

Drought Impacts to Western Slope Rangelands and Resources

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**COLORADO STATE UNIVERSITY
EXTENSION**

~72% of lands
in Colorado
are
rangelands



Rangelands as Agroecosystems



Insects



Bird habitat



Antelope & Elk

Drought is part of what rangelands are

2002



223 lb / acre

2003



1338 lb / acre

2004



758 lb / acre

2005



1250 lb / acre

Being adaptable allows you to thrive in highly **variable** environments.

Plants have a drought strategy



Tolerate it



Avoid it



Escape it

Impacts of Climate Change to Western CO Rangelands

Bradford, John B., et al. "Robust ecological drought projections for drylands in the 21st century." *Global change biology* 26.7 (2020): 3906-3919.

Williams, A. Park, et al. "Large contribution from anthropogenic warming to an emerging North American megadrought." *Science* 368.6488 (2020): 314-318.

Winkler, D. E., Belnap, J., Hoover, D., Reed, S. C., & Duniway, M. C. (2019). Shrub persistence and increased grass mortality in response to drought in dryland systems. *Global Change Biology*, 25(9), 3121-3135.



INCREASED ARIDITY



GRASS MORTALITY

2011 -2018 | 400 Individuals



INCREASED ARIDITY



GRASS MORTALITY



- 2011 -2018 | 400 Individuals tracked
- Plant mortality was 10-20% higher in treated plots versus non treated
- Grasses, especially ricegrass, were more sensitive compared to shrubs

Hoover, D. L., et al. (2015). "Pulse-drought atop press-drought: unexpected plant responses and implications for dryland ecosystems." *Oecologia* 179(4): 1211-1221.

Winkler, D. E., Belnap, J., Hoover, D., Reed, S. C., & Duniway, M. C. (2019). Shrub persistence and increased grass mortality in response to drought in dryland systems. *Global Change Biology*, 25(9), 3121-3135.

INCREASED ARIDITY



GRASS MORTALITY

- General aridification makes grass plants more vulnerable to severe drought



Hoover, D. L., et al. (2015). "Pulse-drought atop press-drought: unexpected plant responses and implications for dryland ecosystems." *Oecologia* 179(4): 1211-1221.

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Perennial Grass Replacement by Shrubs

Winkler, Daniel E., et al. "Shrub persistence and increased grass mortality in response to drought in dryland systems." *Global Change Biology* 25.9 (2019): 3121-3135.



Increase in Invasive spp.

*Grass mortality increased by the
presence of invasive spp.*

Winkler, Daniel E., et al. "Shrub persistence and increased grass mortality in response to drought in dryland systems." *Global Change Biology* 25.9 (2019): 3121-3135.



Economics: Bad years are more bad than good years are good

Positives of wet years do not overcome the negative impacts of dry years

Need for economic diversification and/ or income sources to cope with increased variability

Hamilton, Tucker W., et al. "Economic impacts of increasing seasonal precipitation variation on southeast Wyoming cow-calf enterprises." *Rangeland Ecology & Management* 69.6 (2016): 465-473.

Briske, David D., et al. "Future climate variability will challenge rangeland beef cattle production in the Great Plains." *Rangelands* 43.1 (2021): 29-36.



Drought Advisors

Drought Advisors is a network of professionals committed to improving access to technical resources for drought preparation and response among Colorado producers.

What we do

- Connect interested producers with technical professionals to create drought plans
- Build a network of producers and professionals to increase capacity to cope with drought
- Improve access to drought planning resources through trainings, online and written materials, and one-on-one consulting



Drought Resources

droughtadvisors.org



01

Drought website

02

Drought Handbook

03

Drought Leadership
Training

04

Drought Plan Program



RestoreNet

- Dryland restoration trials to improve likelihood of seeding success
- Started by USGS
- Two sites in CO established in 2021

