

Genetics

Seeds of the Future

On an unusual old farm in New York City, workers are stashing away the seeds of the future. In this unlikely place, researchers are putting the seeds from flowering plants and trees in a sleep-like state called suspended animation. Many years from now, other workers will rouse the slumbering plant embryos and plant them where they're most needed. These seeds are like the legendary Rip van Winkle, who fell asleep under a tree and woke up 20 years later. The small farm, called the Greenbelt Native Plant Center, is part of a global effort to save threatened plants and trees.

Around the world, native plants are being crowded out by invasive newcomers, which can hitch rides on boats, planes, and trains. Unaware of the consequences, people sometimes even plant invasive species because they seem useful or pretty at first. Adding insult to injury, native plants have less room to grow now as a result of the growth and spread of cities. And global warming is making some places hotter, drier, or otherwise different from what native plants are used to.

American bittersweet is a good example of a plant in peril and one whose seeds should be stored, says Steven Clemants, vice president for science at the Brooklyn Botanic Garden in New York City. The plant, a climbing vine with orange berries, is native to the eastern United States. But an evil twin called Oriental bittersweet is elbowing it out of the way. People brought Oriental bittersweet to the United States in the 1860s because gardeners loved its fall display of yellow leaves and orange berries. Too late, they realized that the imported beauty was really a beast. The thorn-studded invader can wrap itself around trees and slowly kill them. Now, the transplant is threatening to replace its harmless native counterpart.

Experts used to think that it was impossible to protect big-city plants such as American bittersweet because growth space is limited in urban environments. Crowding increases competition between natives and invaders, and the aggressive aliens often win the battle. But botanists are now teaming up and fighting back. The Brooklyn Botanic Garden is trying to identify all of the estimated 1,000 plant species that grow within 50 miles of New York City. So far, workers at the Greenbelt Native Plant Center have gathered seeds from about 300 of those plants, says Edward Toth, the center's director. The seeds are being kept in storage compartments at the Greenbelt Center. Some are also being held as part of an international collection in Europe. When planted in the future, these seeds could help restore damaged parklands and forests. Revived plants could also protect reservoirs of drinking water by filtering out pollution.

The New York project is getting storage tips from the Millennium Seed Bank, a project in the United Kingdom run by the Kew Royal Botanic Gardens. Michael Way, a coordinator with the British project, says that the most important step is to collect seeds at exactly the right time—when they are just about ready to fall from the plant.

Workers then store the seeds at a constant temperature of 59° Fahrenheit (15° Celsius) while slowly drying them in specially designed chambers. The temperature and humidity in the chambers is similar to that on a fall night in the southern Arizona desert.

Name:

Period:

After the seeds dry, they can enter a state of suspended animation when stored at a frosty -4°F (-20°C). That's like January in northern Minnesota. How long can chilled seeds survive? "There's a huge variation between species," Way said. Some seeds last only 30 years, while others can "sleep" for up to 10,000 years! If stored properly, Way says, seeds from 90 percent of the plants that grow in the New York area should last 200 years or more.

The Millennium Seed Bank, Brooklyn Botanic Garden and Greenbelt Native Plant Center are among many contributors to a national project called Seeds of Success, run by the U.S. government. The government manages about 600 million acres of land—nearly one-fourth the area of the entire United States, including Hawaii and Alaska. Invasive plants are taking over much of that land, says Peggy Howell, a botanist with the government's Bureau of Land Management. To make things worse, forest fires in the western United States are destroying more vegetation than they used to. Seeds of Success workers have been collecting seeds in the prairies, deserts, and mountains of the West since 2001. Now, they're doing the same thing on the East Coast. Organizations in Chicago, Texas, and elsewhere are pitching in with seeds from their areas.

Collecting seeds for storage can be challenging. Sometimes, human seed collectors have to compete with insects and other animals that like to eat seeds and the fruits that contain them. Some plants are very delicate, and the workers have to sneak up on them. Consider, for example, the narrowleaf four o'clock. Each of this prairie plant's pink flowers produces a single seed that can fall off with the slightest breeze—or sneeze.

The hard work is paying off. So far, more than three dozen collection teams assisting Seeds of Success have helped stash away seeds from some 3,000 flowering plant species. In all, about 18,000 to 20,000 flowering species grow in North America north of the Mexican border. Some of the seeds will be frozen and put into long-term storage at U.S. Department of Agriculture facilities in Colorado and Washington State. Other seeds will be kept cold until they can be given to growers, researchers and agencies that request them. The Department of Agriculture has a lot of experience banking seeds. The government agency manages more than 480,000 collections of seeds in 21 separate facilities. Altogether, these banked seeds represent nearly 12,500 different species. Most of them have the potential to become crops.

The Millennium Seed Bank is also huge. Earlier this year, the number of seeds in this international collection reached 1 billion. The billionth seed came from an African bamboo plant that produces seeds only once every 7 years. The international project aims to store seeds from one-tenth of the world's flowering plants, or about 30,000 species, by 2010. After that, there will still be enough room to stockpile seeds from half of the world's flowering plant species. With the right care, the leafy Rip van Winkles should be around for a very long time.

SEED STASH

M E D B I T T E R S W E E T I
J G E B A N K L J Y T P T L P
G N S N A T S K D N Q R D E R
J A E M I I S N O N F A R B M
I R R D J A N I M A T I O N F
E O T E R C T W N Y L R R E N
D L K D A A I N V A S I V E K
N F B N T I G A U G T E P R X
W S D E E S W V S O M O X G K
N G G P K L M P X V M S B B J
M E R S H U M I D I T Y N E M
V H R U X M Y R E N E E R G W
O G R S L B I F A E F O X Y R
C U W V C E P L E T T O B P E
Z R Q O D R P W H S B M Z E Y

ANIMATION	HUMIDITY	VEGETATION
BANK	INVASIVE	VINE
BITTERSWEET	MOUNTAIN	
BOTANIST	ORANGE	
DESERT	PERIL	
DORMANT	PLANTS	
DRIED	PRAIRIE	
FIRE	RIPVANWINKLE	
FLORA	SEEDS	
GARDEN	SLUMBER	
GREENBELT	STORE	
GREENERY	SUSPENDED	

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Name:

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Period:

1. Based on the title, what do you predict the article will be about?
2. Can plants become endangered like animals can? If so, what are some of the threats that plant species might face?
3. Why is American bittersweet in peril?
4. What are the goals of the Millennium Seed Bank?
5. What is "suspended animation"? Why might scientists want to put seeds in this state?
6. Name two reasons that some native plants species are endangered in the United States.
7. What are the ideal conditions for storing seeds?
8. Describe some of the challenges that workers face while trying to collect seeds.
9. What percentage of North American flowering plant species has the Seeds of Success program already collected?
10. Why do seed banks save seeds instead of entire plants or other parts of plants?
11. What kinds of scientists might work at a seed bank?
12. Workers face different challenges when collecting seeds in an urban area compared to a rural one. Compare the process of collecting seeds in both environments. What obstacles might people face in each type of place?
13. Do you think seed banks are the most efficient way to preserve plants? Other strategies include keeping gardens of native plants and trying to destroy all invasive plants. Compare the pros and cons of each strategy.
14. How can kids help protect native plants?