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Displacement

An example of "novel ecosystems": The spontaneous vegetation at the former industrial area of Berlin Südgelände.

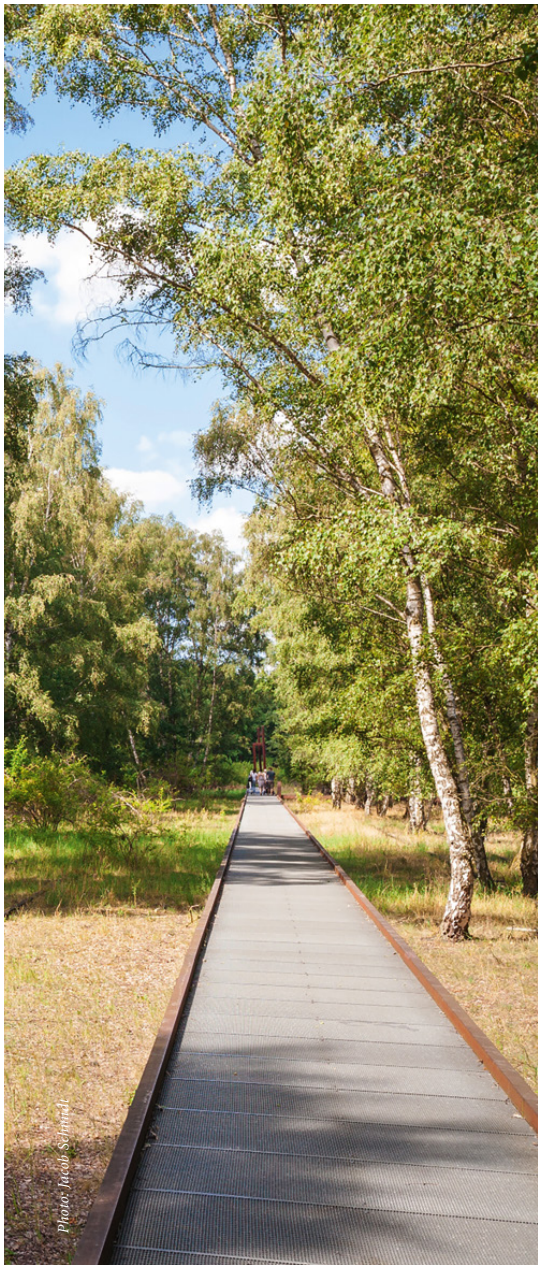


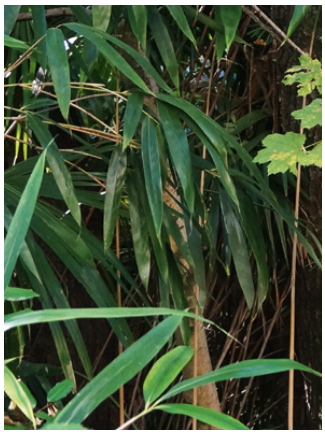
Photo: Jacob Schmidt

Invasive plants

Native species are a common good and must be protected, whereas non-native species are less valued: that is the traditional view of nature conservation. But there are also contradicting opinions: invasive species have benefits, too. Against the background of the increasing loss of biodiversity the question if invasive species are boon or bane for our ecosystems gains in importance.

TINA HEGER

Boon or Bane?



In our globalized world, goods are transported from one continent to another with unprecedented frequency, and people travel great distances within a few hours. These transportation routes do not only carry wares and luggage, however, but often stowaways. Tiny seeds can stick to all kinds of materials, and many plants have evolved structures such as spines or hairs to enhance this capability. Arriving in a new area, these seeds can establish and grow, building a population and causing the species to spread. Sometimes, populations even thrive and grow dense, outcompeting native plants. In such cases, these plants are called "invasive".

It is not only stowaways who become invasive. In fact, most invasive plant species were intentionally introduced as garden plants, bee plants, for landscaping, or for forestry. The more frequently these are planted, the more likely it is that they escape gardens and parks to establish self-sustaining populations. Invasive plants today can be found around the globe. European species such as Purple Loosestrife (*Lythrum salicaria*) inhabit North American wetlands, and the riverbanks in Central Europe are a favorite habitat for Himalayan Balsam (*Impatiens glandulifera*). This latter species used to be called "farmer's orchid", because it produces orchid-like flowers and is very easy to grow. Bees and other insects profit from its large quantities of nectar.

The presence of invasive species has caused frequent conflict, and debates about their evaluation come and go like waves in the scientific literature as well as in public discourse. The traditional view in nature conservation is that native species are a good that must be protected, whereas non-native species are of less value; if these have a negative effect on native species, they must be controlled. Prime examples of this would be fast growing vines: Kudzu (*Pueraria montana*) was introduced to Central Europe as a garden plant. It escaped from gardens and established in the wild. Since it has a vigorous growth, it quickly covers whole areas. Other plants rarely manage to live underneath the carpets it forms, and due to the fast biomass production and a symbiosis with nitrogen fixing bacteria, it strongly alters the soil chemistry.

