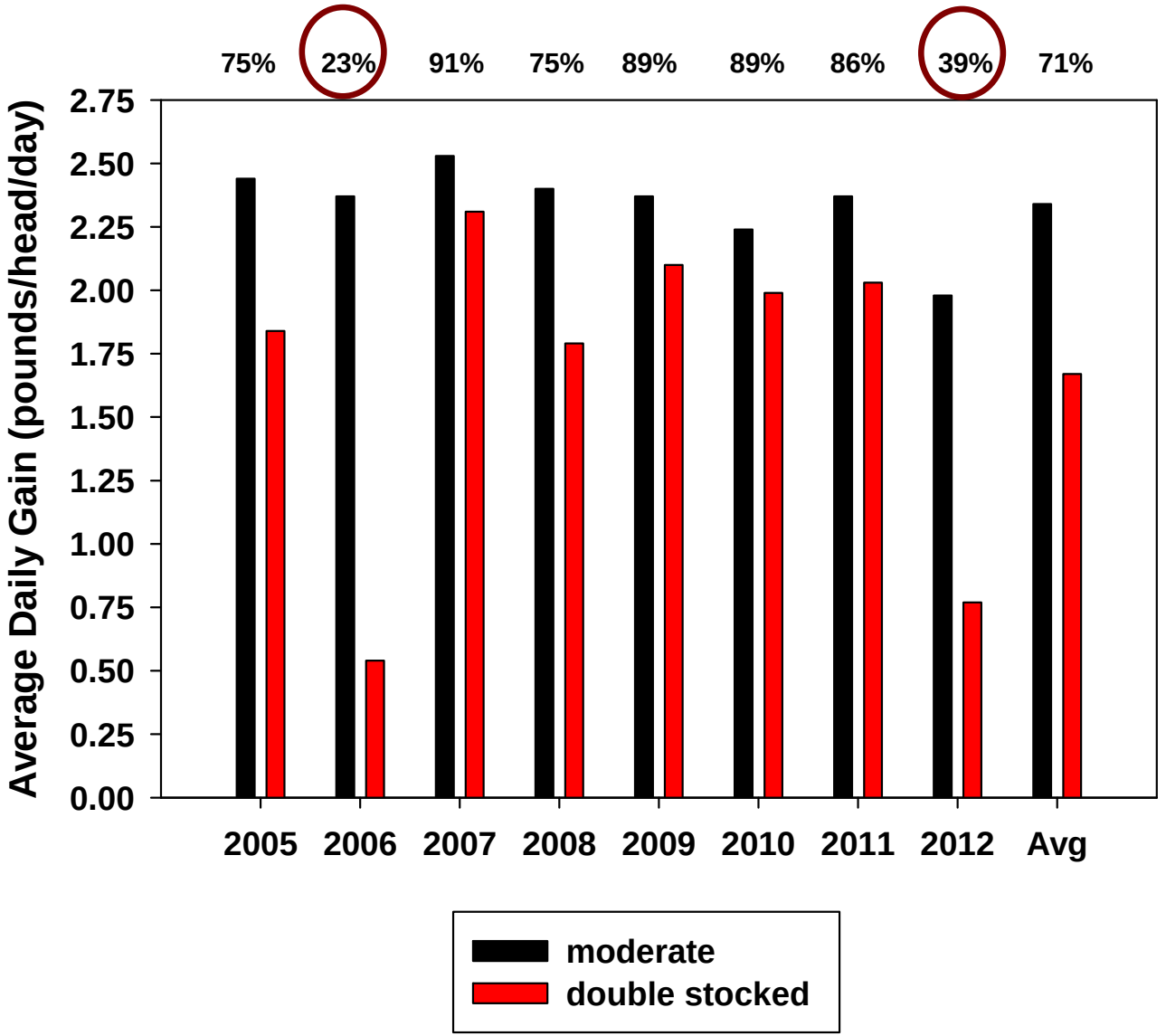
CPER Annual Precipiation (1939-2011)

