

Research Update

S&T Program Project ID 9449
Bulletin 2017-07

Bottom Line

This research project produced an open source software toolkit and a repository of global climate projection data processed into hydrologic units (HUC8). This “Climate Analysis Toolkit” (Toolkit) equips Reclamation scientists and engineers with the necessary tools and preprocessed data to readily integrate global climate projection data into operations, planning, and design.

Better, Faster, Cheaper

To understand the behavior of western water resources now and into the future, it is essential to consider projected changes in precipitation and temperature. However, the global climate projections data assembled by the international climate change community is complex and extensive. The Toolkit enables global climate projections to be quickly evaluated, selected, and processed to generate inputs for hydrologic modeling.

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Making Sense of Global Climate Projection Data

Geospatial and statistical analysis tools to aid scientists and engineers to access, visualize, evaluate, and use global climate projection data to inform water resources planning and design

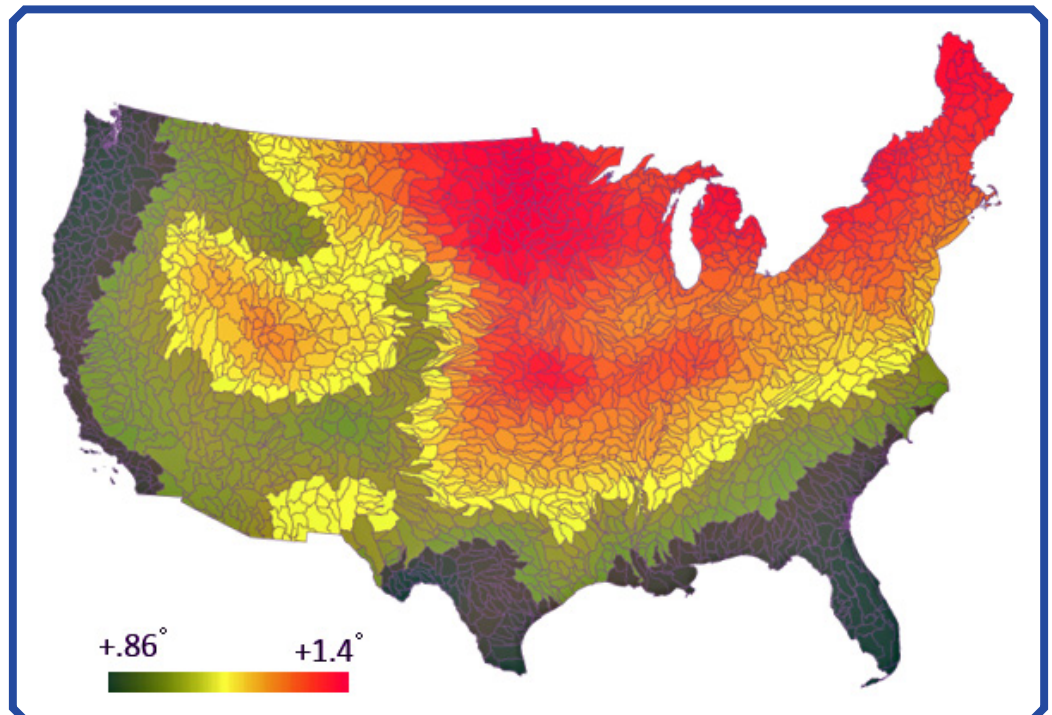
Problem

The complexity and enormity of global climate projection data have hampered Reclamation’s ability to integrate climate change considerations into its planning and design processes. Nonetheless, an understanding of projected changes in precipitation and temperature is crucial for good planning and design, future operations, and decisionmaking. What can be done to assist scientists and engineers to better use global climate projection data in their work?

Solution

This Reclamation Science and Technology Program research project involved interviewing a cross section of Reclamation hydrologists and engineers to identify software tools and processes that would best aid them in using global climate projection data in their work. During the interviews, the following common needs were identified:

- A tool to visualize and evaluate the numerous global climate projections
- A way to select global climate projections data for an area of interest
- A way to generate input data for use in hydrologic models



Projected change in temperature—one of 234 Coupled Model Intercomparison Project Phase 5 (CMIP5) global climate projections.

Application and Results

Reclamation's collaboration with the Department of Civil and Environmental Engineering at Brigham Young University, Provo, Utah, produced an open source software toolkit and a repository of global climate projection data processed into hydrologic units (HUC8). The "Climate Analysis Toolkit" (Toolkit) was designed as an extension to HydroDesktop, a widely used, open source, Geographic Information System (GIS)-based application supported by the Consortium for the Advancement of Hydrologic Science, Inc. (CUASHSI).

Armed with user requirements provided by Reclamation, Associate Professor Dr. Dan Ames and his graduate students developed a set of software tools that evolved into the Toolkit. They also developed a method for preprocessing global climate projection data into collections that correlate to basin hydrologic units (HUC8). Users can visualize individual global climate projections, or create ensembles of projections, using the Hybrid Delta statistical method, to represent a future condition for analysis. The Toolkit also includes tools for downloading global climate projection data for a specific geographic area of interest. Based on the selected global climate projections, users can then generate forcing files for precipitation and temperature to be used in model-projected streamflows with hydrologic models.

Future Plans

Hydrologists and engineers are already using the Toolkit to integrate climate-adjusted streamflow projections into project design and analysis, as well as ongoing basin studies. The global climate projections data, preprocessed into hydrologic units (HUC8), will be published as an open data resource by the CUASHSI.

"Things become clearer when you can visualize complex data. Tools that can take a bunch of seemingly unrelated data files and turn them into a picture showing how they relate is invaluable."

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More Information

www.usbr.gov/research/projects/detail.cfm?id=9449

www.usbr.gov/research/projects/researcher.cfm?id=1479