

Grade: Merit

For Merit, the student needs to explain human-induced change within the Earth system.

This involves using science ideas to explain how the change affects the Earth system.

This student has explained how soil without trees and their roots can lead to both flooding and droughts. Effects on the geosphere and hydrosphere are explained. The student has also included several pieces of data to indicate how significant the human induced change is across Aotearoa.

For Excellence, the student could discuss the scientific implications of a human induced change by analysing how effects in a sphere may link to affects in other sphere(s).




Deforestation

PESS 1.1 Demonstrate understanding of human-induced change within the Earth system.



How deforestation leads to floods



Tree roots soak up excess water in the soil. If there are fewer trees, the roots won't be soaking up water, so once the soil has absorbed all the water it can, the extra water will have nowhere to go and will sit above ground, causing a flood. The tree roots also funnel the water deeper underground, where the water won't get to otherwise. Without roots holding the soil together, the dirt and debris can easily get pulled along with flowing water and cause a blockage which water can build up behind and flood even higher. After trees get cleared, the roots will dry out and shrivel up, which creates blockages underground in the soil, so it takes longer for water to soak down, meaning more sitting water.

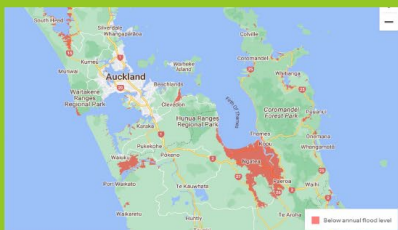


How deforestation leads to droughts

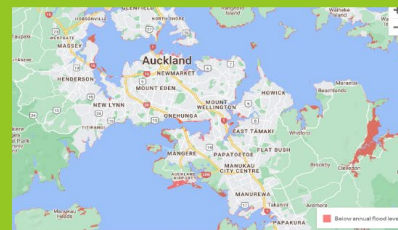
Trees funnel water underground and that water supplies lakes, rivers, and other plants. Without trees funnelling the water, this process can't happen, causing water shortages. A fully grown tree releases 1,000 litres of water vapor per day into the atmosphere, and the entire Amazon rain forest sends up 20 billion tons a day. ([NY Times](#)) The water vapor creates clouds that turn into rain, so without the trees, there is less rain, and water sources dry out, so droughts happen. Cutting down trees releases carbon dioxide, held in the trees, into the atmosphere. The carbon dioxide then traps heat and leads to global warming, so water dries up faster, and droughts become more frequent.



What will happen to Auckland if deforestation continues



[Climate central](#)



Deforestation leading to climate change and flooding means the sea level will rise. The red zones on these two images, of Auckland and surrounding areas, show the areas that are expected to be submerged by 2050 ([Climate central](#)). If deforestation continues at the rate it currently is, climate change rates will also keep climbing, and these red zones won't be the only parts underwater.



What NZ previously looked like vs what it looks like now



([Enviro History](#))

This image shows that between 1000 AD and 1840, there was a lot of deforestation, especially along the east coast of the south island, the centre of the north island and the top of the north island. Between 1840 and 2001, there was even more deforestation spreading over the entirety of every island. As a result, there is minimal forest left in many places that used to have dense forest covering it.