

CLIMATE CHANGE on the TONGASS NATIONAL FOREST

The future climate on the Tongass National Forest is likely to be different than what we see now and what we have seen in the past. According to projections, the Tongass will gradually warm and receive slightly increased levels of precipitation over the next century. A changing climate may influence social, ecological, and economic systems. Environments and resources managed by the U.S. Forest Service will be impacted. However, considerable uncertainty exists around how, where, and to what degree the impacts will occur. One way to deal with uncertainty is to consider a range of possible scenarios. By considering various future scenarios, the Tongass National Forest can better manage resources vulnerable to climate change.

Southeast Alaska is likely to remain a coastal rainforest over the next century, but changes in temperature and freezing patterns may indirectly influence snow, water, fish and wildlife, cultural practices, economic development, and other features of the region.



Creating Climate Projections

To help anticipate changes, climate models can be used to estimate future ranges of temperature and precipitation. Climate models are simplified versions of reality that use mathematic equations to represent climate processes. Information about regional geography, such as elevation, slope, and coastlines, can be integrated into global climate models so that they better reflect the projected changes at a regional scale. This process is called downscaling, and it is the primary means to estimate future forest-level climate.

Climate Change in the Tongass

Downscaled climate projections of temperature and precipitation have been developed for the Tongass. **Based on conservative scenarios, the Tongass is projected to gradually warm and receive slightly increased levels of precipitation over the next century.**

During the 21st century, this region is expected to experience the largest increase in the number of days above freezing in North America. **Future projections suggest that the Tongass will have a later freeze date and earlier thaw date** (date that the temperature midpoint drops below or rises above 32° F). Changes in temperature and precipitation are likely to impact the distribution, timing, and quantity of snowfall and resulting runoff in the Tongass. The magnitude of these impacts will likely be influenced by elevation and aspect in this mountainous region.

Impacts on Tongass Resources

What do the projected changes in temperature and precipitation mean for Tongass resources? Given the reliance on water-related resources, the quantity and timing of precipitation is a particularly important change to consider in the region. Hydropower, forest resources, tourism, fish, and wildlife are just a few of the forest characteristics and resources in and around the Tongass that may be affected by climate change.

It is important to note that predicting climate-driven changes in the environment is difficult, especially in Alaska where historical weather-station data is relatively sparse. Increased monitoring in Alaska is one of the best strategies for improving our understanding of changes in climate and the response of ecosystems to change.

The Tongass plans to expand climate change related knowledge and understanding. Exploring the interaction between climate and important Tongass resources will guide future management decisions intended to maintain livelihoods, economic opportunities, and cultural integrity, despite climate uncertainty. As opportunities arise, the Tongass plans to collaborate with partners to evaluate potential climate effects by assessing key social, ecological, and economic resources.

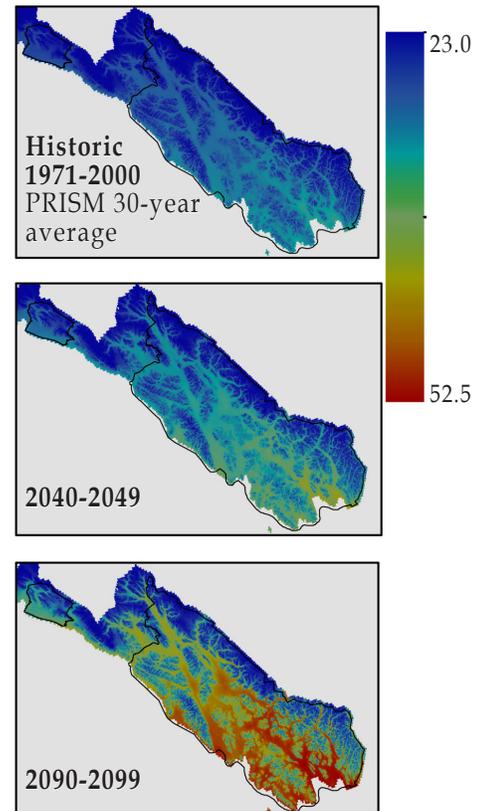
40 and 90-Year Temperature Projections for the Tongass National Forest

Downscaled climate models for the Tongass suggest the average annual temperature will gradually increase during the 21st century.