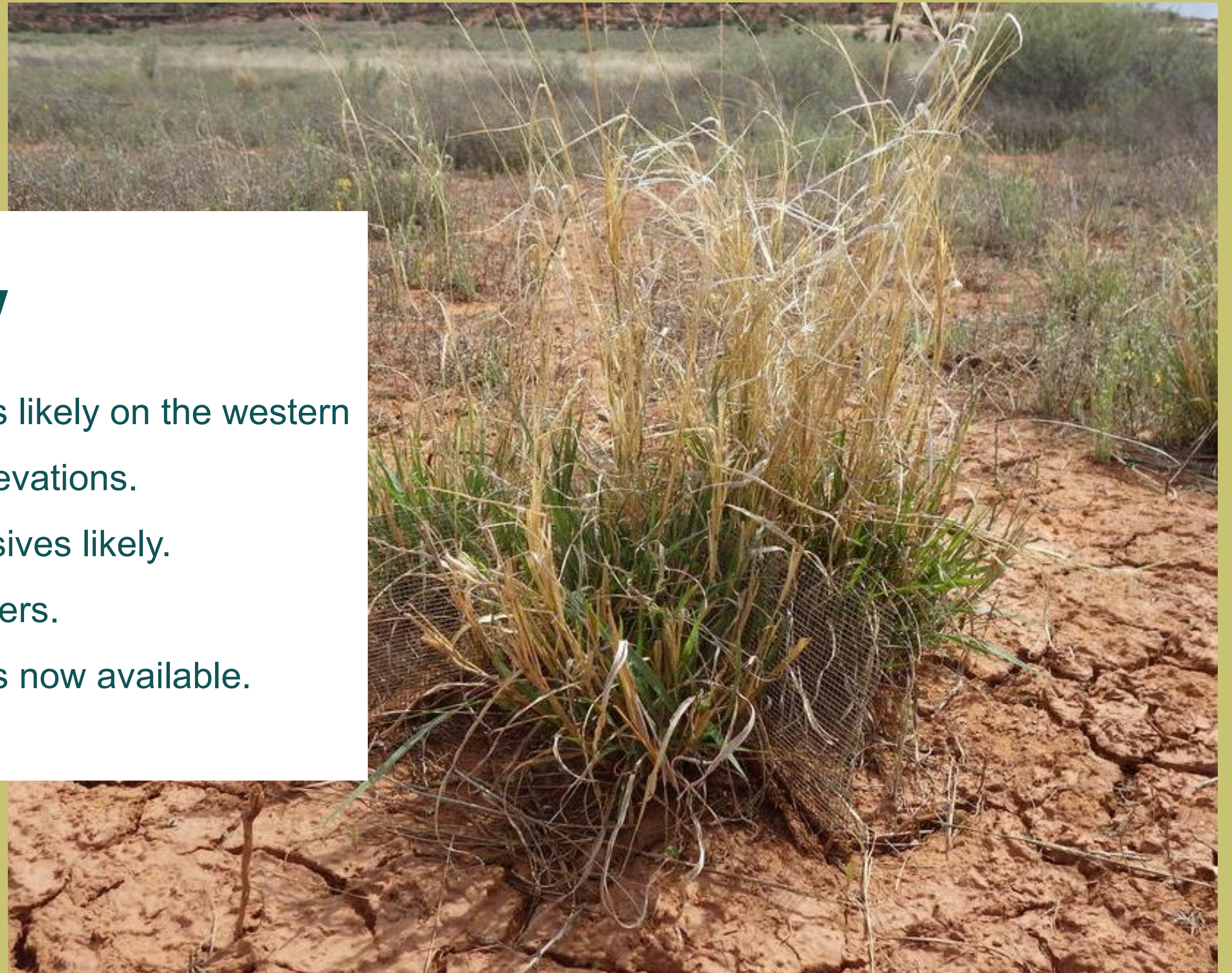


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Summary

- Cool-season grass declines likely on the western slope, especially at lower elevations.
- Increased shrubs and invasives likely.
- Economic impacts to ranchers.
- Drought planning resources now available.
- Research ongoing.