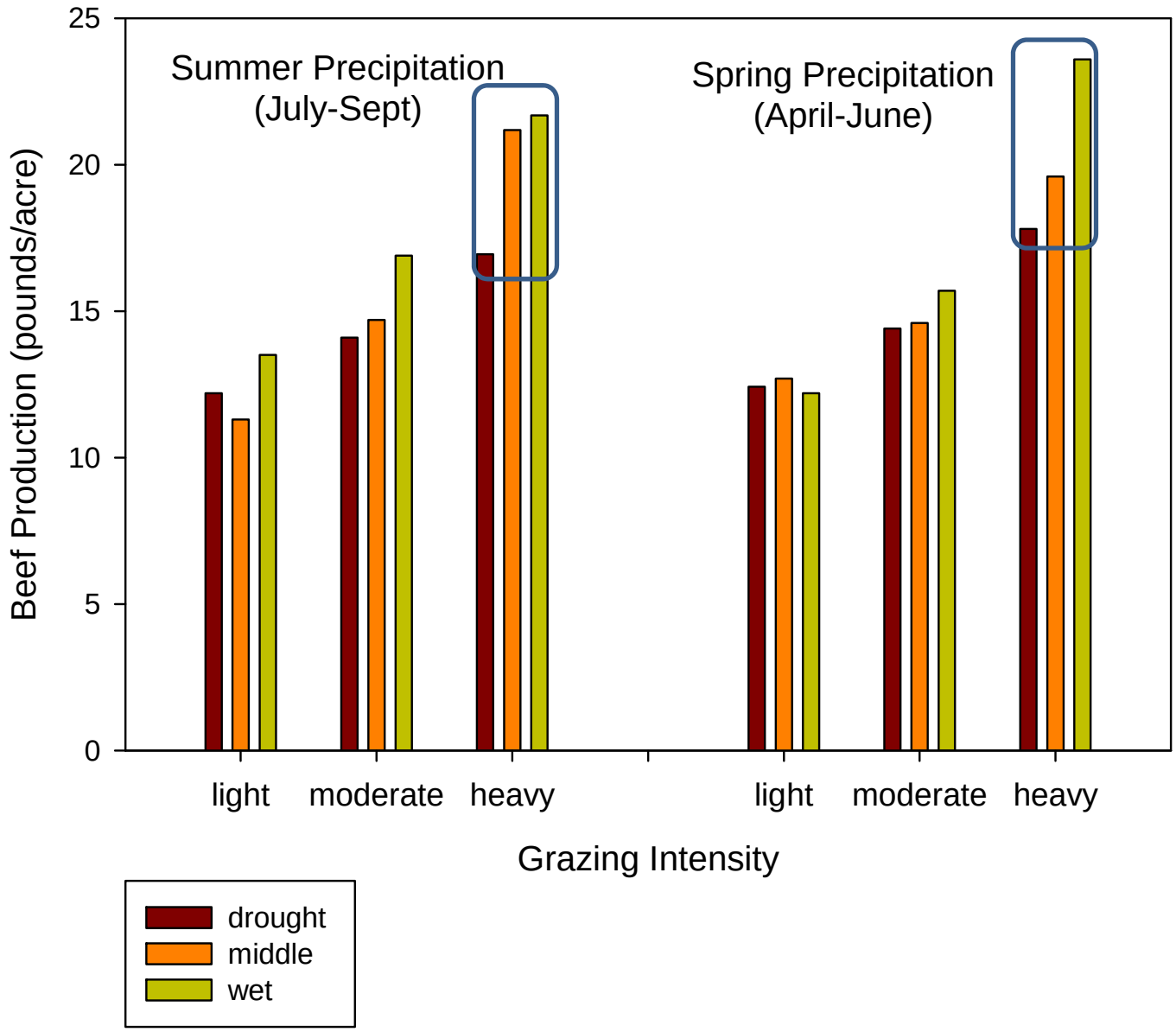


Monthly CPER Precipitation





Derner et al. unpublished data



