

Climate Change Impacts and Adaptation

Values

Through its effects on water resources, climate change impacts food security, energy production, ecosystem health, and public safety. Ongoing and projected climate change will result in sea level rise with increased risk of flooding and erosion in coastal areas, reduced winter snow accumulation and decreased water supply, changes in flood and drought frequency and severity, and loss of aquatic habitat. Evaluating and understanding the potential impacts of climate change on water resource systems and operations can assist managers in developing strategies that anticipate and adapt to future climatic conditions.

Services

NHC evaluates climate change impacts and develops adaptation strategies as an integral component of our hydrologic and hydraulic analysis and water planning and design services.

OUR SERVICES INCLUDE:

- Quantifying runoff volumes and timing under climate scenarios at various geographical scales.
- Evaluating flood risk under future climate and land use scenarios that combine changes in the frequency and severity of peak stream flows with sea level rise, storm surge, and waves.
- Investigating effects of changes in precipitation and temperature regimes on water availability for storage and downstream beneficial use.
- Developing adaptive flood control and water system operational alternatives.
- Analyzing climate change impacts on river ice regimes.
- Projecting shifts in river morphology in response to changes in hydrologic regimes.
- Assessing climate change impacts on aquatic habitats.



Technical Approach and Capabilities

NHC collaborates with clients to address specific water management challenges posed jointly by climate change, a growing population, and environmental quality goals. We incorporate our longstanding leadership in numerical modeling and analysis of hydrologic and hydraulic systems to address the evolving science of climate change adaptation. Using our thorough understanding of hydrologic processes, we apply the best scientific and engineering techniques to select climate projections, use state-of-the-art hydrologic and hydraulic models, and evaluate adaptive management alternatives. To support clients' planning decisions for future time horizons, we evaluate the inherent uncertainties in our assessments and provide probabilistic estimates to support risk-based decision making.



Experience

Recent projects of current NHC staff have evaluated climate change impacts and adaptation actions in the areas of water supply, floodplain management, hydro-ecology, infrastructure resiliency, and water quality:

■ Sea Level Rise and Coastal Flood Analysis

- Impacts of sea level rise on interior flooding in the Serpentine and Nicomekl Rivers watersheds, British Columbia
- Impacts of climate change on flooding risk at NASA Ames Research Center, South S.F. Bay
- Analysis of changes in storm surges and risk of coastal flooding in the Hudson Bay area as part of the Ouranos Project, Northern Canada

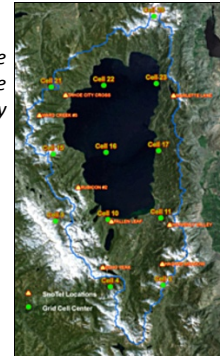


Howard Hanson Dam and Reservoir, Green River, WA

■ Snowpack, Ice, and Water Supply Management

- Climate change impacts on Eastern Sierra snowpack, and resulting water yield for this major water source for the City of Los Angeles
- Implications of climatic warming for a proposed dam, river ice regime, and downstream flooding on the Peace River, Alberta
- Ice monitoring program in the James Bay area highlighting the impacts of warmer winters on the ice fields, James Bay, Quebec

Effect of climate change on Lake Tahoe water quality



■ Urban Stormwater, Water Quality

- Application of dynamically downscaled precipitation and hydrologic modeling to assess changes in flooding and base flow in Thornton Creek, Seattle, Washington
- Analysis of implications of climate change on management of stormwater to meet TMDL targets for Lake Tahoe



Effect of climate change on flooding risk at NASA Ames Research Center, South San Francisco Bay

■ River and Floodplain Management

- Application of climate projections and downscaling to analysis of future flow regime and implications for management of the Green River, Washington
- Development of an approach to climate change adaptation for restoration design on the Sammamish River, Washington

Benefits

NHC's climate change assessments provide a basis for prudent planning to adapt to potential future changes in water supply, flood conditions, and aquatic habitat values. This analysis and planning can enhance preparations to gain legal and public support to pursue adaptation strategies to bolster future water supplies, increase flood protection, support informed land use decision making, and address threats to ecosystem health.

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