Average winter temperatures are projected to surpass the freezing point (32°F). It is important to begin thinking about what impact this will have on Tongass hydrology characteristics (snow pack, spring runoff).

Time Period	Season	Average Temp. (°F)	Change from Historic Value
Historic (1971-2000)	Annual	39.9	<i>not applicable</i>
	Winter	28.3	
	Spring	38.5	
	Summer	52.4	
	Autumn	40.4	
2045	Annual	42.7	+ 2.8
	Winter	31.1	+ 2.8
	Spring	41.3	+ 2.8
	Summer	55.0	+ 2.6
	Autumn	43.4	+ 3.0
2095	Annual	46.3	+ 6.4
	Winter	35.9	+ 7.6
	Spring	44.7	+ 6.2
	Summer	58.5	+ 6.1
	Autumn	46.1	+ 5.7

Projected Change in Average Annual Temperature (°F)



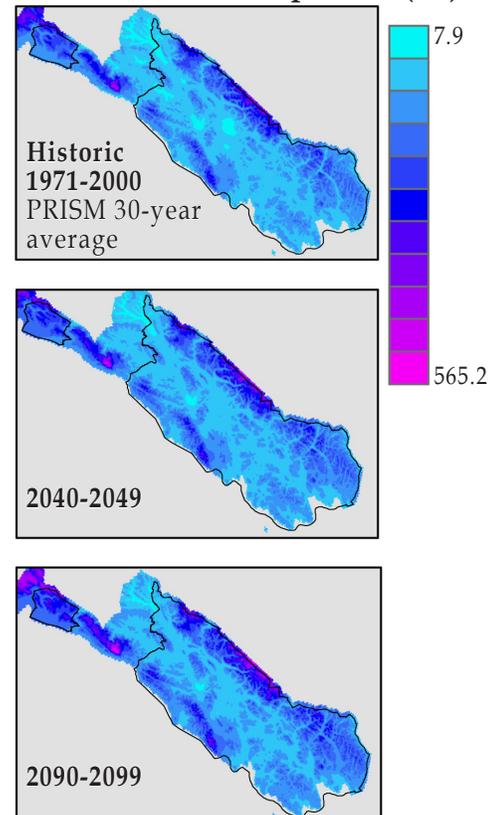
40 and 90-Year Precipitation Projections for the Tongass National Forest

Downscaled climate models for the Tongass suggest the average annual precipitation will slightly increase during the 21st century.

Average winter precipitation is projected to increase the most, and summer is projected to increase the least. Considering most change is anticipated in the winter, it may be important to think about how precipitation will interact with changes in winter temperature to influence snow conditions.

Time Period	Season	Total Precipitation (Inches)	Change from Historic Value
Historic (1971-2000)	Annual	131.7	<i>not applicable</i>
	Winter	36.8	
	Spring	25.1	
	Summer	20.3	
	Autumn	49.4	
2045	Annual	142.6	+ 10.9 (8.3%)
	Winter	39.8	+ 3.0 (8.2%)
	Spring	27.8	+ 2.7 (10.7%)
	Summer	21.6	+ 1.2 (6.4%)
	Autumn	53.0	+ 3.6 (7.3%)
2095	Annual	154.7	+ 23.0 (17.5%)
	Winter	47.4	+ 10.6 (28.8%)
	Spring	30.4	+ 5.3 (21.1%)
	Summer	21.6	+ 1.3 (6.4%)
	Autumn	55.3	+ 5.8 (11.9%)

Projected Change in Total Annual Precipitation (In.)



Tongass National Forest
 Darrin Kelly, Acting TNF
 Partnership Coordinator
 dpkelly@fs.fed.us | 907.747.4229
 www.fs.fed.us/r10/tongass

Scenarios Network for Alaska & Arctic
 Planning (SNAP)
 3352 College Road, Fairbanks AK 99709
 nlfresco@alaska.edu | 907.474.2405
 snap.uaf.edu