



Multiple impacts— Multiple strategies

How Wyoming Cattle Producers
Are Surviving in Prolonged Drought

Amy Nagler
University of Wyoming

Chris T. Bastian
University of Wyoming

John P. Hewlett
University of Wyoming

Siân Mooney
Boise State University

Steven I. Paisley
University of Wyoming

Michael A. Smith
University of Wyoming

Marshall Frasier
Colorado State University

Wendy Umberger
The University of Adelaide

Padmaja Ponnameneni
University of Wyoming

UNIVERSITY OF WYOMING

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MULTIPLE IMPACTS—MULTIPLE STRATEGIES: How Wyoming Cattle Producers Are Surviving in Prolonged Drought

The economic impact of drought can be tempered with information and planning. This publication presents results from the 2005 Wyoming Cattle Producers Survey detailing management strategies and recent responses to drought.

The emotional impact of drought was clearly expressed in the margins of the survey where Wyoming cattle producers wrote: “Drought killing everybody. We need rain!” “Everything is effected.” These respondents reported strong agreement with the statement “A drought contingency plan is important for beef producers in Wyoming.”

Drought in Wyoming

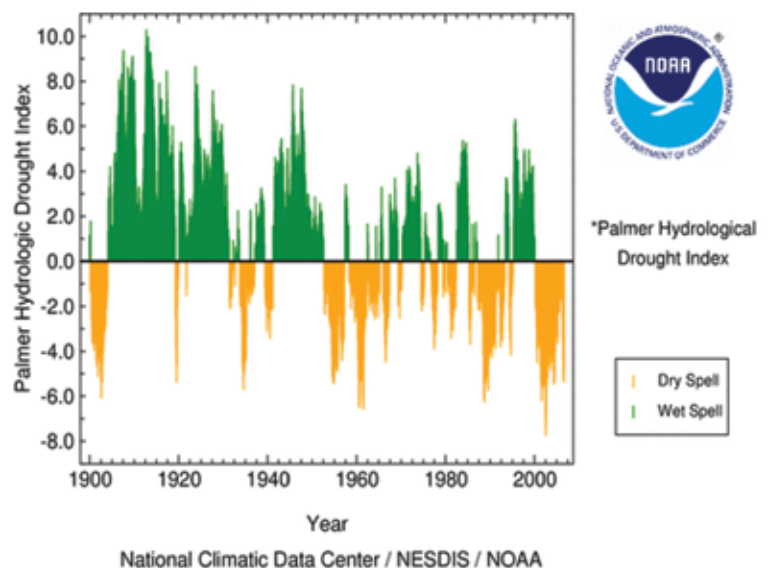
Portions of the western United States, including the state of Wyoming, have experienced the worst drought in 80 years. Wyoming has undergone multiple periods of consecutive years with below-normal precipitation with the most recent period being between 2000 and 2005 (Figure 1).

Figure 1 shows the Palmer Drought Severity Index (Palmer Index) measuring long-term drought in Wyoming between 1900 and 2006. The figure shows more frequent and prolonged periods of drought since 1952. According to the National Climatic Data Center (NCD, 2006), “The 1999-2004 drought in the western U.S. will go down in history as one of the most severe droughts in the past 100 years.”