But there are contradicting opinions. Invasive species have benefits, too. There are many examples of native species making use of non-natives as pollinators, seed dispersers, food, or shelter. The dense stands of Japanese Knotweed (*Fallopia japonica*) in Germany have long been regarded as "dead zones", because native plants are usually unable to grow in these thickets. Recently, however, it has been found that several bird species are using the stands as breeding grounds, including the Red-backed Shrike (*Lanius collurio*) and warblers. Especially in cleared, intensively used agricultural landscapes as in eastern Germany, Knotweed offers a surrogate habitat structurally similar to reed beds. Another argument against disfavor of non-natives is that whether a plant has unwanted effects on other species does not necessarily depend on whether it is native or non-native.

Recently, these debates have regained momentum. This time, the debated issue is not so much single invasive species, but assemblages of many non-native species occurring in strongly altered environments. Such assemblages are called "novel ecosystems". In the scientific literature, this term has been coined to address ecosystems with no historic equivalent. Species occur together that never have co-occurred before, and they inhabit abandoned mines, industrial grounds, and urban wastelands.

Since we are currently facing an unprecedented human-induced loss of biodiversity, the question arises whether such instances of self-sustained, natural growth and development could be regarded as "nature's salvation". It is argued that novel ecosystems, and with them the invasive species they contain, should not be maligned, but should instead be seen as a great chance. Two lines of arguments are invoked, suggesting that the traditional viewpoint of nature conservation should be reconsidered. First, scientists nowadays broadly agree that the concept of balance is not very useful to describe ecological systems, and that stable states without any change in species composition are not the rule. Consequently, the aim to conserve a specific state of an ecosystem seems to contradict "nature". Second, an increasing number of scientific studies indicate that even in remote areas, effects of cultural activities are visible – truly pristine nature seemingly no longer exists. Even in the Amazon rain forest, clear signs of pre-colonial settlements and cultivation have been found. And in times of climate change, basically no area worldwide is pristine in the sense of being completely unaffected by humans. Even protected areas nowadays are facing changed atmospheric chemistry and changed climate.

The consequent request, that we should step back and applaud invasive species and novel ecosystems for demonstrating the resilience of nature, however, is a hard one to which to accede. It seems that such claims open the doors to inaction, and that allowing the spread of invasive species and the establishment of novel ecosystems means to shirk responsibility.

But what should be the societal aims in face of these scientific insights that pull the carpet from under the feet of traditional nature conservation? Is it really wrong to aim at saving endangered species and ecosystems, because nature is changing, anyway? Is it senseless to try to restore a historic state of an ecosystem or a landscape? Or vice versa: Is it wrong to make use of non-native plants in gardens or for landscaping? Is it wrong to refrain from controlling invasive species?

Left: Kudzu (Pueraria montana) was introduced to Central Europe as a garden plant. It escaped from the gardens and established in the wild.

Right: The Chinese windmill palm (Trachycarpus fortunei) can be found in private gardens around the Lago Maggiore, but meanwhile it also extended to the forests.

The response to these questions is that decisions about wrong and right need to take into account the specific situation – general answers are rarely helpful. Biodiversity loss is a serious problem, and therefore, protecting endangered species needs to stay a top priority. But for reaching this aim, non-native species in some cases can be helpful, because they may provide habitat, or may replace lost interaction partners. Especially for those invaders already widespread, control measures can be very costly, and must be carefully weighed against the benefits.

The traditional aims and tools of nature conservation therefore could and should be supplemented by new ones. It should not only be the near-natural areas that are the focus of environmental management, but also heavily modified areas like cities, agricultural fields, and industrial sites. In these places, management could even aim at enhancing the establishment of novel ecosystems, with an aim toward facilitating specific ecosystem services such as carbon storage, air purification, shade provisioning, or cooling effects in increasingly hot environments.

Invasive species and novel ecosystems thus can be boon as well as bane, depending on context. Since experience has shown that invasive species can seriously threaten endangered species, future invasions should be prevented. But invasive species now well-established and widespread should not be controlled at any cost – in fact, their potential benefits and uses should be explored. Existing near-natural ecosystems with native fauna and flora should be conserved, and this may necessitate the control of invasive species. But in strongly modified areas, development of novel ecosystems can be appreciated for their multiple benefits, even if they contain high proportions of non-native species. In times of global change and species loss, new ways of reconciling nature and culture are urgently needed, meaning there is a need to move beyond black-and-white thinking.

Photos: Tina Heger