

US a surprisingly large reservoir of crop plant diversity

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Known commonly as cucumber-leaf sunflower, *Helianthus debilis* Nutt. subsp. *cucumerifolius* is a wild relative of cultivated sunflower. Credit: Kasia Stepian

North America isn't known as a hotspot for crop plant diversity, yet a new inventory has uncovered nearly 4,600 wild relatives of crop plants in the United States, including close relatives of globally important food crops such as sunflower, bean, sweet potato, and strawberry.

The findings, which were published today (Apr. 29) in the journal *Crop Science*, are good news for plant breeders, who've relied increasingly in recent years on the wild kin of domesticated crops as new sources of [disease resistance](#), [drought tolerance](#),

and other traits.

The not-so-good news is that many of these "crop wild relatives" are currently threatened by [habitat loss](#), pollution, and climate change, says lead author Colin Khoury of the International Center for [Tropical Agriculture](#) (CIAT) in Cali, Colombia. For instance, a wild sunflower species that breeders have used to restore fertility and create [salt tolerance](#) in cultivated sunflower is also globally imperiled. Another 62 taxa in the inventory are listed under the U.S. [Endangered Species Act](#).

In fact, an estimated 30 percent of U.S. plant species are now of "conservation concern," says Khoury, who is also a doctoral student at Wageningen University in the Netherlands. And crop wild relatives are possibly even more vulnerable because they've tended to be overlooked both by agricultural scientists and the conservation community.

He and his co-authors hope this will now begin to change with publication of their inventory—the first of its kind in the [United States](#). "We always say that crop wild relatives are important and that they're threatened," he says. "I think what this study does is takes those general statements and puts some good evidence and documentation behind them."

Many countries in Europe and the Middle East have already completed inventories of their crop wild relatives and plans for their conservation, thanks largely to University of Birmingham plant scientist, Nigel Maxted, a long time champion for their protection and Khoury's master's degree adviser. The effort to tally the United States' crop wild relatives was started by Stephanie Greene of the USDA-Agricultural Research Service, who recruited Khoury to the project with the help of Maxted.

Over the past four years, a team led by Khoury and Greene has been collecting as much information on U.S. crop wild relatives as it can, including who the

species are, which [crop plants](#) they've been used to improve (if any), how closely related they are to their respective crops, and whether any of the genetic resources found in crop wild relatives are already conserved in gene banks.

Once an initial list was compiled, Khoury prioritized the species using several criteria. U.S. wild relatives of the world's most important [food crops](#)—including strawberry, sunflower, sweet potato, bean, stone fruits, and grape—form the bulk of the list. But it also contains relatives of forage crops like alfalfa; fiber crops such as flax and cotton; ornamental plants like roses and lilies; *Echinacea*, St. John's Wort and other medicinal herbs; and what Khoury calls "iconic U.S. crops," including sugar maple and wild rice.

The rich assortment of U.S. crop wild relatives came as something of a surprise to him and his colleagues, but Khoury says there are several possible reasons for it. For one, although North America is itself not a major center of [crop plant diversity](#), it abuts one—Mesoamerica—where crops like corn, bean, squash, and chili pepper originated and whose relatives spill across the border. Many wild species in temperate parts of the United States also share close kinship with crops, like hops and strawberry, which were domesticated in other temperate regions of the globe.

More controversially, 12 percent of the taxa in the U.S. inventory are non-native plants, while nearly 5 percent are listed as federal or state noxious weeds. Despite being non-native and potentially invasive, however, these plants are still valuable genetic resources for breeding, Khoury says; it's just that protecting and managing them becomes more complicated.

Now that the inventory is completed, figuring out how to protect and manage valuable U.S. crop wild relatives is the next step. Over the coming year, Khoury will analyze the geographic distributions of the plants in the list, determine if they've been safeguarded in gene banks or in protected areas such as national parks; and then identify the priority places for collecting seed from species that haven't yet been secured.

The large number of U.S. crop wild relatives makes the task exciting but also daunting, especially since there is little time to lose.

"The window for securing these plants so that they're safe and can be used, it's narrowing for sure," Khoury says. "So it's really time to move forward and get these resources protected."

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