Palmer drought severity indices

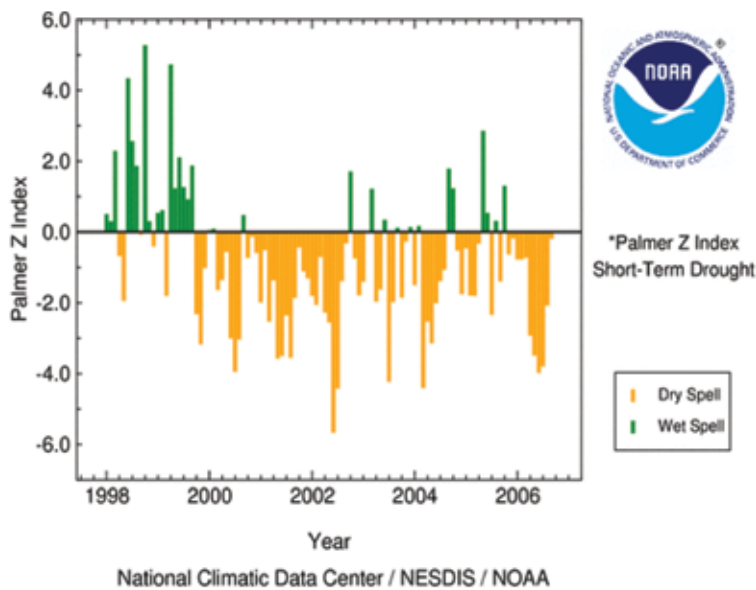
The Palmer Index is effective in quantifying long-term drought. It uses 0 as normal with drought shown in terms of negative numbers: -2 is moderate drought, -3 is severe drought, and -4 is extreme drought. Likewise, excess moisture is reflected by positive numbers with +2 indicative of moderate rainfall, etc. The Palmer Index is standardized to local climate so it can be applied to any region as a relative measure of drought conditions. The Palmer Hydrological Drought Index (PHDI) (Figure 1) is a long-term drought index. The Palmer Z Index (shown in Figure 2) measures short-term drought on a monthly scale.

Figure 1. Palmer Index measure of long-term drought in Wyoming (1900-2006).



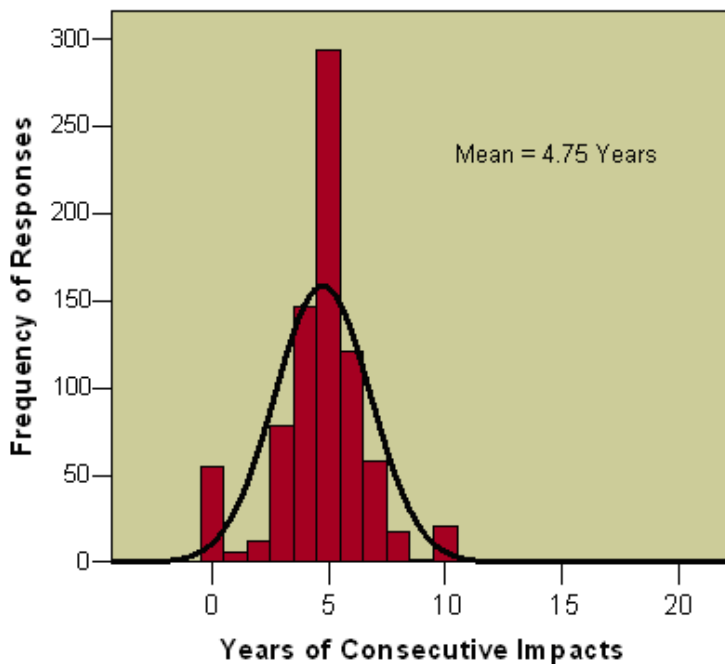
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Figure 2. Palmer Z Index: Short-term drought in Wyoming (1998-2006).



http://www.ncdc.noaa.gov/img/climate/research/prelim/drought/Reg048Dv00_palm07_pg.gif

Figure 3. Consecutive years of recent drought reported by Wyoming cattle producers.



During the most recent drought, below-normal precipitation has been predominant statewide since the winter of 1999/2000 (Figure 2). This most recent period of drought has reduced range productivity, lowered irrigation water supplies, and may ultimately force ranchers to develop drought management strategies with longer time horizons.

The Wyoming Beef Cattle Producers Survey: Results Regarding Drought

Data and Methods

Results presented here are from a survey of Wyoming beef cattle producers conducted during spring 2005 by the U.S. Department of Agriculture's National Agricultural Statistics Service on behalf of the University of Wyoming. A stratified, random sample of 3,000 producers was drawn from the population of Wyoming beef cattle ranchers. The overall survey response rate was 40 percent with 1,190 responses. The survey contained questions about each producer's resource base and production practices, marketing practices, drought impacts and management strategies, sagebrush management, and demographics. This publication focuses on drought impacts and management strategies.

A copy of the survey instrument and a complete report of results is available at <http://agecon.uwyo.edu/WYLivestock/default.htm>.

