CHAPTER 4. DROUGHT

Of all the natural weather-related disasters, drought is by far the most costly to 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 U.S. 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 socioeconomic 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).

Converse County had 435 farms in 2007—the latest year for which this information is available. The number of farms was up 28% from 2002, but the number of acres of land in farms was down 6% to 2,517,920. The average farm size was down 27% during the period to an average farm size of 7,247 acres. In 2007, the total value of agricultural products sold from Converse County was $34.8 million. In 2007, the county ranked #1 in the state for sheep and lambs and 12th for cattle—making it vulnerable to drought. (Source: wwwagcensus.usda.gov)

History

The most recent statewide drought in Wyoming started in 1999, but began in earnest in the spring of 2000 and endured through 2004. 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 in order of increasing precipitation deficit.

Table 4.1 Wyoming's Recent Worst Multi-Year, Statewide Droughts

Period	Average Annual Precipitation (Inches)	Percent of 1895-2006 Average Annual Precipitation (13.04")
1952-1956	10.65	81.69%
1900-1903	10.76	82.52%
1999-2004	11.07	84.89%
1987-1990	11.12	85.28%
1958-1964	11.67	89.49%
1974-1977	11.77	90.26%
1931-1936	11.79	90.41%

Widespread droughts in Wyoming, as determined from stream flow records, were most notable during three periods: 1929-1942, 1948-1962, and 1976-1982.

