



Ornamental, Beneficial — and Vanishing?

The Shaw Nature Reserve, a division of the Missouri Botanical Garden located 35 miles southwest of the garden in Gray Summit, Mo., strives to inspire responsible stewardship of the environment through education, protection and restoration of natural habitats and public enjoyment of the natural world.

The Challenge of Protecting America's Wildflowers

By Wendy L. Applequist

One resplendent sign of spring comes with the return of delicate wildflowers that bloom briefly following the bleak winter. Though their ephemeral nature enhances the enduring popularity of such pretty plants, they paradoxically represent a beauty that our descendants may never see: within a few generations, many of these blossoms that lighten our hearts in springtime and serve us in important practical ways may be gone forever.

And the fault is ours.

Flowers continue to wither away

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consequence of global climate change, but is instead an event in progress, due largely to habitat destruction and overuse.

Extinction already totals several hundred times the normal historical rate,¹ meaning that species are lost faster than new ones evolve as replacements.

Peter Raven, president of the Missouri Botanical Garden and a leading conservation biologist, predicted at the 1999 International Botanical Congress that if trends continue, “as many as 100,000 of the estimated total 300,000 [plant] species may be gone or on the way to extinction by the middle of the [21st] century.”²

Most species at greatest risk live in the biodiverse tropics or on islands, where destruction of a relatively small piece of habitat or the introduction of a single invasive species can wipe out vulnerable plants and animals.

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In temperate climates, woodland wildflowers may be among the plants most in peril. For one thing, these plants thrive only in a certain habitat and are dependent upon the shade and stability of the forest for shelter. (Inversely, because trees block out light, a small plant on the forest floor can be hard put to gain enough energy from sunlight to grow and reproduce. This is why many spring flowers bloom so early, before they are shaded out.)

Forests are threatened by logging and global warming. Severe droughts, which are predicted to increase in many areas including much of the Western U.S.,^{3,4} can cause devastating loss of forest trees.^{5,6} And if trees are lost, the plants of the forest floor cannot compete in a much sunnier and more disturbed environment.

Also, although the effects of climate change are still relatively minor, the earth has gotten warmer over the past century. This may expand the range of destructive insects⁷ and the plant diseases they carry.⁸ And several studies of phenology (the study of the timing of a species' activities or life stages) show that warmer temperatures may induce some plants to flower earlier than they used to.^{9,10} Spring-flowering plants, with their tendency to break dormancy at the first hint of warmth and flower soon thereafter, may be more affected than other plants.^{11,12} The point: disturbing the natural cycle may be harmful.

Ecologists warn that the web of relationships among organisms could be disrupted if insects and other animals that pollinate plants or disperse or consume seeds experience different levels of phenological change. For example, a pollinating insect might begin to emerge in spring before or after the plant has flowered, rather than simultaneously.¹³

Losses mount when plants die out

When plants vanish from an area, or go extinct altogether, we lose more than beauty. Many wildflowers can be used as foods, herbal medicines, or dyes — sometimes all three. For instance, the ripe fruit of mayapple (*Podophyllum peltatum*) is edible, while one of the active compounds in the root, podophyllotoxin, has been used to develop two cancer



More than 300 azaleas and 130 dogwoods burst into bloom each spring in the English Woodland Garden at the Missouri Botanical Garden amid clusters of perennial wildflowers and hydrangeas.



Members of the St. Louis Herb Society care for the Herb Garden at the Missouri Botanical Garden. There are some 600 varieties of herbs in the garden, including many species with medicinal value. Society members plant 1,200 to 1,500 plants a year.

drugs, including etoposide, best known as part of the treatment that saved cyclist Lance Armstrong's life.¹⁴ And goldenseal (*Hydrastis canadensis*) helps to treat sore throat and digestive inflammation and can be used to make a yellow dye.

Because most plants have not been studied at all, valuable applications surely remain to be derived from some. Extinction of any species imposes an unknown cost on our descendants, a cost that at the

Photo courtesy of Gerrit Davidse.



Goldenseal (*Hydrastis canadensis*), which sprouts colorful red fruit, winds up in common herbal remedies and as a yellow dye traditionally used by the Cherokee.

least denies us everyday advantages and at worst might be measured in lives.

Even if a particular species has no direct use to humans, that does not mean its existence doesn't benefit us. Functioning forests and other biotic communities provide services that we could never duplicate on our own, such as holding and purifying water, improving air quality, and accumulating nutrients and carbon in the soil. Plus, insects pollinate crops, and birds and bats control disease-carrying pests. The dollar value of the free services provided by nature is almost twice that of all human-

produced goods and services in the world.¹⁵

Admittedly, flowering herbs are not major providers of ecosystem services. Nevertheless, their decline could be an ominous portent for the system's long-term health. Species do not exist in isolation. If bloodroot (*Sanguinaria canadensis*), an Eastern wildflower whose antibiotic root is used in animal feed and toothpaste, disappears from a forest, the ants that gain a food reward from dispersing its seeds may suffer. The predators upon those ants may, too, and so forth. Likewise, bees that pollinate bloodroot, suddenly deprived of a food source, might be reduced in number and jeopardize other plants usually pollinated by these bees.

