Klamath River Basin

Basin Overview

The Klamath River Basin has an area of approximately 15,700 square miles and is the second largest watershed in the State of California after the Sacramento River. The basin supports a wide range of habitats for numerous fish and wildlife species in addition to supplying water for agricultural, hydropower, Tribal, recreational, municipal, industrial, and domestic uses. Reclamation's Klamath Project, authorized in 1905, provides water to approximately 1,400 farms covering about 200,000 acres, as well as about 27,000 acres of irrigable lands in the Lower Klamath and Tule Lake National Wildlife Refuges.

Future Changes in Climate and Hydrology

Temperature

Relative to the historic climate (1950 to 1999), temperatures are likely to continue to increase during the 21st century. Warming is projected to increase by about 2°F (degrees Fahrenheit) in the early-21st century, 3°F at mid-century, and more than 4.5°F with a potential range from 2.5°F to 10°F by the end of the century.

Precipitation

During the 21st century, project changes in basinwide annual precipitation include an increase of about 2 percent by mid-century to about 5.5 percent by the end of the century, with a potential range of between a 2 percent decrease to a 6 percent increase.

Snowpack and Runoff

Compared with the historical period (1950 to 1999), basinwide snowpack projections—as measured by snow water equivalent—indicate declines in April 1 snow water equivalent of roughly 30 to 40 percent by the 2030s and close to 60 percent by the 2070s. Due to warming, more winter precipitation will occur as rainfall. This change is projected to cause an increase in basinwide runoff of about 10 percent by the 2030s, increasing to about 15 percent by the 2070s.

Innovations

As part of the Klamath River Basin Study, the Klamath River Basin RiverWare water operations model was developed to encompass the entire watershed. To represent the importance of groundwater and water temperature, the basin study team incorporated a groundwater model (MODFLOW) of the Upper Klamath River Basin and a river temperature model (RBM10), each developed by U.S. Geological Survey (USGS) researchers, into the modeling framework. In addition, the Reservoir Operations Pilot study developed a new modeling framework for incorporating new process-based ensemble forecasts (using physical models as opposed to statistical models) of water supply and irrigation water demands in the Upper Klamath River Basin, allowing water managers to consider uncertainty in the forecasts.

Next Steps

Klamath River Basin Study Tasks

A number of tasks have been identified to further enhance our understanding of climate change impacts on the Klamath River Basin:

- Refinement of ecosystem demands and vulnerabilities
- Development of coupled groundwater/surface water models
- Refinement of the Reservoir Operations Pilot
- Analysis of effects of potential policy changes

Investment in Applied Science Projects

In July of 2020, Reclamation announced an initial $1.2 million investment in applied science projects for the Klamath Project. These projects will be conducted in collaboration with other Klamath River Basin agencies and stakeholders. The projects will improve partners' understanding of natural streamflows and the relationship between project operations and aquatic ecosystems in the basin. This funding will allow Reclamation to begin several important science initiatives:

New Naturalized Flow Study – Update a 20-year-old assessment of streamflows to address shortcomings identified in the National Academy of Science's 2004 and 2007 reviews, as well as incorporate more recent data.

Lake Level Science Update – Conduct focused evaluations of emerging science, in partnership with the USGS and U.S. Fish and Wildlife Service, that will improve the understanding of how Upper Klamath Lake elevations affect endangered sucker fish.

Flow/Habitat Relationships in the Klamath River – Evaluate contemporary methods of data collection and habitat modeling techniques to tailor a plan to better support habitat and water flow needs of juvenile Chinook and threatened Coho salmon in the Klamath River.

Salmon Model Refinement – Refine a salmon survival model, in partnership with the USGS and U.S. Fish and Wildlife Service, that will update the Stream Salmonid Simulator model, which is used to estimate juvenile salmon survival during their migration to the sea.

Salmon Disease and Hydrology Data Portal – Develop a process that will improve biological data management on salmon disease in the Klamath River Basin. Collectively, these initiatives will assist with water supply forecasting, operations planning, and modeling to guide more informed decision making in the basin.

Klamath Project Sign, Klamath Falls, Oregon

To see the full basin report and other components of the 2021 SECURE Water Act Report, please visit: https://www.usbr.gov/climate/secure