On The Fringe
Journal of the Native Plant Society of Northeastern Ohio

## Program Schedule – Winter 2017

**Sunday, January 29, 2:00 - 3:00 pm – The West Woods Nature Center, Geauga County** – **On assignment in Costa Rica.** Tom Sampliner, photographer and past president of the Native Plant Society of Northeastern Ohio, shares his images capturing beautiful flowers, animals, birds, insects and habitat scenery, taken in Costa Rica during the summer monsoon season while he was on assignment to photograph trees and their traits. Presented in conjunction with Geauga Park District. **Directions:** take St. Rt. 87 east from Rt. 306 in Russell Township approx. 2 miles to the park entrance on south side of the road. 9465 Kinsman Road, Novelty, Ohio 44072. 41°27'26.9"N 81°18'13.9"W. **No registration** required. Stay afterwards for a double feature.

**Sunday, January 29, 3:15 - 4:00 pm – The West Woods Nature Center, Geauga County** – **A local botanist's look at the flora of the Hawaiian Island of Kauai**. Judy Barnhart shares images of her recent travels to Kauai, looking at how the Polynesian culture and recent introductions have influenced the flora of the island. Presented in conjunction with the Geauga Park District. **Directions:** take St. Rt. 87 east from Rt. 306 in Russell Township approx. 2 miles to the park entrance on south side of the road. 9465 Kinsman Road, Novelty, Ohio 44072. 41°27'26.9"N 81°18'13.9"W. **No registration** required.

**Saturday, February 18, 10:00 am – 2:00 pm. The West Woods Nature Center, Geauga County – Ohio Lichen Workshop**. **Lichens, often misunderstood and ignored**. Janet Traub and Jim Toppin with the Ohio Moss and Lichen Association present the interesting symbiotic relationship between alga and fungi. A two-hour indoor introductory session with samples to view will be followed by a lunch break, before a field foray in search of examples. Bring lunch and a hand lens. **Directions:** take St. Rt. 87 east from Rt. 306 in Russell Township approx. 2 miles to the park entrance on south side of the road. 9465 Kinsman Road, Novelty, Ohio 44072. 41°27'26.9"N 81°18'13.9"W. **Registration required:** call Geauga Park District at 440-279-0880.

**Friday, March 24 – Ohio Botanical Symposium.** The Native Plant Society of Northeastern Ohio will be a sponsor of The Ohio Botanical Symposium, which brings botanists, naturalists, and other nature enthusiasts together to network, provide professional enrichment, and view posters and displays on Ohio's native flora, natural areas, and rare plants. Directions: Villa Milano Banquet and Conference Center, 1630 Schrock Road, Columbus, Ohio, 43229. 40°06'23.2"N 82°58'20.8"W. **Registration required:** for information go to http://naturepreserves.ohiodnr.gov/stay-informed/2016-ohio-botanical-symposium. [Note: information not yet posted on this site]

**Thursday, April 20, 9:00am - 12:00 pm – Sawdust Tract, Ashtabula County.** Jim Bissell, Curator of Botany at Cleveland Museum of Natural History, leads this joint trip with NEON to the museum's Sawdust Tract in western Ashtabula County on Mill Creek with large stands of Carolina Spring Beauty. **Directions**: From I-90 travel south on Rt 528 for about 2.5 miles until you reach Ross Road. Make a left on Ross (east). At the Ashtabula county line, Ross becomes Cold Cork Springs Rd., which ends at Atkins Rd. Make a right on Atkins Rd and travel south about 2 miles until you reach Belle Rd. Meet at the NE corner of Belle and Atkins Rd. 41°41'56.0"N 80°59'35.9"W. **Registration required** by calling Judy at 440-409-1688 (C) or emailing at judysbarnhart@gmail.com.

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### *On The Fringe*

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The Mission of the Native Plant Society of Northeastern Ohio is to promote the study, appreciation, and conservation of the native plants and plant communities of Ohio.

## Inviting Wildlife Into Your Winter Garden

**By Claire Hagen Dole**

Some crisp fall day when you're harvesting pumpkins or throwing spent vines on the compost pile, take a moment to sit quietly and observe all the wild activity in your garden. Listen to the drowsy hum of a bumblebee in your herb garden or the sharp call of a flicker high in an apple tree. Watch a red admiral butterfly avidly feeding on the juice of a fallen apple. As the late afternoon turns chilly, perhaps you'll begin to wonder what happens to the birds, insects, and other wildlife that live year-round in your corner of the world. Where do they take refuge during the cold months?

You may not realize it, but your own garden is host to many wildlife species, from tiny larvae inside plant stalks to lumbering raccoons making midnight visits. You can provide shelter and food to help a number of creatures get through the winter.

And although the localized food chain of your backyard is bewilderingly complex, you don't need a degree in ecology to support it.



Linear landscape features such as hedgerows are important for bats. Photo taken from Pinterest.com.

