

Chapter 8: Drought

Of all the natural weather-related disasters, drought is by far the most costly to our society. It indirectly kills more people and animals than the combined effects of hurricanes, floods, tornadoes, blizzards, and wildfires. And, unlike other disasters that quickly come and go, drought's long-term unrelenting destruction has been responsible in the past for mass migrations and lost civilizations. The 1980 and 1988 droughts in the US resulted in approximately 17,500 heat-related deaths and an economic cost of over \$100 billion. Drought occurs in four stages and is defined as a function of its magnitude (dryness), duration, and regional extent. Severity, the most commonly used term for measuring drought, is a combination of magnitude and duration.

The first stage of drought is known as a meteorological drought. The conditions at this stage include any precipitation shortfall of 75% of normal for three months or longer. The second stage is known as agricultural drought. Soil moisture is deficient to the point where plants are stressed and biomass (yield) is reduced. The third stage is the hydrological drought. Reduced stream flow (inflow) to reservoirs and lakes is the most obvious sign that a serious drought is in progress. The fourth stage is the socio-economic drought. This final stage refers to the situation that occurs when physical water shortage begins to affect people.

As these stages evolve over time, the impacts to the economy, society, and environment converge into an emergency situation. Without reservoir water to irrigate farms, food supplies are in jeopardy. Without spring rains for the prairie grasslands, open range grazing is compromised. Without groundwater for municipalities, the hardships to communities result in increases in mental and physical stress as well as conflicts over the use of whatever limited water is available. Without water, wetlands disappear. The quality of any remaining water decreases due to its higher salinity concentration. There is also an increased risk of fires, and air quality degrades as a result of increased soil erosion in strong winds (blowing dust).

History

The most recent statewide drought started in 1999, but began in earnest in the spring of 2000. It is considered by many to be the most severe in collective memory. However, some old timers have indicated that they remember streams drying up in the 1930s and 1950s. According to instrument records, since 1895 there have been only seven multi-year (three years or longer) statewide droughts. Based on deficit precipitation totals (negative departures from the long term average), they are ranked statewide.

Table 8.1 Wyoming's Recent Worst Multi-Year, Statewide Droughts

Period	Drought Deficit (departure from annual precipitation)
1952-1956	94%
1999-200x (thru 2003)	82%
1958-1964	77%
1900-1903	72%
1931-1936	61%
1987-1990	61%
1974-1977	41%

Widespread droughts in Wyoming, as determined from stream flow records, were most notable during three periods: 1929-1942, 1948-1962, and 1976-1982. Fremont County-specific data are not available at this time.

As a whole, Wyoming's precipitation record from 1895-2003 reveals that, for the first half of the 20th century (except for the Dust Bowl years of the 1930s), there was generally a surplus of moisture. During the second half of the century (Table 8.1), there was an increasing trend of increased periods of drought (Table 8.3). Fremont County data have not been analyzed.