Survey Results

Length of recent drought impacts. The majority of respondents (69 percent) indicated their operations had been negatively impacted from four to six years by the most recent drought, with an average duration of 4.75 years (Figure 3). These results are comparable to short-term Palmer Index measures in Figure 2 and suggest that multiple-year drought is common in Wyoming and should be integral to drought management contingency plans.

Multiple Impacts —

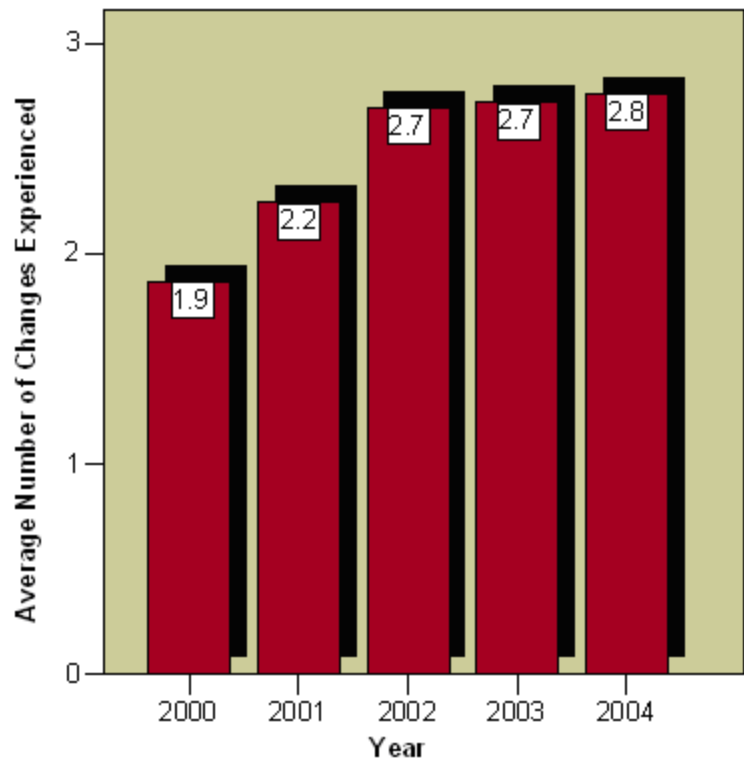
Severity of drought impacts increase over time. Survey respondents characterized how drought affected grazing, irrigation water supplies, winter feed production, sale weights, weaning, and owner equity between the years 2000 and 2004 in comparison to a “normal” year. Several producers pointed out that, after so many years of below-normal precipitation, it had become hard to compare their operation to a normal year: “After five years of drought, nothing is average on this ranch” — however, a general trend of impacts increasing in severity over time was expressed.

The greatest impacts of the recent drought are attributed to reduced grazing capacity, irrigation water supplies and, consequently, reductions in production of winter feed. Between 2000 and 2004, producers reported grazing capacity dropped from 16- to 31-percent below normal. Irrigation water supplies were reduced from 12- to 22-percent below normal over the same period, and winter feed production decreased from 18-percent below normal in 2000 to 35-percent below normal in 2004 for producers responding to the survey. This translates into reductions over four years of 15-, 10-, and 17-percent respectively for grazing capacity, irrigation water, and winter feed supplies that were already compromised in 2000. Reduced feed availability coupled with other responses to the drought also reduced sale weights (from 4- to 6-percent below normal) and weaning percentages (which each dropped from 4- to 6-percent below normal).

Respondents also reported negative impacts to owner equity over the same time period, but a 7-percent reduction in owner equity reported in 2004 was not as large as one might expect given the severity of some of the impacts reported above.

Compounding number of impacts over time. Not only did the intensity of individual drought-related impacts increase, but Wyoming ranches experienced a compounding

Figure 4. Increasing number of changes experienced due to drought.



number of impacts due to drought between 2000 and 2004. Survey respondents reported an average of 1.9 different impacts (i.e., reported in multiple categories on the survey) in 2000 — which increased to an average of 2.8 impacts reported in 2004 (Figure 4).

Overall, these results indicate Wyoming cattle producers need to consider drought management strategies that account for longer term cumulative effects of drought.