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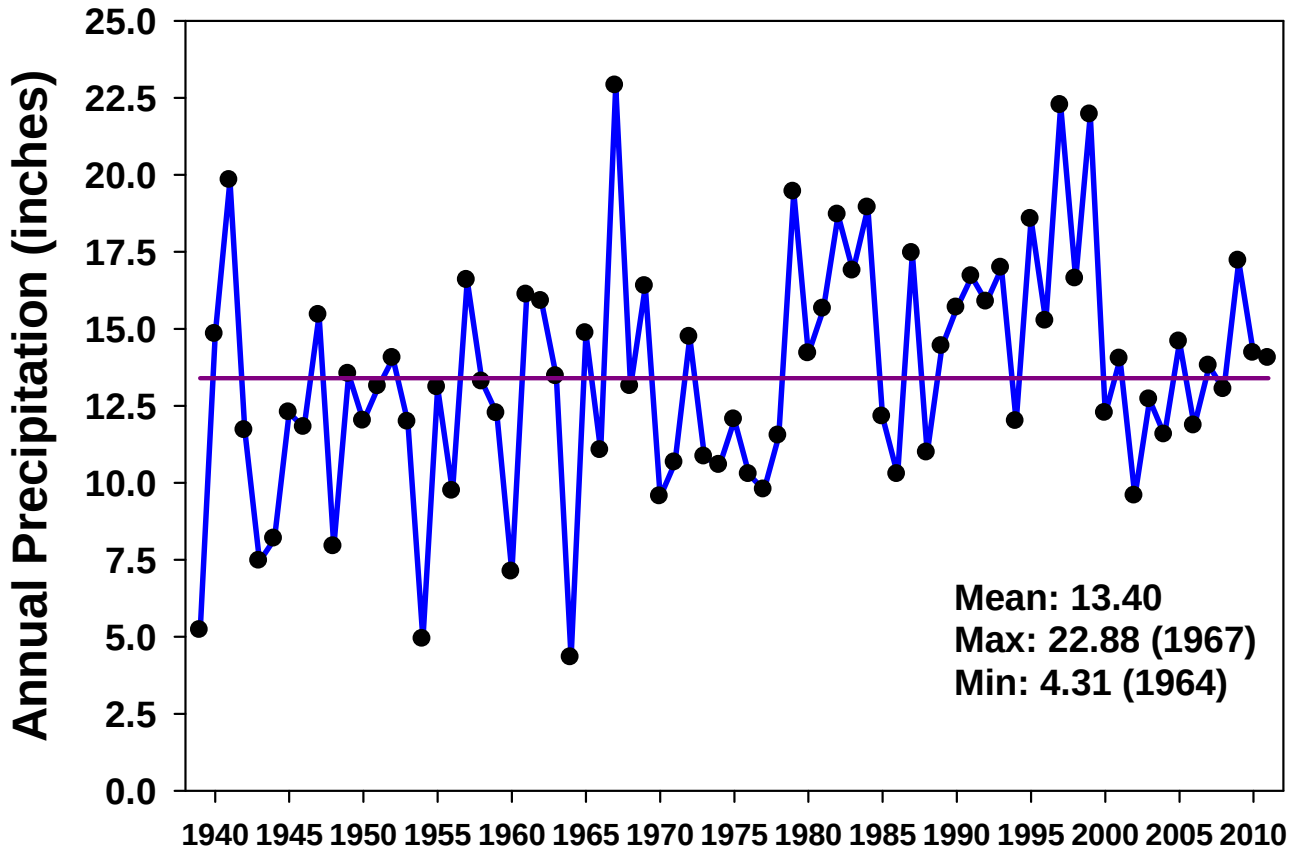