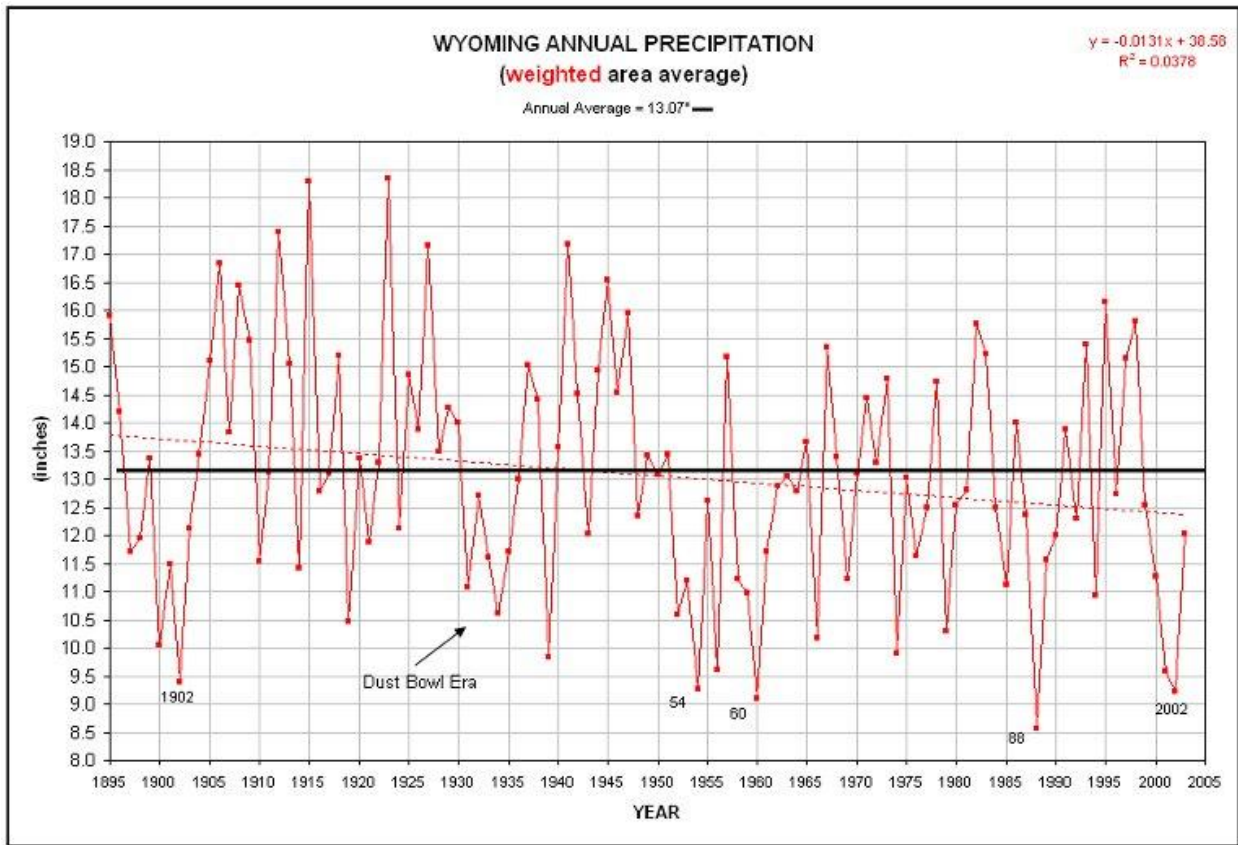


Table 8.3 Wyoming Annual Precipitation (1895-2003)

Impacts

Based upon Table 8.3, the drought of 1999-2003 is as significant, if not more significant than any other droughts in the last 100 years for the entire state. The data has not been analyzed for Fremont County. Table 8.3, derived from the Wyoming Climate Atlas, indicates that the most significant droughts in the last century, in terms of precipitation deficit, were in 1952-1956 and 1999-2003. In order to determine which drought period had the most significant impact on Wyoming, crop production and livestock inventory data for the two periods were compared. Tables 8.4 and 8.5 show peak decline (%) in production during drought compared to the 5-year pre-drought production average for various commodities.

Table 8.3 Peak Commodity Production Changes from Pre-Drought (1947 – 1951) to Drought (1952 – 1956)					
Commodity	5-Year Pre-Drought Production Average (1947-1951)	Units	Lowest Production During Drought (1952-1956)	Year of Lowest Production (1952-1956)	Percent Change
Winter Wheat	5,072	1,000 bu.	2,346	1954	-54%
Spring Wheat	1,579	1,000 bu.	600	1954	-62%
Barley	4,414	1,000 bu.	2,700	1956	-39%
Oats	4,577	1,000 bu.	2,470	1954	-46%
Dry Beans	1,009	1,000 cwt.	589	1955	-42%
Sugarbeets	413	1,000 tons	421	1955	+2%
Corn	227	1,000 bu.	161	1953	-29%
Alfalfa Hay	490	1,000 tons	675	1954	+38%
Other Hay	674	1,000 tons	442	1954	-34%
Cattle/ Calves Inventory	1,050	1,000 head	1,096	1954	+4%

Table 8.4 Peak Commodity Production Changes from Pre-Drought (1994-1998) to Drought (1999-2003)

Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Lowest Production During Drought (1999-2003)	Year of Lowest Production	Percent Change
Winter Wheat	6029	1,000 bu.	2375	2002	-61%
Spring Wheat	648	1,000 bu.	96	2002	-84%
Barley	8383	1,000 bu.	4680	2002	-44%
Oats	1648	1,000 bu.	750	2002	-54%
Dry Beans	691	1,000 cwt.	514	2001	-26%
Sugarbeets	1151	1,000 tons	659	2002	-43%
Corn	6328	1,000 bu.	4165	2002	-34%
Alfalfa Hay	1581	1,000 tons	1150	2002	-27%
Other Hay	817	1,000 tons	450	2002	-45%
Cattle/ Calves Inventory	1552	1,000 head	1320	2002	-15%

A comparison of Tables 8.3 and 8.4 indicate that drought impacts to the Wyoming agricultural community were greater in the 1999-2003 drought than in the 1952-1956 drought. With the exception of dry beans, all commodities in the worst years of the 1999-2002 drought showed a greater percentage decline in production than in the 1952-1956 drought. As a result, the 1999-2002 drought will be used as the drought of historic record to calculate dollar impacts.