**Design Considerations**

If you want to maximize your yard's attractiveness to wildlife, give a critical eye to its layout and plant choices. Fall is an excellent time to plant perennials, trees, and shrubs. As trees begin to show their winter silhouettes, study your yard from the viewpoint of an animal seeking shelter and food. Are there safe hiding spots and food such as seeds, cones, and berries that persist into late winter? Is there a diversity of habitat—a layering of vegetation from ground cover to shrubbery to tree canopy?

Augment lone trees in your garden with a surrounding grove of small trees like common serviceberry, *Amelanchier arborea,* and eastern redbud, *Cercis canadensis,* along with smaller shrubs, flowers, and grasses. Such layered landscapes enable small animals to range safely in search of food. These travel corridors are especially important in winter, when a hovering hawk has a clear view of the ground.

Reserve a corner of your yard for a thicket-forming plant, such as red-osier dogwood, *Comus sericea* ssp. *sericea.* Or create a hedgerow, a dense living fence of thorny shrubs and vines. Hedgerows provide safe travel, shelter, nesting sites, and food, all in one spot. By placing close together such plants as blackhaw, *Viburnum prunifolium,* juniper, *Juniperus communis,* and trumpet honeysuckle, *Lonicera sempervirens,* you'll create an excellent wildlife-harboring tangle.

The edge of the grove or hedgerow will become an important space for wildlife, especially when insects begin to emerge in spring. In winter, shrubbery that borders the lawn or garden offers small birds an escape route from predators. Life's biggest dramas—feeding, mating, sheltering young—are played out in the spaces where habitats overlap.



Common winterberry, *Ilex verticillata*
Photo taken from www.wildflower.org/plants.

**Plant Choices**

Many plants that attract wildlife also offer pleasing color and texture to the winter garden. The brilliant red fruit of winterberry, *Ilex verticillata,* stands out exceptionally against the striated white bark of paper birch, *Betula papyrifera.* The winter silhouette of a magnificent old maple tree casts shadows on snow, while soft green pine needles break the monochromatic gray sky.

Plants native to your region have developed special relationships with the pollinators, seed-dispersing birds, and beneficial insects of your area. Local birds often show a preference for the fruits of one tree—for example, in the West, cedar waxwings devour Rocky Mountain juniper berries, *Juniperus scopulorum.*

There are plenty of native trees and shrubs with gorgeous berries from which to choose. Some, like sassafras, *Sassafras albidum,* in the eastern U.S., have berries so tasty and rich in fat that they'll be stripped clean by fall-migrating birds. To make sure the bounty lasts all winter, also plant less-favored berries such as hackberry, *Celtis occidentalis,* and snowberry, *Symphoricarpos albus,*—whose berries soften and become less tart during months of harsh weather. High in carbohydrates, they can be lifesavers for wildlife when there is nothing else left to eat.

Evergreen trees provide important roosting and nesting sites for many birds. Some game birds and small animals seek shelter under low-hanging branches. Cones and berries feed numerous animals, from squirrels to juncos foraging beneath the trees for stray seeds.

The beautiful form and color of ornamental grasses are enhanced by a dusting of snow. And native grasses like Indian grass, *Sorghastrum nutans,* also feed and shelter birds and insects. In winter, sparrows perch on the stalks, gleaning seeds from the feathery heads. The caterpillars of many skipper butterflies feed on switchgrass, *Panicum virgatum,* and little bluestem, *Schizachyrium scoparium,* and over-winter in leaf nests on the plants.

**Go Easy on Fall Cleanup**

Spare yourself the labor of cutting back spent perennials like purple coneflower, *Echinacea purpurea,* and globe thistle, *Echinops sphaero-cephalus.* Their seeds will be picked over by finches and sparrows long into the winter months. The downy fluff of common milkweed, *Asclepias syriaca,* provides nesting material in early spring. Examine plant leaves and stalks carefully for tiny butterfly larvae, such as that of the Pearl Crescent, which favors aster leaves. If you find any, leave them alone until fresh spring growth lures them off the old plant.

Goldenrods, *Solidago* species, host the larvae of goldenrod gallflies—tiny insects responsible for the galls on the plant stalk—as well as the wasp larvae that parasitize them. In winter, downy woodpeckers and chickadees tear open the galls, seeking an insect meal. Juncos forage for goldenrod seeds on the ground.



*Symphoricarpos albus* is a species of flowering plant in the honeysuckle family known by the common name Common snowberry.
Photo taken from http://tinakoralgardens.blogspot.com/2011/12/giving-back-to-birds-native-berry.html.

In the vegetable garden, let broccoli, carrots, mustard, fennel, and parsley go to seed to attract finches and chickadees. Leave a few cornstalks standing to shelter foraging birds and field mice.

If you have a lawn, allow a section of grass to remain unmowed as a safe corridor for frogs, snakes, mice, and insects. In winter, birds will search the grass for seeds and an insect meal, such as the hibernating larvae of satyr butterflies.

**Brush Piles and Other Enhancements**

One of the most valuable elements of a wildlife garden is a brush pile. Depending on size and composition, brush piles can provide winter refuge to a large array of birds, amphibians, small mammals, and insects. Field mice, rabbits, and even foxes may find shelter inside a brush pile. Many birds, such as sparrows and wrens, use the pile for winter shelter or nesting in the spring. Towhees and yellow-throated warblers perch on the protruding twigs to sing, preen, and catch insects. Cold winds may drive birds temporarily from evergreen trees to the warmer brush pile.

