

# NYBG

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## **NYBG Scientist and Collaborators Propose Measures to Improve Plant Research Collections and Data Access to Address Biodiversity Loss and Climate Change**

Their Call to Action is Part of *The State of the World's Plants and Fungi 2020*, Which Estimates Nearly 40 Percent of the World's Plant Species Are at Risk of Extinction



Barbara M. Thiers, Ph.D., Vice President and the Patricia K. Holmgren Director of the William and Lynda Steere Herbarium at The New York Botanical Garden, contributed to *The State of the World's Plants and Fungi 2020* report, calling for improvements in plant research collections and data access to address environmental challenges. (NYBG Photo)

**Bronx, NY**—In a comprehensive report that estimates nearly 40 percent of the world's plant species are at risk of extinction, a research team including a scientist at The New York Botanical Garden (NYBG) is calling for a series of measures to improve the world's plant research collections and enhance access to the data contained in nearly 400 million preserved plant specimens as a crucial component in addressing environmental challenges such as biodiversity loss and climate change.

Released today, *The State of the World's Plants and Fungi 2020* is the result of an unprecedented international collaboration organized by the Royal Botanic Gardens, Kew to show how people are currently using plants and fungi, what useful properties are being neglected, and what is at risk of being lost. The report, the fourth in Kew's survey of the world's plants since 2016, summarizes the findings of 210 scientists from 42 countries

whose work is being simultaneously published as a series of research papers in the scientific journal *Plants, People, Planet*. Among the subjects covered by the report are endangered plants; new species; uses of plants for food, fuel, and medicine; and global research plant collections, such as NYBG's William and Lynda Steere Herbarium, which, with 7.8 million specimens, is the second-largest herbarium in the world .

According to NYBG's Index Herbariorum, which tracks research plant collections globally, there are currently 3,324 active herbaria in the world with an estimated 392.4 million preserved specimens, which are generally pressed and dried and mounted on sheets of paper with information about their species and where, when, and by whom they were collected. These specimens have long been an invaluable resource for botanists, conservationists, and land-use managers, among others. More recently, the revolution in molecular biology—the study of a species' DNA—has increased demand for DNA samples, and digitization of a specimen's data is making it easier for researchers to aggregate information from far-flung collections.

“Herbaria, like all natural history collections, not only preserve a record of life on Earth, but foster international collaborations in research, conservation, and education,” said Barbara M. Thiers, Ph.D., Vice President and the Patricia K. Holmgren Director of the Steere Herbarium, who was part of the team that studied current and potential uses of research collections. “Working as a community to share specimens and digitized specimen records and images amplifies the power of these resources for addressing our current environmental challenges.”

By one estimate, only 21 percent of the specimens in the world's herbaria have been digitized, according to the report. The largest proportion of digitized specimens is from North America while Africa, tropical Asia, and the Pacific—regions rich in plant diversity—are poorly represented. To address such gaps and expand the use of collections, researchers called for a number of actions, such as increasing support for national collections in biodiverse areas by governments and aid agencies; accelerating digitization of data; collecting specimens from key areas of the world that are underrepresented in research collections; and creating networks of “extended” specimens in which an image, collection data, a DNA sequence, and a chemical profile are linked to a single specimen.

Such moves would help scientists draw new data from collections that could be used to address biodiversity loss, climate change, and other environmental challenges. “At the end of the day, the value of collections comes from their use,” said Alan Paton, Ph.D., Kew's Head of Collections and the lead author of the scientific paper on which the collections chapter of the report is based. “It's not the fact that you have them, it's the fact that they are used for something that gives them their value.”

## Two in Five Plants Are Now Estimated to Be Threatened with Extinction

Among other findings in *The State of the World's Plants and Fungi 2020* is a dramatically higher estimate of the proportion of plant species at risk of extinction. Kew's 2016 *State of the World's Plants* report estimated that 21 percent of plant species were at risk, but new analyses this year show that extinction risk may be much higher than previously thought, with 39.4 percent of plants estimated to be threatened with extinction. This near-doubling of the percentage is due to more sophisticated conservation assessments and new analytical approaches to correct biases in current data. Accounting for under- and over-represented plant groups and geographical areas enabled the scientists to estimate extinction risk more accurately.