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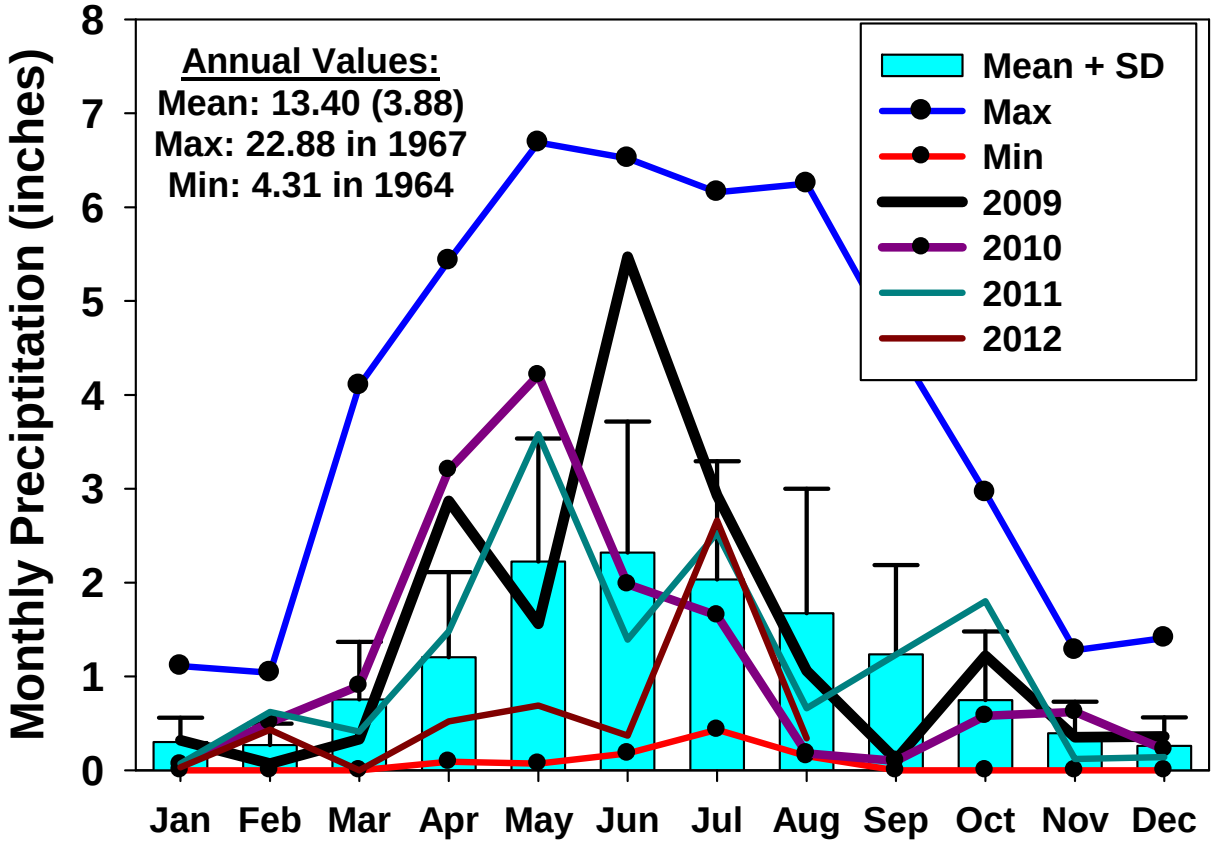

