

# Europeans have unknowingly contributed to the spread of invasive plant species in the US

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The common dandelion (*Taraxacum officinale*) is one of these Central European plants that were introduced by humans to North America and over time became naturalized in this continent. Credit: Photo: André Künzelmann/ UFZ

Halle (Saale). The role of plant traits might be overestimated by

biologists in studies on plant invasiveness. Anthropogenic factors such as whether the species was being cultivated proved to be more important. These conclusions were made from a study on Central European plants that were introduced by humans to North America and over time became naturalised in this continent. Naturalisation of new plant species, a process that makes it a permanent member of the local flora, most strongly depends on residence time in the invaded range and the number of habitats occupied by species in their native range, researchers reported in the journal *Ecology*.

The study was jointly conducted by scientists from The Czech Academy of Sciences of the Czech Republic (AV ?R) and the Helmholtz Centre for Environmental Research (UFZ) and also involved scientists from the Charles University in Prague, Martin-Luther-University Halle-Wittenberg, the German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Masaryk University in Brno, Biota of North America Program, North Carolina and other institutions.

Invasive [species](#) that spread widely in their invaded range can not only have detrimental impacts on ecosystems and threaten biodiversity but may also cause massive economic damage in agriculture and forestry. Once a species has already been naturalised, it can often no longer be fully controlled - even after considerable efforts. Since the 1980s biologists have been looking into ways of predicting which species show invasive behaviour and which species do not - a complex and multi-faceted problem. One thing that remains certain, however, is that the majority of alien species have become naturalised in their new home range with the help of humans.

Over the course of history many species arrived in other parts of the world with the Europeans - and North America is no exception. Intensive trade between the two continents in the last five hundred years has led to one of the largest processes of species exchange. Since this propagation

route has been symptomatic for the spread of many species across continents, scientists have investigated this process more closely in an attempt to find out what makes certain species successful. For this they used the most comprehensive database available so far that provides information on central European plant species found in North America. A comparison was made between the flora of the Czech Republic (representative of plant species found in Central Europe) and the most comprehensive database on vascular plants of North America. It was found that out of 1218 species of seed plants from Central Europe, 466 taxa had already become naturalised in North America and had formed populations that persist on their own in the wild. The comprehensive information from the database enabled the scientists to compare and analyse numerous traits such as plant height, number of seeds or methods of pollination with their geographic distribution.

In order to analyse this volume of information, the team developed a model that describes the invasion process of Central European plant species in the USA and Canada in terms of different drivers, showing just how efficient certain factors are as drivers of invasion. Purely biological traits such as specific leaf area, plant height or seed persistence played a much less significant role compared to geographic or [anthropogenic factors](#). For example, the [residence time](#) of a species in its invaded range, i.e., the time since introduction of that species, accounts for a 20 times higher risk of invasion compared to one of the important biological traits, which was the ability of seed to persist in soil for several years in a viable state. Whether or not the species had been cultivated in its native or new region also played a major role. "Our results clearly indicate the overwhelming role of these factors in determining invasion, with the residence time having about three times as strong an effect as the propagule pressure resulting from the cultivation in the invaded range", explains Prof. Petr Pyšek from the Institute of Botany of The Czech Academy of Sciences.



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That the cultivation of plants by humans plays a major role in these processes is further illustrated by the fact that only six percent of the plants analysed in this study had never been cultivated during the process of their naturalisation. This confirms that the vast majority of invasive [plant species](#) had previously been associated with humans in one way or another. "These new results from North America confirm the results that were reported for Europe two years ago: socioeconomic factors and thus the influence of humans have a stronger influence on invasion processes than the biological traits of species", emphasizes Prof. Dr. Ingolf Kühn

from the UFZ in Halle (Saale). Furthermore, "generalists" (species that are less sensitive to environmental factors with the ability to reproduce quickly) do not only occur more frequently than invasive species, but are also cultivated more often than "specialists".

"One of our most important messages is therefore that studies on [invasive species](#), which do not take into account the characteristics of the native range or residence time in the invaded range, may seriously overestimate the role of biological traits", states Ingolf Kühn. Spurious predictions of plant invasiveness could then be the consequence. Studies such as the one at hand therefore contribute to making better assessments of future risks, since the factors mentioned here can also be applied to those species that have not yet made their way to regions outside their distribution and may therefore represent potential problems in the future.

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