Thank You

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“And I happen to be the only one left in our family, and it was a very large ranch, and I’m the only one that has any of it left. And it’s not something that I take lightly. Times can get hard and you just suck up and hang with it. Because there is no tomorrow for it if you walk away, that’s it. There is no replacement value. And you struggle with it, and I have struggled a lot, and nothing makes my heart feel better than to see a banker that has tried to close me down at a meeting that comes up and says, do you remember me, and I say, yes, call him by name, and I said ‘I’m still on the ranch. You a\$%#*&^.’”

From interviews conducted for: Wilmer, H. and M. E. Fernández-Giménez (2016). "Some years you live like a coyote: Gendered practices of cultural resilience in working rangeland landscapes." *Ambio* 45(3): 363-372.



Drought Preparation

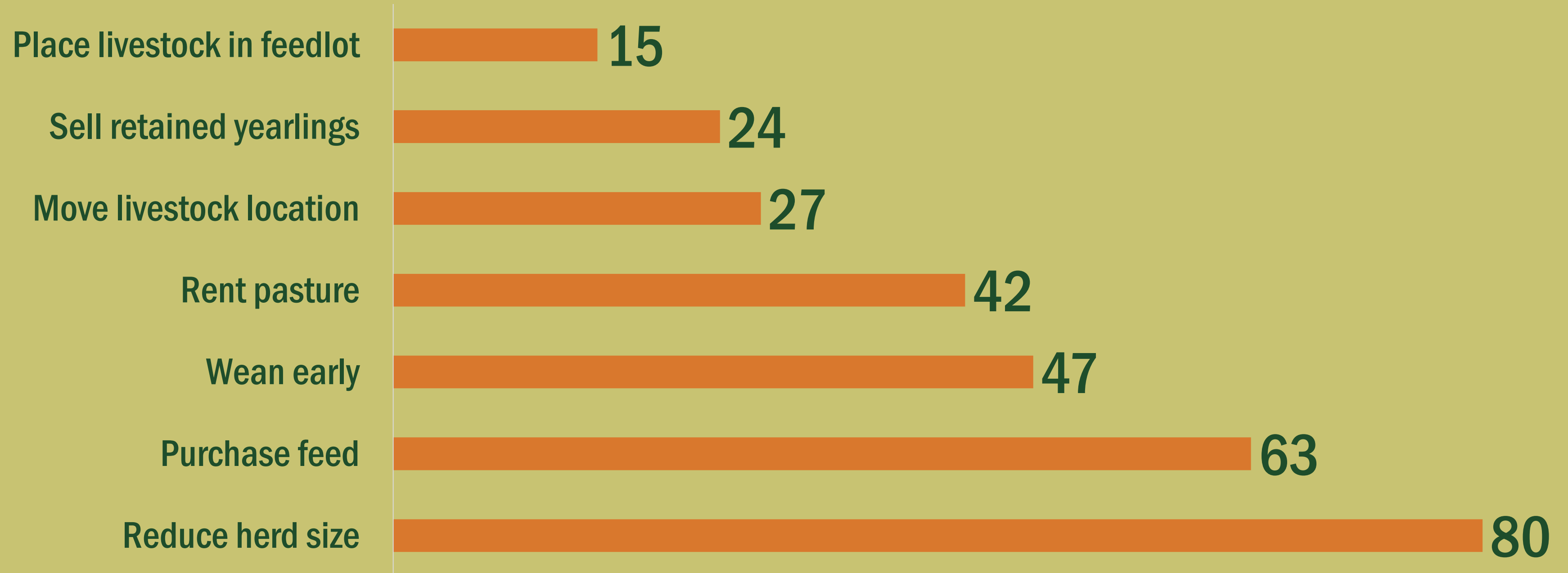
■ Percent of ranchers (WY)



Source: Survey of Wyoming Ranchers 2012, N= 307
Kachergis et al. *Ecosphere* 5(6):77.

Drought Response

■ Percent of ranchers (WY)



Source: Survey of Wyoming Ranchers 2012, N= 307
Kachergis et al. *Ecosphere* 5(6):77.