

# Colorado's Lake Dillon is warming rapidly

January 8 2019, by Katie Weeman

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Lake Dillon, a mountain reservoir that supplies water to the the Denver area. A new study finds the lake's surface waters are warming. Credit: CIRES Center for Limnology

The surface waters of Lake Dillon, a mountain reservoir that supplies

water to the the Denver area, have warmed by nearly 5 degrees Fahrenheit (2.5 degrees Celsius) in the last 35 years, which is twice the average warming rate for global lakes. Yet surprisingly, Dillon does not show adverse environmental changes, such as nuisance algal blooms, often associated with warming of lakes.

Researchers at the CIRES Center for Limnology, who have just published a multi-decadal study of Lake Dillon, conclude that the [lake's](#) rapid warming and its lack of ecological response to warming are explained by the high elevation of the lake.

"The warming of Lake Dillon is a result of climate change but, in contrast with warm lakes, which respond in undesirable ways to warming, Lake Dillon shows no environmental response to warming," said William Lewis, Director of the CIRES Center for Limnology and lead author of the new paper published today in AGU's *Water Resources Research*. "The explanation for the lake's ecological stability lies in its low temperature, which serves as a buffer against ecological effects of warming."

Since 1981, Lewis and colleagues in the CIRES Center for Limnology have collected detailed information not only on Lake Dillon's temperature, but also on its water quality and aquatic life. Full vertical profiles of water temperature document changes in vertical distribution of heat over time. The record shows that warming of tributary water contributes to warming of the lake's deepest waters.

"The 35-year data set allows us to see the complete warming pattern of the lake," said James McCutchan, associate director of the Center. Natural events, including droughts and floods, create interannual variation that obscures the effects of climate change over short intervals, whereas multidecadal data sets can show more clearly the effects of climatic warming.

Dillon is the highest lake yet studied for full water column warming, as Lewis and his colleagues note in their paper. The study also is the first to analyze warming in a reservoir, rather than a natural lake.

"Reservoirs can differ fundamentally from other lakes in their response to warming because they often release water from the bottom as well as the top of the water column," said Lewis. "They can warm not only from the top, in response to solar radiation reaching the surface, but also from the bottom, as tributaries subject to climatic [warming](#) replace cold bottom water with progressively warmer tributary water."

The Lake Dillon study program is sponsored by Denver Water, which uses the [water](#) for treatment and delivery to Denver residents, and by the Summit Water Quality Committee, which represents the interests of local residents in preservation of Lake Dillon's [water quality](#).

**More information:** Effects of climatic change on temperature and thermal structure of a mountain reservoir. *Water Resources Research*. [doi.org/10.1029/2018WR023555](https://doi.org/10.1029/2018WR023555)

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