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U.S. Army Corps of Engineers, U.S. Bureau of Reclamation and Sandia National Laboratories Issue Upper Rio Grande Impact Assessment Report

ALEXANDRIA, VIRGINIA. The U.S. Bureau of Reclamation (Reclamation), the Albuquerque District of the U.S. Army Corps of Engineers (USACE), and Sandia National Laboratories (Sandia) issued the *West-Wide Climate Risk Assessment: Upper Rio Grande Impact Assessment* in December 2013. This study investigates historic and future climate trends in the Rio Grande Basin above Elephant Butte Dam, New Mexico, in order to derive better estimates of future water availability in this increasingly arid region where surface water is already fully allocated. This study was supported by funds from Reclamation, the USACE Institute for Water Resources Responses to Climate Change Program, and USACE Albuquerque District.

USACE conducted an analysis of temperature and precipitation trends between 1971 and 2012 for the Upper Rio Grande. The analysis shows that average annual temperatures have been rising at a rate of approximately 0.35°C (0.63°F) per decade. Lower elevation valley and plateau areas have seen increases in nighttime lows and daytime highs. However, higher elevation areas of the Southern Rocky Mountains and adjacent ranges that provide the majority of flows to the Rio Grande are warming at a much faster rate, particularly at night. Precipitation shows little trend, with the exception of statistically-significant decreases in March and November. Warmer winter and spring temperatures are likely contributing to increased snowpack loss in winter, earlier spring runoff, and reduced peak runoff flows throughout the Upper Rio Grande. The rate of warming in higher elevation areas in 2001-2012 was more than double that in the period 1971-2000.

The climate models show that the Upper Rio Grande is likely to warm by an additional 5 to 7°F (3 to 4°C) during the 21st Century while precipitation is likely to decline slightly. The small change in precipitation abundance will be accompanied by changes in the magnitude, timing and variability of precipitation events and stream flows. Model simulations consistently project decreasing snowpack, an earlier and small spring snowmelt runoff, and an increase in the frequency, intensity and duration of both droughts and floods.

The existing trends and model projections point to a future in which surface water abundance declines in the Upper Rio Grande. Potential impacts to USACE business lines are likely:

- **Flood Risk Management:** Despite the increased frequency and duration of drought, precipitation is likely to become more concentrated into larger storm systems, producing larger and possibly more frequent flood events in the basin comparable to the September 2013 flood event.
- **Ecosystem Restoration:** Ecosystem restoration efforts along the Rio Grande are likely to be increasingly hampered by reduced water availability and decreased water quality. Lower average flows in the Rio Grande are likely to concentrate pollutants. Warmer water is likely to have a higher nutrient load and lower dissolved oxygen content than at present. Periodic major flood events can increase the contribution of pollutants in the

river. Declines in near-surface groundwater are anticipated to reduce water availability to riparian vegetation. Ecological systems that are already operating near thresholds for water availability may cross those thresholds and undergo fundamental changes in the types of vegetation and wildlife they support.

- **Hydropower:** Hydropower is generated at Abiquiu and Elephant Butte Dams. Lower average and late summer stream flows are likely to reduce the ability of hydropower facilities to generate electricity.
- **Recreation:** Recreation at USACE and Reclamation reservoirs is likely to be affected by both drought and floods. Both events reduce the availability of facilities for water-based recreation in this arid region. Projected decreases in stream flows in the basin are also likely to have a negative impact on whitewater rafting and fishing.

The complete report is available on the Reclamation Upper Rio Grande Impact Assessment website at <http://www.usbr.gov/WaterSMART/wcra/reports/urgja.html>.

Learn More

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