Instrumentation Record

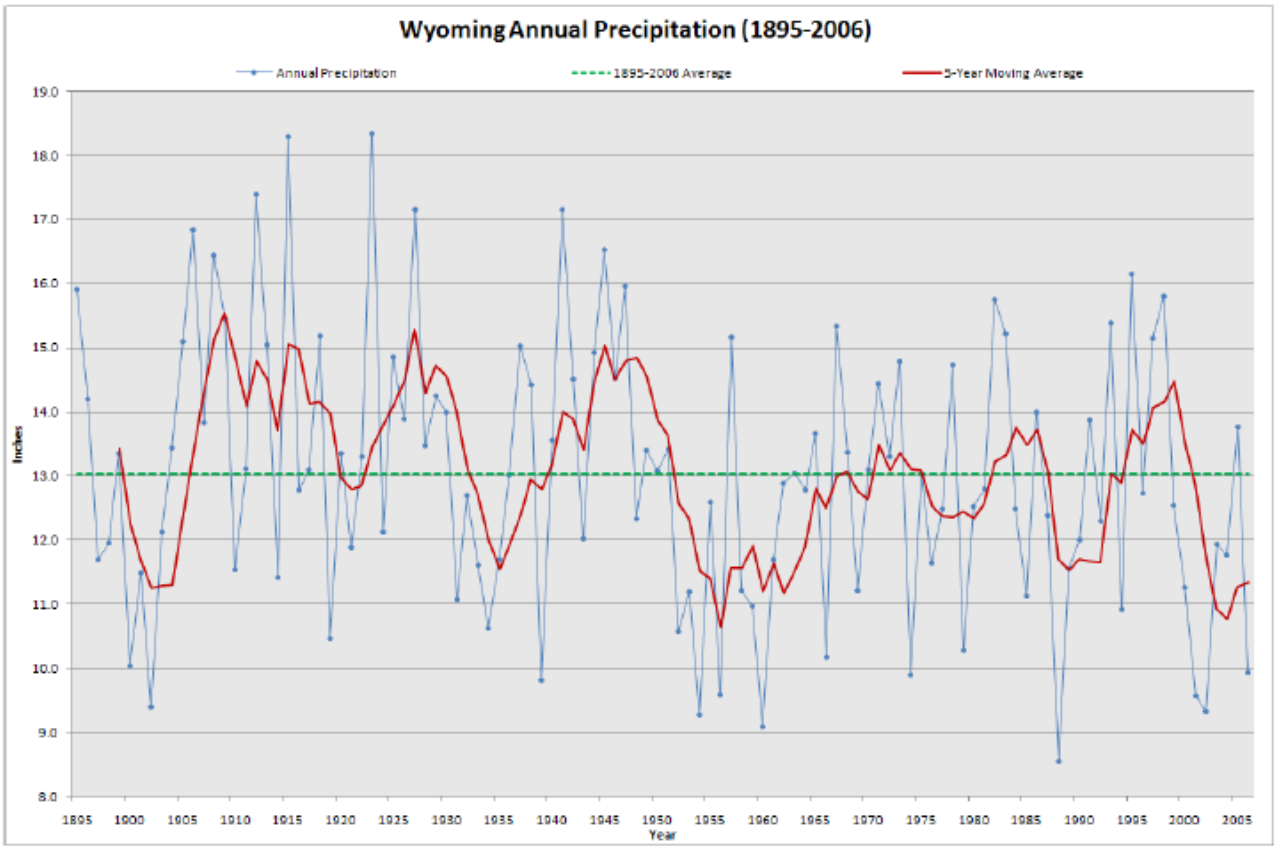

Figure 4.1 Wyoming Annual Precipitation (1895-2006)

As a whole, Wyoming's precipitation record from 1895-2006 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 there was an increasing trend of increased periods of drought (Figure 4.1). Converse County data have not been analyzed; however, the history of drought in Converse County is expected to be similar to the State patterns described above.

Impacts

Based upon Table 4.1 and Figure 4.1, the drought of 1999-2004 is as significant, if not more significant than any other droughts in the last 100 years for the entire state. Table 4.1, from the Wyoming State Climate Office, indicates that the most significant droughts in the last century, in terms of annual statewide precipitation averages, were in 1952-1956, 1900 to 1903, and1999-2004. In order to determine which drought period had the most significant impact on Wyoming, crop production and livestock inventory data for the 1952-1956 and 1999-2004 periods were compared. 1957 and 2005 were wetter years, with annual statewide precipitation totals above the 1895-2006 average. Those two years were used as endpoints for the droughts that started in 1952 and 1999 respectively. In both cases, the years following saw a return to drier conditions.

Dollar Impacts

Agricultural dollar impacts can also be used to show the effects of drought. Production figures were obtained from the Wyoming Agricultural Statistics that is compiled by the Wyoming Agricultural Statistics Service of the U.S. Department of Agriculture.

The data below represent changes in production in all hay and changes in inventory value for cattle and calves, and sheep. As such, the data should be considered impact value versus loss value. For example, with cattle and calves inventory, the inventory decreased during the latest prolonged 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. The information in Table 4.2 shows (with some time lag) generally decreased agricultural production in the county in response to the drought years and a rebound following the end of the drought.

Table 4.2 Converse County Production and Inventory (1999 – 2009)

Year	Hay Production (Tons)	Cattle and calves inventory	Sheep inventory
1999	88,400	77,000	61,000
2000	70,500	85,000	61,000
2001	66,500	85,000	65,000
2002	53,500	78,000	64,000
2003	64,000	59,000	60,000
2004	51,800	60,000	Not available
2005	55,600	62,000	Not available
2006	53,500	64,000	Not available
2007	62,000	63,000	Not available
2008	93,100	52,000	70,000
2009		54,000	62,000

Source: National Agricultural Statistics Service (www.nass.usda.gov)

The 1999-2004 drought can be shown to be the drought of historic record. There have been significant impacts on the agricultural and other industries from the 1999-2004 drought. The worst-case year was 2002, with a negative dollar impact of $308,171,390 statewide. Converse County is one of 23 counties in the State of Wyoming. 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 Converse County for 2002 would have been approximately $13,400,000.

The total impact statewide for the 1999-2004 drought has been $903,649,936. If it is assumed that the drought impact is equally distributed across the state, which in reality it is not, then the potential drought impact in Converse County would be over $39 million for the five-year period in 2002 dollars. Using a 4% annual inflation rate, this would put the losses for Converse County for this five-year event at approximately $56 million in 2010 dollars.

Future Potential Impacts

Based on the historic record, Wyoming experienced major drought conditions for 36 years out of a 115-year period (based on the total number of years in each of the seven droughts).

This yields a 31% chance that Wyoming will be in a drought in any given year. Should the drought become severe, the state could expect similar impacts to the 1999-2004 drought (based on the event of record). Post-2006 data shows that significant losses were experienced in the agricultural industry following the 1999-2004 drought. Even when a drought technically ceases, the impacts can continue. It may take years for the Wyoming agricultural industry to fully recover from the effects of any given drought.

Additionally, drought can exacerbate the risk of wildfires; increase the cost of municipal water usage; and deplete water resources used for industry and recreation, affecting the economy.

Summary

PROPERTY AFFECTED: Medium
POPULATION AFFECTED: High
PROBABILITY: High
JURISDICTION AFFECTED: County