

Could lemmings be involved in regulating our climate?

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A pedestrian walks near the scenic coastline in Anchorage, Alaska. In past years, satellite images have shown a perceptible growth in grasses and shrubs in parts of the Arctic, a phenomenon pinned on global warming.

The mention of lemmings usually evokes images of small rodents throwing themselves off the top of cliffs in acts of mass suicide; however, their reputations might no longer be determined by hearsay as a new report suggests they could be having an intricate effect on the Earth's climate.

The study, published today, in IOP Publishing's journal *Environmental Research Letters*, suggests that lemmings may be maintaining the biomass of certain [plants](#) in the Arctic at a time when the greening of this vast area is becoming more noticeable.

When lemmings are excluded from the [Arctic environment](#), the researchers, from the University of Texas at El Paso, observed an increase in certain plant types called lichens and bryophytes; however when the lemmings were present there were surprising increases in grass and sedge - the plant material that lemmings actually feed on.

"Our paper confirms that we really need to be careful attributing the greening of the Arctic to

global warming alone. We have shown that lemmings can promote similar greening, through the increase of grasses and sedges, as warming does in [Arctic regions](#) where lemmings are present and go through dramatic population cycles," said lead author of the study David Johnson.

The increase of grass and sedge could be due to changes in nutrient availability in soils from the addition of urine and faeces from the lemmings, or by simply reducing competition for space by keeping bryophyte and lichen abundance low, as well as reducing the amount of standing dead [grass](#) and sedge litter.

Lemming populations have historically gone through periods of highs and lows, which researchers believe have played a key role in regulating many properties and processes of tundra ecosystems. To measure these effects, the researchers measured plant cover and biomass in 50-year-old lemming exclosures and control plots in the coastal tundra near Barrow, Alaska.

Satellite imagery has already confirmed that Arctic regions are becoming increasingly populated with greenery, such as grasses and shrubs, as increasing temperatures make the areas more habitable.

As the Arctic regions continue to become populated with more plant [biomass](#) during the summer months, the effects on the climate could tip either way. Warmer temperatures may allow plants to grow bigger and store more carbon, taking carbon dioxide out of the atmosphere and potentially reducing climate warming.

Conversely, soil decomposition increases with warmer temperatures meaning soil microbes are respiring and releasing carbon into the atmosphere and potentially increasing [climate](#) warming.

"We still don't know the relative magnitude of these

two feedbacks to warming. A greener landscape may maintain the region as a carbon sink, however higher plant growth in a greener landscape may not be enough to offset losses of carbon from soil microbes. It is plausible that herbivores, in some situations, may provide a mechanism for higher plant growth maintaining these ecosystems as carbon sinks.

"We are not saying that lemmings are causing the greening, because greening is occurring in areas where lemmings don't occur at high densities and we are not sure how lemming populations across the Arctic are themselves responding to warmer conditions. However, it is clear from our study that lemmings, and other herbivores, are more important in some of these Arctic ecosystems than people historically give them credit for," continued Johnson.

More information: 'Exclusion of brown lemmings reduces vascular plant cover and biomass in arctic coastal tundra: resampling of a 50+ year herbivore exclosure experiment near Barrow, Alaska', D R Johnson, M J Lara, G R Shaver, G O Batzli, J D Shaw and C E Tweedie 2011 *Environ. Res. Lett.* 6 045507, freely available online from November 18 at iopscience.iop.org/1748-9326/6/4/045507

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