— Multiple Strategies

Drought management strategies used by Wyoming producers. Wyoming cattle producers were asked to identify all drought management strategies they used from 2000 through 2004. The most frequently cited drought management strategies were purchasing additional winter feed, partial herd liquidation, and participating in some type of government feed assistance program. The next two most frequently used strategies were leasing additional grazing and early weaning of calves to reduce feed requirements (Table 1).

Table 1. Strategies used each year to deal with drought in 2004

Strategy	Respondents (percent)
Purchase Additional Winter Feed	59
Partial Herd Liquidation	44
Earn Off-Farm Income	44
Participated in Government Feed Assistance Program	42
Early Weaning of Calves to Reduce Feed Needs	34
Lease/Purchase Additional Grazing	33
Selling Retained Yearlings	13
Participated in Government Income Assistance Program	10
Added Alternative Livestock Enterprise	7
Other	4
Total Herd Liquidation	3
Added Alternative Crop Enterprise	3



Other strategies listed

“Other” strategies listed by Wyoming producers included changes in grazing, pasture, or other feed sources; specific herd reductions (e.g., culling cows or not keeping replacement heifers); herd management strategies, including pasture rotation, moving herds off of pasture early, and not backgrounding calves; hauling water or changing irrigation practices in response to water availability; and increasing income from additional ranch and off-ranch sources.

The least common drought strategy reported was total herd liquidation. Given the potential for specialization and long-term genetic improvement programs for herds, it is not surprising ranch operations were unwilling to consider total herd liquidation in response to drought. (Note: The responses received for this strategy could underestimate the frequency with which this strategy was adopted because producers who no longer had cattle when they received the survey may have declined to participate or were eliminated from the analysis.)

Strategies by operation size. Not surprisingly, a much higher percentage of respondents in the small- and medium-size categories indicated earning off-farm income as a strategy to cope with drought. Large operations were more likely to add alternative crop or livestock enterprises. Medium- and large-size operations were more likely to lease or purchase additional grazing as the length of drought increased. Medium- and large-size operations were also more likely to sell retained yearlings in response to drought than small operators. It is possible that larger producers face fewer resource constraints, which may also partially explain the differences observed between the small, medium, and large producers concerning their strategies related to the sale of retained yearlings. It is easier for larger operations to retain genetic bases while selling off yearlings to make quick forage adjustments.

Diverse responses. As the length of the drought increased, respondents were more likely to use multiple strategies to mitigate drought impacts (Figure 5). During the years 2000 and 2001, producers used one to two strategies on average while between the years 2002 and 2004, the mean number of strategies utilized increased to between two and three in a given year. This held true across all operation sizes. Wyoming ranchers employed a broad number of alternatives and combinations of strategies when faced with extended periods of drought.

Managing Tax Liability: Income Averaging

One common recommendation to some producers from agricultural economists in this most recent drought has been to sell breeding livestock and take advantage of income averaging from a tax liability standpoint. Producers experiencing relatively high income in a given year because of breeding stock liquidation could use this as a strategy to reduce tax liability and ultimately maximize after-tax income. To take advantage of this tax break, producers are required to replace breeding livestock to normal levels within 24 months of the liquidation unless the government decides to grant an exception.

