NOAA Supports Research to Assess Vulnerability of Boulder’s Water Supply

After a historic drought in 2002 that drastically limited Boulder, Colo.’s water supply and required strict mandatory water use restrictions, city leaders grew concerned that its water system would not sustain future demand. For decades, Boulder, which is located in a semi-arid climate, met its annual water resource needs by capturing the spring runoff from mountain snowpack that drains into the Boulder Creek watershed through a system of dams, reservoirs and pipelines. However, as the region’s population continues to grow and the climate continues to change, water managers began to ask questions about how changes in temperature or the timing and amount of precipitation could impact their critical water supply.

Some of these questions included: How often are droughts as severe as the 2002 event likely to occur? Will the winter snowpack decline and how will this alter the spring runoff? Will water shortages become more common? Is Boulder’s water system resilient enough to handle a hotter and potentially drier climate? What else needs to be done to ensure there is enough water to meet future needs?

To address these questions, the city of Boulder collaborated with a team of climate scientists and water resource experts from NOAA, other federal, state and local agencies, universities and the private sector to conduct an in-depth analysis of vulnerabilities posed by a changing climate and other factors on their water supply. The team looked back at historic local climate records from a variety of sources, including stream flows, weather records, climate extremes, and tree-ring measurements. They also used NOAA’s Geophysical Fluid Dynamics Laboratory climate models (GFDL1, GFDL0), along with general circulation models from other sources, to make climate projections for this region.

The team integrated all of the collected climate information and developed various climate scenarios in order to project how conditions might change through the end of the century and to generate altered stream flow sequences for Boulder Creek. In every climate scenario, models projected that temperatures are likely to be warmer than in the past; however, they diverged over whether the future would be wetter or drier. Although it appears that a warmer climate will not pose an immediate problem to the city’s short-term municipal water needs, it may affect Boulder-area farmers who need larger quantities of water to irrigate crops in the summer.

This study, “The Potential Consequences of Climate Change for Boulder Colorado’s Water Supplies,” is helping the city of Boulder planners in diverse ways—among them, to better prepare for and

On average, Boulder’s annual water supply comes from Barker Reservoir on Middle Boulder Creek, Silver Lake/Lakewood Watershed on North Boulder Creek, and the Boulder Reservoir. Farmers, ranchers, residents, and wildlife living in the Boulder Valley and the South Platte River basin compete to use the meltwater from the Rocky Mountains.
respond to the real water challenges of today as well as the 
projected future challenges influenced by a changing climate. The 
city is now beginning to prioritize activities and projects that will 
help it better manage their water system. These efforts will 
increase the city’s ability to adapt to natural disruptions such as 
year-to-year variations in precipitation and snowpack, and 
societal factors such as increases in demand and water rights.

For example, the city fast-tracked a project in its Capital 
Improvement Plan to rehabilitate a dam for an existing reservoir 
in the city’s Silver Lake Watershed, in part because reservoir 
storage will become even more important as mountain 
Snowpack begins melting earlier in the spring. Also, a water 
pipeline project that was proposed to address water quality and 
security concerns is now a priority for funding because it will also 
provide the water utility with more flexibility in its choices of water sources in the presence of increased climate 
variability.

The Boulder water supply study highlights the inextricable connection between climate science and water 
management by providing climate scientists and water resource professionals with an opportunity to share their 
respective knowledge and translate it into the practical applied information — information that engineers and 
water managers need to plan for the future.

In addition to partially funding this collaborative study, 
NOAA will continue playing a vital role in helping Boulder 
plan for the future. According to Carol Ellinghouse, a veteran 
water manager who has served as Boulder’s Water Resources 
Coordinator, there will be “ongoing interactions between 
NOAA scientists and area water providers at workshops and 
conferences designed to both increase the understanding of 
water providers needs and about the information that 
NOAA can provide.”

Ellinghouse further notes that Boulder water managers 
actively track various NOAA publications and use NOAA 
research data to assess trends in water resource data to 
effectively manage their water supply.

NOAA continues to provide support for studies that help 
people and communities better plan and respond to climate 
change and variability. These investigations strive to identify 
sector-specific vulnerabilities to climate impacts and help 
build the capacity within that sector to adapt to climate 
variability and change.

For more information:
• NOAA National Climatic Data Center: www.ncdc.noaa.gov
• NOAA Climate Prediction Center: www.cpc.ncep.noaa.gov
• National Integrated Drought Information System: 
  www.drought.gov
• Climate Portal story “Will Boulder’s Water Supply Stand Up to 
  Climate Change?”
  www.climatewatch.noaa.gov/article/2011/39522
• Final study report (February 2009) by Stratus Consulting: “The Potential Consequences of Climate Change for Boulder 

NOAA’s Water Resources Products and Services

Long-Range (Seasonal)
• NOAA issues 3-month seasonal temperature, 
  precipitation and drought outlooks
• NOAA works with local, state and national partners in the 
  water, agricultural and other sectors using drought and 
  flood information to reduce impacts and risks.

Monthly
• NOAA issues 30-day temperature and precipitation 
  outlooks
• NOAA provides monthly El Niño/La Niña forecasts
• NOAA issues the State of the Climate, putting climate 
  events in historic context

One to Two Weeks
• NOAA issues 8-14 day nationwide weather and water 
  forecasts
• NOAA, USDA and the National Drought Mitigation Center 
  issue the U.S. Drought Monitor

Daily to Weekly
• NOAA issues daily to 7-10 day nationwide weather and 
  water forecasts
• NOAA meteorologists are deployed to fire and flood 
  operation centers to support real-time forecasts
• NOAA conducts briefings with media and emergency 
  response personnel

Other Products
• U.S. Snow Climatology
• Local & Regional Climatological data
• Climate Normals