Dollar Impacts

Dollar impacts of drought are derived from “Wyoming Agricultural Statistics 2003” that is compiled by the Wyoming Agricultural Statistics Service of the U.S. Department of Agriculture. Supplemental data through 2003 were provided by the Cheyenne, Wyoming office of the agency.

The data below represent changes in production value for crops and changes in inventory value for cattle and calves. As such, the data should be considered impact value versus loss value. For example, with cattle and calves inventory, the inventory has decreased during the drought. Therefore the value of inventory on hand has decreased. The inventory decreased, however, because of the sale of the cattle and calves. The sales resulted in an increase in cash receipts to the farming and ranching community. The net result, however, is a decrease in inventory value, which is a negative drought impact.

Table 8.5 1999 Production and Inventory Value Impact					
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	1999 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6029	1,000 bu.	6105	2.12/bu	+ 161,120
Spring Wheat	648	1,000 bu.	264	2.54/bu	- 976,376
Barley	8383	1,000 bu.	7310	3.03/bu	- 3,251,190
Oats	1648	1,000 bu.	1539	1.45/bu	- 158,050
Dry Bean	691	1,000 cwt.	788	16.00/cwt	+ 1,555,200
Sugar Beet	1150	1,000 tons	1205	39.00/ton	+ 2,145,000
Corn	6328	1,000 bu.	6136	1.94/bu	- 372,480
Alfalfa Hay	1581	1,000 tons	1782	67.00/ton	+ 13,467,000
Other Hay	817	1,000 tons	1008	60.00/ton	+ 11,436,000
Cattle/Calves Inventory	1536	1,000 head	1580	770.00/head	+ 33,880,000
TOTAL					+ \$57,886,224

Table 8.6 2000 Production and Inventory Value					
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2000 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6029	1,000 bu.	4080	2.70/bu	- 5,262,300
Spring Wheat	648	1,000 bu.	232	2.70/bu	- 1,124,280
Barley	8383	1,000 bu.	7885	3.08/bu	- 1,533,840
Oats	1648	1,000 bu.	1156	1.55/bu	- 252,650
Dry Bean	691	1,000 cwt.	762	16.80/cwt	+ 1,196,160
Sugar Beet	1150	1,000 tons	1556	32.50/ton	+ 195,000
Corn	6328	1,000 bu.	7656	2.02/bu	+ 2,682,560
Alfalfa Hay	1581	1,000 tons	1449	85.00/ton	- 11,220,000
Other Hay	817	1,000 tons	650	80.00/ton	- 13,392,000
Cattle/Calves Inventory	1536	1,000 head	1550	780.00/head	+ \$10,920,000
TOTAL					-\$177, 913,50

Table 8.7 2001 Production and Inventory Value Impact					
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2001 Production	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6029	1,000 bu.	2880	2.70/bu	- 8,502,300
Spring Wheat	648	1,000 bu.	168	2.90/bu	- 1,393,160
Barley	8383	1,000 bu.	6970	3.32/bu	- 4,691,160
Oats	1648	1,000 bu.	1344	1.65/bu	- 501,600
Dry Bean	691	1,000 cwt.	514	23.00/cwt	- 4,066,400
Sugar Beet	1150	1,000 tons	794	39.70/ton	- 14,133,200
Corn	6328	1,000 bu.	6375	2.30/bu	+ 108,100
Alfalfa Hay	1581	1,000 tons	1276	110.00/ton	- 33,550,000
Other Hay	817	1,000 tons	605	105.00/ton	- 22,302,000
Cattle/Calves Inventory	1536	1,000 head	1470	780.00/head	- 51,480,000
TOTAL					- \$140,511,720

Table 8.8 2002 Production and Inventory					
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2002 Production	Value	Production and Inventory Value Impact
Winter Wheat	6029	1,000 bu.	2375	\$3.70/bu	- \$ 13,519,800
Spring Wheat	648	1,000 bu.	96	\$3.90/bu	- \$ 2,154,360
Barley	8383	1,000 bu.	4680	\$3.23/bu	- \$ 11,960,690
Oats	1648	1,000 bu.	750	\$2.20/bu	- \$ 1,975,600
Dry Bean	691	1,000 cwt.	624	\$18.30/cwt	- \$ 1,222,440
Sugar Beet	1150	1,000 tons	659	\$42.30/ton	- \$ 20,769,300
Corn	6328	1,000 bu.	4165	\$2.60/bu	- \$ 5,623,800
Alfalfa Hay	1581	1,000 tons	1150	\$111.00/ton	- \$ 47,841,000
Other Hay	817	1,000 tons	450	\$106.00/ton	- \$ 38,944,400
Cattle/Calves Inventory	1536	1,000 head	1320	\$760.00/head	- \$164,160,000
TOTAL					- \$308,171,390