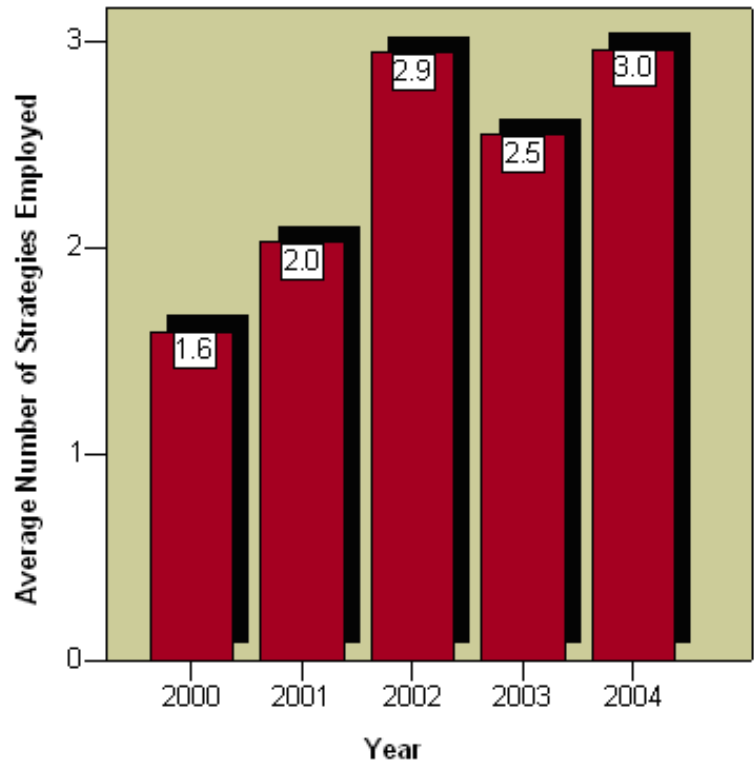
Given the importance of herd liquidation as a potential strategy and using income averaging to reduce tax liability, Wyoming Cattle Producers Survey respondents were asked to answer several questions regarding whether they took advantage of this tax break and whether they had repopulated their herd to pre-drought levels. Twenty-seven percent of all respondents who reported liquidating all or part of their herd had used income averaging to reduce tax liability. Medium-size operators responded they had done this more frequently than large or small operators.

Interestingly, only 11 percent of respondents reported repopulating their herds to pre-drought levels. This was largely due to continued drought and lack of feed. These responses suggest a number of producers may face an additional tax burden at a time when their income potential may be reduced by drought.

Importance of the Price Cycle

Many producers culled their herds at a time when cattle prices were below the cyclic peak (in the years of 2000 to 2004), resulting in lower sales revenue. They also incurred higher feed costs to maintain the remaining herd. Together, these factors contribute to reduced profitability. Additionally, breeding livestock purchased now to restock drought-liquidated

Figure 5. Increasing number of strategies employed to mitigate drought.



herds would be done so at or near the peak of this most recent cattle price cycle. Live-stock purchased now or in the next several years would likely generate negative returns throughout their productive life, even if a ranch had the available feed resources.

Current forecasts suggest cattle prices are likely to start their cyclical decline within the next two years. The economic consequences of restocking at this point in time coupled with smaller herd sizes from drought liquidation puts ranchers in a weaker financial position to survive the downside of this most recent price cycle.

Conclusions

Average annual precipitation in Wyoming has been trending downward since modern records have been kept. Research suggests drier summers could become more common as the climate changes. The potential for longer periods of drought and greater cumulative effects of drought, tax policy related to drought, and

the importance of price cycle dynamics point to the need for cattle producers to develop multiple-year drought contingency plans. These plans likely need to include multiple strategies such as partial herd liquidation, early weaning, acquiring additional feed resources, and deep culling strategies to maintain a superior genetic base for increased efficiency and performance after the drought.

Research at the University of Wyoming is investigating the impacts of these strategies at different points in livestock price cycles and their impacts on long-term profitability and sustainability.

Where To Go For Information? Drought Management Links

Drought Weather and Climate Monitoring

National Oceanic and Atmospheric Administration
Drought Information Center

Recent conditions and drought status, drought maps, and predictions.

<http://www.drought.noaa.gov/>

Federal Government

U.S. Department of Agriculture/Farm Service Agency
Disaster Assistance

Latest news and information on federal drought assistance programs.

<http://www.fsa.usda.gov/FSA/webapp?area=home&subject=diap&topic=landing>

General Regional Information

Rangelands West

Information and resources for sustainable management of western rangelands.

<http://rangelandswest.org/index.html>

Western Land-Grant Universities

Facing the Drought

Articles regarding drought management strategies from Texas A&M University.

<http://agnews.tamu.edu/drought/DRGHTPAK/CONTENTS.HTM>

Coping with Drought

North Dakota State University's livestock, crop, and general drought information.

<http://www.ag.ndsu.edu/drought/>

Arizona Drought Resources

Links to publications and Web site resources from The University of Arizona.

<http://cals.arizona.edu/extension/drought/>

National Drought Mitigation Center

Drought monitoring, assessment, and mitigation from the University of Nebraska.

<http://drought.unl.edu/index.htm>

International

Drought Watch Canada

Canada Agriculture and Agri-food Canada drought management information.

http://www.agr.gc.ca/pfra/drought/article_e.htm

Australia Drought

Australian Department of Primary Industries/Agriculture drought research.

