

## The Climate Benefits of Protecting Whales

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Whales act as ecosystem engineers due to their many important roles in the oceans. One such central role is that whales act as carbon sinks. During the relatively long lifespans of most marine megafauna, particularly mammals, carbon is accumulated in the body throughout an animal's lifetime. Given that the average lifespan of a whale is around 40-70 years, they accumulate a substantial amount of carbon during their lifetimes. When they die, whales act as carbon sinks by sinking to the bottom of the ocean, where the carbon in their bodies is locked away for centuries. On average, a great whale sequesters 33 tons of CO<sub>2</sub>, removing it from the atmosphere for hundreds of years. In comparison, a single tree, which are widely acknowledged as important carbon sinks, absorbs only 48 pounds of CO<sub>2</sub> per year. The protection and recovery of whale populations therefore has critical benefits to the climate.

Yet another climate positive impact owed to whales is a phenomenon known as the whale pump. Zooplankton, microscopic animals found abundantly in oceans, excrete waste into deep waters that is chock full of vital nutrients, such as nitrogen, phosphorus, and iron, as they go about their migration through the water column, so that nutrients get pumped downward towards the ocean floor. Although they can sometimes be observed feeding at shallow depths, whales often dive deep into the water column to feed on dense groupings of fish and invertebrates. When they surface to breathe, they excrete waste by releasing what has often been referred to as "flocculent fecal plumes". In doing so, nutrients from the deep are brought in full circle, through vertical transfer, back up to the surface water, completing the 'pump'. These flocculent fecal plumes are heavy in iron and nitrogen, which are vital to the growth of phytoplankton. As such, wherever whales are, phytoplankton will be nearby,

and they have a big role to play for the health of our planet. Phytoplankton can be thanked for every second breath we take as they are responsible for at least 50% of all oxygen in the atmosphere as they capture 37 billion metric tonnes of CO<sub>2</sub>, an estimated 40% of all produced CO<sub>2</sub> in the atmosphere. In keeping with our previous comparison to trees, this is equivalent to the amount of CO<sub>2</sub> produced by 1.70 trillion trees or the number of trees within the equivalent of 4 amazon forests.

There is yet another analogy to a tool when describing whales as carbon sinks in what is referred to as the 'great whale conveyor belt'. This describes the process whereby the migration of various species of great whales across oceans results in horizontal nutrient transfer as whales migrate from nutrient rich feeding grounds in arctic regions to nutrient poor breeding grounds in tropic and sub-tropic waters, releasing nutrients through urea, carcasses, and placentas. As with the whale pump, these nutrients help phytoplankton populations to increase as they are vital to their growth, thereby capturing billions of metric tons of CO<sub>2</sub>, sequestering it, and reducing the amount of greenhouse gases in the atmosphere.

In conclusion, whales activate positive climate impacts with growing scientific evidence that they play essential roles as ecosystem engineers in capturing carbon from the atmosphere and in regulating the global climate. Whales presently face many threats such as fishing gear entanglement, ship-strike, and underwater noise pollution, among others. While recovered whale population numbers are vital (whales were heavily hunted commercially several decades ago, drastically reducing their populations) to averting climate change, whales are themselves at the forefront of experiencing climate impacts. With the consequences of climate change as well as the many other threats posed to whales, there is little time to waste in their protection. Supporting all efforts, whether local, regional, national, or global to restore whale populations turns out to be quite an effective method of combating climate change.



Humpback whale off Conche Newfoundland  
Photograph by Nicholas Gates

### Reading Materials:

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