Conservation biologists Paul and Anne Ehrlich compare an ecosystem stressed by species losses to an airplane that continues to be flown as a progressively greater number of rivets are removed: "In most cases an ecologist can no more predict the consequences of the extinction of a given species than an airline passenger can assess the loss of a single rivet. But both can easily foresee the long-term results of continually forcing species to extinction or of removing rivet after rivet."¹⁶

Cultivate an environmentally friendly green thumb

When we go for a stroll in the woods, tour a botanical garden or work in our yard on a beautiful spring day, it's easy to enjoy the activity as a moment of peace, free of worries about the future. But we owe it to our grandchildren to recognize that our way of life could be making those idyllic days a thing of the past — and to act to preserve them.

While international policy changes are called for to address climate change, there are direct steps we can take now to alleviate some of the immediate challenges these plants face:

- Buy sustainably sourced botanical products, which are made in a way that does not threaten the future existence of wild populations. If plants are at risk in the wild, commercial suppliers should turn to cultivated material instead when possible.

Material collected in the wild should be certified as having been obtained under formal guidelines such as the World Health Organization's Good Agricultural and Collection Practices.¹⁷

- Grow native. Instead of filling your backyard with exotic plants, learn what plants are native to your area and plant those instead. (By doing so, you help preserve other native species as well, such as insects that pollinate these flowers.)



For footnotes, go online to <http://www.phikappaphi.org/web/Publications/Forum/spring2010/gardens>.



Bloodroot, a perennial wildflower that is native to North America and that blooms in early spring, is threatened by the overharvesting of its antibiotic root.

As a consequence, you save time and effort; after all, native plants have already proved they can survive in the area without a lot of care and feeding!

- Preserve natural woodlands and related environments and support nonprofit organizations involved in such pursuits. Habitat loss is the most immediate threat to most species. Choose wood products that are recycled or certified as sustainably harvested; they're often comparable in price to counterparts. We do not have to destroy whole forests to make lumber and paper.

To keep an ecosystem functioning permanently, we need to save or re-create large corridors of natural habitat so that species have adequate breeding populations and can migrate in response to climate change.

Perhaps because most wildflowers are so small and inconspicuous for most of the year, we think of them as being pretty, but not important. Learning about their use may help to preserve them and help us to become more invested in the environment. ■



Wendy L. Applequist

(Iowa State University) is an assistant curator in the Missouri Botanical Garden's William L. Brown Center (<http://www.wlbccenter.org>),

which conducts ethnobotanical research and contributes via the Sacred Seeds garden network to the conservation of medicinal plants worldwide. She manages natural products discovery programs in the U.S., Madagascar, and Vietnam and is an expert on the authentication and quality control of botanicals in dietary supplements. Educated at University of Illinois at Urbana-Champaign (B.S., Biology) and Iowa State University (Ph.D., Biology), Applequist is an associate editor of *Economic Botany*. Articles she wrote or co-wrote have appeared in scientific publications including the *American Journal of Enology and Viticulture*, *Biodiversity and Conservation*, and *Systematic Botany*. Email her at wendy.applequist@mobot.org



Cherry blossoms, azaleas, chrysanthemums, peonies, lotus, and other oriental plantings thrive in the Drum Bridge, or *Taikobashi*, in spring in the *Seiwa-en* Japanese Garden at the Missouri Botanical Garden. Many of these culturally important plants have medicinal value.

Planting the Seeds for Protecting Medicinal Blooms

For most of human history, plants were the only medicine people used, and in poor nations today, people still rely on them for treatment, having little or no access to modern medicine.

Also, herbal remedies remain popular in Western countries, and an increasing number of these folk cures have undergone scientific study that often supports their value.^{1, 2}

Because such plants are both culturally meaningful and potentially salutary, understanding their properties and preserving their populations are vital.

At least 2,582 North American plant species were used medicinally by Native Americans over thousands of years of experimentation.³ Examples include many perennial wildflowers such as trillium (for coughs and digestive upset) and hepatica (for liver ailments and poor digestion).

Most research on medicinal plants occurs in Europe and Asia, so few American plants have been studied adequately. However, if Native American remedies are comparable to the European/Asian traditional pharmacopoeia, it's likely that many of the former have some real value and could be sources of new drugs.

While abandonment of traditional knowledge can put such plants at risk, because we do not know which plants should be protected for their possible health benefits, overenthusiastic embrace of that traditional

knowledge can threaten them as well.

For instance, woodland perennials are expensive (or occasionally impossible) to cultivate; they often require multiple growing seasons, artificial shade, and time-consuming seed-germination protocols. Market fluctuations make it risky to invest years of funding in a crop whose price might suddenly plummet. Material for certain herbal products is, therefore, usually collected from the wild.

With wild harvesting, it's all too easy to wipe out a population through careless or deliberate overcollection. These woodland perennials are slow-growing herbs, with relatively few new plants emerging each year. They cannot recover from harvesting as easily as fast-growing annuals or weedy perennials, especially if the root or rhizome (underground stem) is dug up, a process which often kills the plant.

An example of a woodland perennial jeopardized partly by overharvesting is goldenseal, whose rhizomes are used in dietary supplements. And a study of American ginseng (*Panax quinquefolius*), so much in demand as a tonic that it's often illicitly harvested, indicates that too much collection impedes its genetic diversity and reproductive fitness.⁴

If our children and grandchildren are to continue to benefit from these plants, we must place limits on the exploitation of nature's bounty. ■

— Wendy L. Applequist