<http://www.agric.nsw.gov.au/drought/>

Quick Review of Academic Literature Regarding Drought Management

- Foran and Smith (1991) indicated that, for droughts lasting two years or longer, maintaining a lower-than-average stocking rate was most profitable in the long-run.
- Hall et al. (2003) found producers believed that below-normal stocking of pastures, storing more hay, and adjusting stocking rates to current grazing capacities were the best drought-management strategies available.
- Lardy and Poland (1997) indicate providing additional feed supplements, herd liquidation, renting additional pasture, and grazing crop residues are all effective strategies for stretching tight forage supplies during periods of drought.

- Heitschmidt et al. (2005) studied effects of grazing on range under drought conditions from 1998 to 2001. The authors concluded that periodic grazing during drought has a minimal impact on forages — post-drought recovery was found to be substantial the year after a drought with or without intense grazing.
- Hild et al. (2001) conclude drought limited subsoil root production regardless of grazing treatments.
- Thurow and Taylor (1999) conclude management and policy tools must improve the integration of economic and ecological aspects of drought-induced de-stocking decisions.

References

- Foran, B. D., and D. M. Stafford Smith. 1991. "Risk, Biology and Drought Management Strategies for Cattle Stations in Central Australia." *Journal of Environmental Management*. 33: 17-33.
- Hall, D. C., T. O. Knight, K. H. Coble, A. E. Baquet, and G. F. Patrick. 2003. "Analysis of Beef Producers' Risk Management Perceptions and Desire for Further Risk Management Education." *Review of Agricultural Economics*. 25(2): 430-448.
- Heidschmidt, R. K., K. D. Klement, and M. R. Haferkamp. 2005. "Interactive Effects of Drought and Grazing on Northern Great Plains Rangelands." *Rangeland Ecology and Management*. 58: 11-19.
- Hild, A. L., M. G. Karl, M. R. Haferkamp, and R. K. Heitschmidt. 2001. "Drought and Grazing III: Root Dynamics and Germinable Seed Bank." *Journal of Range Management*. 54: 292-98.
- Lardy, G., and C. Poland. 1997. *Supplementing Cattle on Drought Affected Pastures and Ranges*. North Dakota State University Extension Service. Bulletin DS – 12-97.
- Livestock Marketing Information Center. 2006 (January). *Cattle Situation and Price Outlook: Analysis and Comments*. Livestock Marketing Information Center. Lakewood, CO.
- National Climatic Data Center (NCDC). 2006. "Climate of 2005: Annual Review of U.S. Drought" January 13, 2006. <http://www.ncdc.noaa.gov/oa/climate/research/2005/ann/drought-summary.html>
- O'Neill, P. D., L. J. Held, and D. J. Menkhous. 1999. "Importance of Timing Cowherd Expansion and Pre-Expansion Financial Conditions." *Journal of the American Society of Farm Managers and Rural Appraisers*. 62: 107-16.
- Piechota, T., J. Timilsena, G. Tootle, and H. Hildalgo. 2004. "The Western U.S. Drought: How Bad Is It?" *EOS*. 85(32): 301-308.
- Thurow, T. L., and C. A. Taylor, Jr. 1999. "Viewpoint: The Role of Drought in Range Management." *Journal of Range Management*. 52: 413-19.
- Tronstad, R., C. W. Gray, and L. Meyer. 2002. "Weather Related Sales of Livestock and Tax Implications." *Managing For Today's Cattle Market and Beyond*. http://agecon.uwyo.edu/Marketing/MngTCMkt/March2002Update/Weather_Related_Sales.pdf.

Abstract

Results from the 2005 Wyoming Beef Cattle Producers Survey detail compounding impacts and diverse management strategies in response to prolonged drought. Producers reported an increasing intensity and a mounting number of different drought impacts over time. To survive in these conditions, Wyoming producers were more likely to employ multiple strategies to mitigate impacts as the length of drought increased. The potential for longer periods of drought and greater cumulative effects of drought, tax policy related to drought, and the importance of price cycle dynamics point to the need for cattle producers to develop multiple-year drought contingency plans.