Possible Impacts of Climate Change to California's Water Supply

Introduction

The State Water Project (SWP) and federal Central Valley Project (CVP) provide water for over 23 million people in California. Water stored in reservoirs flows through the Sacramento-San Joaquin Delta where pumps and canals transfer the water to central and southern California. A 2009 report by the California Department of Water Resources on *Using Future Climate Projections to Support Water Resources Decision Making in California* looks at how projected future climate conditions could affect the reliability of California's water supply. Following are the key findings of the report.

Future Uncertainty

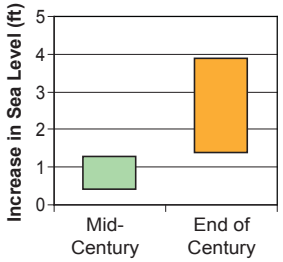
Planning for the future involves uncertainties. This study uses current projections for climate, population, and water demands to estimate California's future water supply. Uncertainties in the analyses increase the farther that we look into the future.

Sea Level Rise Projections

Section 4.1 in the report.

Warmer future air temperatures are expected to cause sea levels to rise. In fact, the sea levels near San Francisco increased by over 0.6 feet in the 20th century. Based on 12 future climate scenarios, projections for global sea level rise are 0.4 feet to 1.2 feet at mid-century and 1.4 feet to 3.9 feet by the end of the century. Rising sea levels will bring more saline ocean water into the Delta. Additional fresh water will need to be released from upstream reservoirs to maintain water quality.

Ongoing research indicates that future sea level rise may be even higher than the projections used in this report.



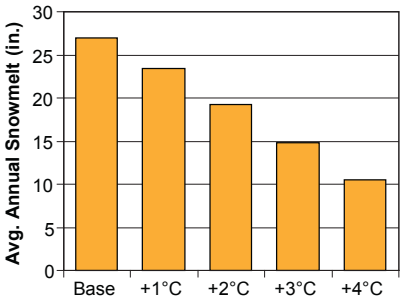
Increasing Air Temperature

Section 5.1 in the report.

Runoff from the upper Feather River basin provides water for Lake Oroville, the main water supply reservoir for the SWP. Because it is a low elevation basin, the snowpack and subsequent snowmelt runoff may be more vulnerable to increasing air temperatures than snowpack in higher elevation watersheds. Warmer air temperatures would shift some precipitation from snow to rain. Snowpack is an important natural reservoir for storing water in the winter and later augmenting the water supply through spring snowmelt.

An air temperature increase of 1°C (1.8°F) is expected to reduce the average annual snowmelt by about 15%, and a 4°C (7.2°F) increase results in about 60% less snowmelt.

Runoff would also shift earlier into the year, which is when reservoirs are operated for flood protection, not water supply. A 4°C (7.2°F) increase in air temperature shifts the mean runoff from mid-March to mid-February.



Climate Change Impacts on Water Supply

Section 5.2 in the report.

Future increases in air temperature, shifts in precipitation patterns, and sea level rise could affect California's water supply by changing how much water is available, when it is available, and how it is used. This study looks at climate change impacts to California's water supply reliability for 12 future projections from Global Climate Models (GCMs) for a higher greenhouse gas (GHG) emissions scenario and a lower emissions scenario. It assumes that current SWP and CVP infrastructure, regulations, and operating rules do not change. However, uncertainties in the results increase as the projections move further into the future.

Expected impacts to the SWP and CVP include pumping less water south of the Delta, having less surplus water in reservoirs that can be used during shortages, pumping more groundwater to augment reductions in surface water supplies, and an increased risk that insufficient water availability could interrupt SWP and CVP operations. A water shortage worse than the one during the 1977 drought could occur in 1 out of every 6 to 8 years by mid-century and 1 out of every 3 to 4 years at the end of the century. The table below shows the range of impacts to the SWP and CVP.

	Mid-Century		End of Century	
	Higher GHG Emissions (A2)	Lower GHG Emissions (B1)	Higher GHG Emissions (A2)	Lower GHG Emissions (B1)
Delta Exports	-10%	-7%	-25%	-21%
Reservoir Carryover Storage	-19%	-15%	-38%	-33%
Sacramento Valley Groundwater Pumping	+9%	+5%	+17%	+13%
SWP & CVP Power Generation	-11%	-4%	-9%	-4%
SWP & CVP Power Use	-14%	-14%	-17%	-16%
System Vulnerability to Interruption*	1 in 6 years	1 in 8 years	1 in 3 years	1 in 4 years
Additional Water Needed to Maintain Operations**	750 TAF/yr	575 TAF/yr	750 TAF/yr	850 TAF/yr

TAF=thousand acre-feet

An acre-foot is the amount of water a family of four will use in a year.

The results at the end of the century are more uncertain than the mid-century results.

* The SWP-CVP system is considered vulnerable to operational interruption during a year if the water level in one or more of the major supply reservoirs (Shasta, Oroville, Folsom, and Trinity) is too low to release water from the reservoir. Under current conditions, the system is not considered vulnerable to operational interruption.

** Additional water is only needed in years when reservoir levels fall below the reservoir outlets.

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