



Climate Monitoring

Importance

Because of its crucial role in driving or regulating many biological and physical processes at the landscape scale, climate has been identified as a vital sign for all Northern Colorado Plateau Network (NCPN) parks. Precipitation and temperature are the primary factors that limit an ecosystem's structure and function. Secondary limiting factors include long-term climate patterns: the length and intensity of weather events, seasons in which they occur, and amount of variability between and among years. Together, these dynamics greatly influence the types of plant species that occur, and where; the ways in which nutrients are cycled; and the relationships between soil, plants, and water availability. They can also affect the susceptibility of an ecosystem to disturbance.

Monitoring Effort

The overarching goal of NCPN climate monitoring is to compile and present climate data in a form that helps us to understand the reasons for trends seen in other network vital signs monitoring efforts. The NCPN compiles climate data from two regional climate monitoring programs, including data from 19 weather stations in and around NCPN parks. Parks are then provided with monthly and annual summaries of variables such as air temperature, precipitation, and snowfall.

Status and Trends

Preliminary assessments of NCPN weather-station data show a general trend also seen in broader, regional assessments: mean annual temperatures are increasing. Most NCPN stations with long observation periods show a general increase in average annual minimum temperature over the past 30–50 years. Conversely, there is evidence for a declining trend in snowfall from the 1980s to the mid-2000s; however, snowfall in 2010 and in the previous couple of years was higher than the



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Cooperative weather station, Black Canyon of the Gunnison National Park, March 2010.

long-term averages. Historical records for NCPN stations indicate that annual precipitation has been highly variable; there is no strong, unidirectional trend evident for the observation period (16–83 years).

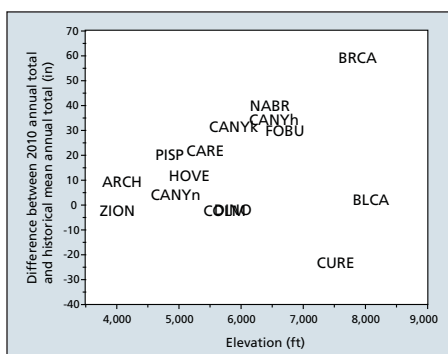
In 2010, mean annual maximum temperature tended to be below average throughout much of the NCPN region, while mean annual minimum temperature, precipitation, and snowfall exceeded long-term averages. Differences between long-term means and this year's measures of average minimum and maximum temperature and total precipitation were not related to the elevation gradient of stations. However, at all but two stations (those at Black Canyon of the Gunnison NP and Curecanti NRA), total snowfall was related to elevation gradient: the higher the elevation, the greater the increase in snowfall relative to long-term means (see figure).

The 25–50-year observation period characteristic of the majority of NCPN stations illustrates general, common trends among stations, but is of insufficient length to begin to discern climatic-regime shifts. In addition, these stations were selected because they are located in NPS units and may not be representative of the entire Northern Colorado Plateau area.

Climate is monitored in all NCPN parks except for Golden Spike National Historic Site.

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Differences between 2010 averages and long-term means for total annual snowfall, arrayed by elevation.