4.3.3 Probability and Magnitude

The National Oceanic and Atmospheric Administration Paleoclimatology Program studies drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, “…paleoclimatic data suggest that droughts as severe as the 1950’s drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago.” Based on this research, the 1950’s drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930’s “Dust Bowl,” has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade. (National Oceanic and Atmospheric Administration, 2003)

A 500-year drought with a magnitude similar to that of the 1930’s that destroys the agricultural economy and leads to wildfires is an example of a high magnitude event. The Palmer Index, an index used by the Climate Prediction Center to measure long-term drought, has frequently had southwest Montana in the “extreme drought” category over the past several years.

 Overall Drought Probability: Moderate

4.3.4 Mapping

Drought is usually a regional hazard that is not enhanced by county-level mapping. All county areas are assumed to have the same risk level. Mapping of the current drought status is published by the US Drought Monitor each Thursday at http://drought.unl.edu/dm.

4.3.5 Vulnerabilities

Critical Facilities

Drought typically does not have a direct impact on structures.

Possible losses/impacts to critical facilities include:

- Loss of critical function due to low water supplies

**Expected Drought Impact to Critical Facilities: Low**

Critical Infrastructure

Severe droughts can negatively affect drinking water supplies. Should a public water system be affected, the losses could total into the millions of dollars if outside water is shipped in. Private wells could also dry up. Lima has a very ample public water supply.
Possible losses to infrastructure include:
   - Loss of potable water

*Expected Drought Impact to Critical Infrastructure*: Low-Moderate

*Except Lima*: Low

**Structures**

Drought typically does not have a direct impact on structures.

Possible losses/impacts to structures include:
   - Loss of function due to low water supplies

*Expected Drought Impact to Structures*: Low

**Population**

Drought evolves slowly over time and the population typically has ample time to prepare for its effects. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

*Expected Drought Impact to the Population*: Low-Moderate

*Except Lima*: Low

**Economic, Ecologic, Historic, and Social Values**

In an article written in the Montana Standard on the long-term drought effects on the Beaverhead River, Dick Oswald of the Montana Fish, Wildlife and Parks Department indicated there was a definite decline in the number of trophy brown and rainbow trout in the river during drought periods. The loss of fish has an economic impact on the county. According to a study of economics related to Clark Canyon Reservoir and the Beaverhead River fisheries completed in 1989, Beaverhead County received revenue between $4 million and $7 million per year directly related to fishing.

Fishing regulations changed numerous times throughout the 1990’s and 2000’s in order to accommodate low water flow. Not only have these changes affected the Beaverhead River, but they have also affected the Big Hole River and the Red Rock River. Regulations that have been modified include the number of fish that can be taken, fishing hours, and mandated and voluntary stream closures. Drought has not only affected the agricultural industry, but it has impacted the economics of the entire county.

Possible economic losses include:
   - Significant agricultural losses due to damaged crops and reduced livestock feed.
Beaverhead County, Montana
City of Dillon — Town of Lima

Pre-Disaster Mitigation Plan
September 2009

Beaverhead County had 421 farms and 1,279,031 acres in farmland with annual sales totaling over $63 million in 2002.

Beaverhead County had 135,926 head of cattle and calves, 15,823 head of sheep and lambs, and 295 head of poultry in 2002.

Source: US Department of Agriculture, 2002

Possible ecologic losses include:
  ▪ Loss of fish and waterfowl populations
  ▪ Loss of wildlife food and water supplies

Possible social losses include:
  ▪ Water rationing and conservation resulting in less than ideal lawns and gardens
  ▪ Water-related recreational activities may be limited

**Expected Drought Impact to the Values:** Moderate-High
**Except Lima:** Moderate

**Future Development**

Future development’s greatest impact on the drought hazard would possibly be to ground water resources. New water and sewer systems or significant well and septic sites could use up more of the water available, particularly during periods of drought. Fortunately, public water systems are monitored by the Montana Department of Environmental Quality, but individual wells and septic systems are not as strictly regulated. Therefore, future development could have an impact on the drought vulnerabilities.

**Expected Drought Impact to Future Development:** Low-Moderate

### 4.3.6 Data Limitations and Other Factors

The data limitations related to the drought hazard include:
  ▪ Difficulties in pinpointing the start and end of drought periods
  ▪ Limitations in quantifying economic losses from drought
  ▪ Lack of a publicly available database listing historical USDA drought declarations and the associated losses

Other hazards often related to drought include:
  ▪ Wildfires
  ▪ Strong winds
  ▪ Extreme heat
  ▪ Soil erosion
  ▪ Flash flooding (dry soils are not as permeable to water and heavy rains run off faster)