Table 8.9 2003 Production and Inventory					
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	2003 Production	Value (USD)	Production and Inventory Value Impact
Winter Wheat	6029	1,000 bu.	3915	3.35/bu	- 7,081,900
Spring Wheat	648	1,000 bu.	150	3.65/bu	- 1,819,160
Barley	8383	1,000 bu.	7125	3.45/bu	- 4,340,100
Oats	1648	1,000 bu.	1058	1.85/bu	- 1,091,500
Dry Bean	691	1,000 cwt.	648	16.30/cwt	- 746,540
Sugar Beet	1150	1,000 tons	752	39.70/ton	- 5,800,600
Corn	6328	1,000 bu.	6450	2.50/bu	+ 305,000
Alfalfa Hay	1581	1,000 tons	1560	82.00/ton	- 1,722,000
Other Hay	817	1,000 tons	770	75.00/ton	- 3,555,000
Cattle/Calves Inventory	1536	1,000 head	1400	890.00/head	- 121,040,000
TOTAL					- \$156,891,800

Table 8.10 Production and Inventory						
Commodity	5-Year Pre-Drought Production Average (1994-1998)	Units	Worst Yearly Production Of Drought	Year	Value (USD)	Production and Inventory Value Impact (USD)
Winter Wheat	6029	1,000 bu.	3915	2002	3.70/bu	- 13,519,800
Spring Wheat	648	1,000 bu.	150	2002	3.90/bu	- 2,154,360
Barley	8383	1,000 bu.	7125	2002	3.23/bu	- 11,960,690
Oats	1648	1,000 bu.	1058	2002	2.20/bu	- 1,975,600
Dry Bean	691	1,000 cwt.	648	2001	23.00/cwt	- 4,066,400
Sugar Beet	1150	1,000 tons	752	2002	42.30/ton	- 20,769,300
Corn	6328	1,000 bu.	6450	2002	2.60/bu	- 5,623,800
Alfalfa Hay	1581	1,000 tons	1560	2002	111.00/ton	- 47,841,000
Other Hay	817	1,000 tons	770	2002	106.00/ton	- 38,944,400
Cattle/Calves Inventory	1536	1,000 head	1400	2003	760.00/head	- 164,160,000
TOTAL						- \$311,015,350

Future Potential Impacts

The 1999-2003 drought can be shown to be the drought of historic record. There have been significant impacts on the agricultural industry from the 1999-2003 drought. (Table 8.5 through 8.10) The worst case year was 2002, with a negative dollar impact of \$308,171,390 statewide. Fremont County is 9.4% of the State of Wyoming in land area. If it is assumed that the drought impact is equally distributed across the state, which in reality it is not, the potential drought impact in Fremont County for 2002 would be approximately \$30,000,000. The total impact statewide for the 1999-2003 drought is \$565,489,036. If it is assumed that the drought impact is equally distributed across the state, which in reality it is not, the potential drought impact in Fremont County would be approximately \$54,000,000.

Long Term Mitigation for Water / Drought “Best Mitigation Project We Could Wish For”

In Fremont County there will always be a shortage or a limitation on water due to our climate. This could be natural moisture or stored water used for crop irrigation and watering of livestock. We can't hope to affect the natural moisture which will continue to fluctuate due to the natural condition in the environment. We could, however, possibly increase the upstream storage for irrigation to lessen the effect of a shortage of water on the agricultural community during short water years. Due to the political and economic conditions in the county at the present, this project for up stream storage will probably never come to pass.

DROUGHT RESOURCE DIRECTORY

The agency at this time feels that the best help it will be able to give to the population of Fremont County in a drought situation will be to assist the citizens in obtaining a drought declaration and federal assistance through grants and low interest loans. Education on these issues may be the difference between the survival of the small rancher, farmer or small business man.

“We can't make it rain!”

SUMMARY

PROPERTY AFFECTED:	high
POPULATION AFFECTED:	high
PROBABILITY:	medium-high
JURISDICTION AFFECTED:	county-wide