Authors suggest the best course of action now is to “fast track” risk assessments so key areas can be protected, and species can be conserved, without delay. To achieve this, artificial intelligence could help identify priorities for conservation assessments. This new technology can detect if an area contains multiple species that have not been assessed but are more likely to be threatened, which will help speed up assessments for areas in most urgent need.

The global demand for naturally derived medicines is threatening some species. New data in this year's report show that of the 5,411 medicinal plants that have been assessed for their conservation status (out of 25,791 documented medicinal plants), 723 (13 percent) are categorized as threatened. Among these threatened species is *Brugmansia sanguinea*, a medicinal plant used traditionally for circulatory disorders, which has been listed as “extinct in the wild” by the International Union for Conservation of Nature (IUCN). Other medicinal species at risk of extinction include *Nepenthes khasiana*, traditionally applied for skin diseases, and the black pepper bark tree (*Warburgia salutaris*), a traditional medicine for coughs and colds.

It is believed that a rise in the demand for herbal medicines is driven by numerous factors including an increase in prevalence of certain chronic diseases and the search for new therapies. Worldwide, as many as four billion people rely on herbal medicines as their primary source of health care, and in China, herbal medicine accounts for about 40 percent of health care services.

## Thousands of Plant Species Hold Potential as Sources of Food and Clean Energy

Humanity is overly dependent on a tiny fraction of plants and fungi for food and energy, despite the thousands of species that have the potential to feed and provide fuel for millions of people around the world. New data in this year's report show there are 7,039 edible plant species that have potential as future foods, yet just 15 species provide 90 percent of humanity's food energy intake, and four billion people rely entirely on three crops—rice, corn,

and wheat. With the global population anticipated to increase from 7.8 billion to 10 billion by 2050, scientists researched which overlooked and underutilized plants could hold the key to future-proofing our food production systems. Of the identified 7,039 species listed as “human food” from a Kew data base of useful plants, only 417 (5.9 percent) are considered major food crops.

Meanwhile, for the purpose of producing energy, researchers identified 2,500 plant species that could be used for fuel or bioenergy, but only six crops—corn, sugarcane, soybean, palm oil, rapeseed, and wheat—generate 80 percent of global industrial biofuel. With 840 million people (mainly in sub-Saharan Africa, Asia, and Oceania) having no access to electricity and three billion without access to non-polluting cooking fuels and technology, new bioenergy crops are urgently needed.

*The State of the World's Plant and Fungi 2020* is available [here](#).

*Plant and Fungal Collections: current status, future perspectives*, the research paper upon which the collections chapter of the report is based, is available [here](#).

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**The New York Botanical Garden is a museum of plants, an educational institution, and a scientific research organization. Founded in 1891, the Botanical Garden is one of the world's preeminent centers for studying plants at all levels, from the whole organism down to its DNA. Garden scientists conduct fundamental research on plants and fungi globally, as well as on the many relationships between plants and people. A National Historic Landmark, the Garden's 250-acre site is one of the greatest botanical gardens in the world and the largest in any city in the United States, distinguished by the beauty of its diverse landscape and extensive collections and gardens, as well as by the scope and excellence of its programs in horticulture, education, and plant research and conservation. Learn more: [nybg.org](http://nybg.org)**

**The New York Botanical Garden, 2900 Southern Boulevard, Bronx, New York 10458**

**The New York Botanical Garden is located on property owned in full by the City of New York, and its operation is made possible in part by public funds provided through the New York City Department of Cultural Affairs. A portion of the Garden's general operating funds is provided by The New York City Council and The New York State Office of Parks, Recreation and Historic Preservation. The Bronx Borough President and Bronx elected representatives in the City Council and State Legislature provide leadership funding.**

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