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Ecologists put price tag on invasive species

Research reports costs of invasive species' damage to ecosystem services

ECOLOGICAL SOCIETY OF AMERICA

Invasive species can disrupt natural and human-made ecosystems, throwing food webs out of balance and damaging the services they provide to people. Now scientists have begun to put a price tag on this damage. In a study published this week in *Frontiers in Ecology and the Environment* e-view, ecologists have listed the invasive species that cause the most harm to environment and cost the most money to control.

"The impacts of many invaders go unnoticed, and our lives depend on the ecosystem services provided by species," says lead author Montserrat Vilà of the Estación Biológica de Doñana in Seville, Spain. "The presence, and many times the dominance, of non-native species can cause many ecological impacts that translate to changes in ecosystem services. These changes can be irreversible, and many are as important as the changes caused by climate change or pollution."

Vilà and her colleagues present results on the more than 10,000 alien species known to exist in Europe. They used data from the Delivering Alien Invasive Species Inventories for Europe (DAISIE) project, which was commissioned by the European Union in 2005 to survey invasive species across Europe and assess their ecological and economic impacts.

Ecosystem services are broken down into four categories: supporting major ecosystem resources, such as water and energy cycles; provisioning by producing goods, such as pollination of crops; regulating ecosystem processes, such as water filtration; and cultural or non-material benefits, such as recreation and aesthetics.

Vilà and her colleagues produced a list of the top 10 invasive species in Europe by assessing which species had the most impacts in the most categories. Among the top invaders were Canada geese, zebra mussels, brook trout, the Bermuda buttercup and coypu, also known as nutria. Terrestrial vertebrates produced the widest range of impacts, often showing effects in all of the ecosystem service categories.

"Many terrestrial vertebrates are top predators, and their introduction causes cascading effects in the food web," Vilà says.

By contrast, terrestrial invertebrates such as insects and spiders had the narrowest range of effects, but wreaked the most financial havoc. Vilà points out that terrestrial invertebrates cause the most damage to crops and forests, sectors in which there are well-established methods to quantify the costs of food and lumber production. The authors estimate annual crop losses in the United Kingdom due to alien arthropods at €2.8

billion (about $3.7 billion); other studies say that the cost of eradicating the 30 most common weeds could be more than €150 million ($197 million).

The authors also describe the alien species generating the highest reported financial investment, including costs of monitoring, controlling and eradicating the invader, along with environmental education programs. Among the most expensive invaders were water hyacinth (€3.4 /$4.5 million), coypu (€2.8/$3.7 million) and a marina alga (€8.2/$10.9 million).

The major issue for management of invasives, Vilà says, is that so many of their impacts are currently unknown. In Europe, the impacts of only about 10 percent of invasive species are known to ecologists and economists, she writes. Although the U.S. has quantified many of the mechanisms by which invasive species disrupt ecosystems, it still lags behind Europe in creating an inventory of known invasive species.

"It is important, first, to continue exploring the impacts of the 'unknown' species," says Vilà. Once scientists have a more comprehensive idea of what makes an invasive invade, she says, researchers can make better predictions about the future damage.

Vilà's team suggests that existing federal, state and local assessments in the U.S. would provide a good start for an inventory of the North American continent. Such a database could interface directly with DAISIE.

"We need to harmonize the existing information on impacts across species and across regions," Vilà says. "Then, finally, we will be able to create institutional bodies across sectors, such as agriculture, environment, health and transportation, to tackle the prevention and management of the impacts of biological invasions."

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Learn more about the DAISIE project at http://www.europe-aliens.org/.

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