Drought decreases livestock gains…

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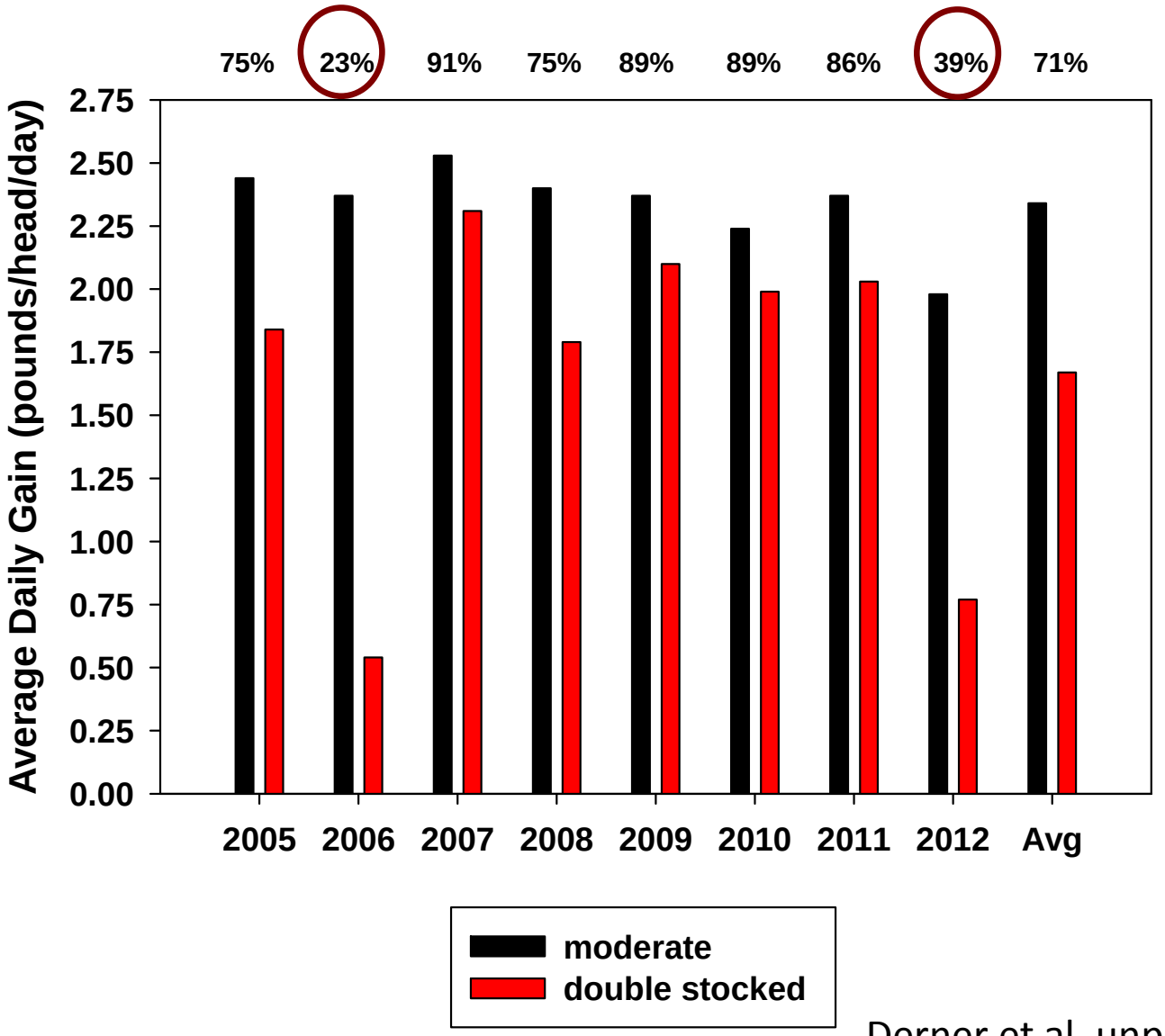

Derner et al. unpublished data

Justin's email:

What have we learned from long-term research? (how important is timing/amount of precipitation for forage and livestock production? Can rangeland production (both vegetation and livestock) respond next year if rainfall is sufficient? What about the likelihood of back-to-back dry years? How do extreme events (substantially dry/wet years influence forage and livestock production, and do the wet years compensate for lost production in dry years? What predictions can we make to assist as triggers for decision support tools?)

What scientific evidence is most relevant for livestock herd management for drought? (e.g., two really nice economics papers by Ritten et al. and Torell et al recently have clearly demonstrated that herd flexibility (including proportion of cows/calves vs yearlings) is an approach to reduce risk and increase economic returns)

What type of drought management approaches do Wyoming ranchers employ in general? (from a just completed survey by Wyoming Stock Growers/University of Wyoming/ARS/UC-Davis)

What type of specific drought management approaches do Wyoming ranchers in SE Wyoming employ (from just completed summer 2012 interviews)

What is an approach for incorporating critical dates (decision triggers) and information (predictions of precipitation and temperature, and incorporation into existing prediction models) in a first approximation of how to manage to avoid the pitfalls of drought?