If you have space, make two or three brush piles out of tree limbs, branches, twigs, and lightweight garden trimmings such as sunflower stalks. Place the heaviest and largest material at the base of the heap to attract snakes, salamanders, and lizards looking for somewhere to hibernate. You can pile the rest of your materials on top in any order. To attract the largest variety of wildlife, position one pile in a sunny spot, another in the shade, and one near your hedgerow or vegetable garden. Do not make the piles in low, damp spots or near busy roads.

Another haven for wildlife is an undisturbed woodpile—something you can create with minimal effort. Beetles and worms will populate the rich soil that forms beneath an old woodpile, and spiders love the protected, insect-rich environment of these piles.



Little bluestem, *Schizachyrium scoparium*
Photo taken from www.wildflower.org/plants.

Leaf litter, especially when composed of small leaves like hawthorns, *Crataegus* species, is a magnet for juncos, towhees, and sparrows. They spend hours scratching through debris, looking for insects. Several butterflies and moths pupate in leaf litter beneath their larval host plant (look for the rounded, papery cocoons of the Luna moth under sweet gum or hickory trees). Use a light hand in your fall cleanup and leave some leaf litter to form a warm mulch. Winter snows actually insulate a leaf litter pile and protect the insects and small animals beneath, so there is no need to rake before a storm.

A dying tree or snag should be pruned for safety but otherwise left in place as a natural wildlife habitat. Cavity-nesting woodpeckers, nuthatches, and chickadees make homes in such trees, and many other birds perch on the dead limbs or look for insects under the bark. Squirrels and mice store food in crevices of dead trees.



Switchgrass, *Panicum virgatum* L.
Photo taken from www.wildflower.org/plants.

Yet another wildlife-harboring part of the garden is rough bark. Either peeling from a tree trunk or loosely attached to a fencepost, bark shelters adult Anglewings and Mourning Cloaks. A warm, sunny day in midwinter may bring them out of hibernation for an hour or so. They are attracted to tree sap, which provides nutrients to these long-lived butterflies.

When frigid winter seems most entrenched, it is heartening to know that your garden is still teeming with life. The gardening decisions you make in autumn can lend a hand to those animals, small and large, that wait out the cold months in your yard.

As you develop your winter wildlife garden and begin to enjoy its rewards, share your enthusiasm with neighbors—getting them involved in wildlife gardening can result in richer habitat and safe travel corridors in the region.

Claire Hagen Dole edited the BBG handbook, *The Butterfly Gardener's Guide,* and is the former publisher of *Butterfly Gardener's Quarterly*, a newsletter for gardeners and butterfly enthusiasts. She has written for *Organic Gardening, Country Living, Sierra,* and other publications.

Reprinted from *Plants and Gardens News,* Brooklyn Botanic Garden *Vol 22, No 3,* Fall 2007/Winter 2008.

## A Brief Introduction to Bryophytes

### By William McAvoy

Let's begin by answering the questions, what is a moss and how are they different from the higher vascular seed plants? Mosses are small, green herbaceous plants that contain chlorophyll and are photosynthetic. Mosses do not have true flowers, and do not produce seeds, they reproduce by spores. Most mosses have no internal means for transporting water and nutrients (non-vascular), they absorb water and nutrients directly into the cells of their stems and leaves. Mosses do not have true roots, but they do have root-like structures called rhizoides, which primarily serve for attachment to the substrate. Mosses are extremely dependent upon water for their survival and reproduction, and are therefore typically found in cool, moist, humid areas like swamps, marshes, along creeks, and in forests. Most mosses usually grow closely packed together in mats or cushions, and are found growing on rotting logs and stumps, rocks, soil, or on the bases and trunks of trees.



*Marchantia*, an example of a liverwort.
https://en.wikipedia.org/

Mosses are distinguished from the higher vascular seed plants by two distinct traits. The first trait is the lack of a true vascular system, the xylem and phloem, the water-conducting tissue that is found in all vascular plants. The second trait concerns their life cycle, or mode of reproduction. As stated, mosses do not have true flowers and do not produce seeds, but reproduce by spores. The moss life-cycle is comprised of two separate generations: the gametophyte generation, which is the leafy green plant we think of as a "moss", and the sporophyte generation, which consists of a smaller spore-producing plant called a sporophyte.

The gametophyte is the dominant generation in the life cycle of the mosses and is perennial. The sporophyte is an annual, and consists of an unbranched stalk, or seta, and a single, terminal spore capsule, or sporangium. The sporophyte is always attached to the top of the gametophyte by a foot, which penetrates the gametophyte tissue. The sporophyte is dependent on the gametophyte for water and nutrients. The gametophyte of mosses can also reproduce asexually by vegetative means. They can shed fragments of leaves or other parts of the plant body that can regenerate into new plants.

A moss begins its life cycle when spores land on a moist substrate and begin to germinate. After germination, the spore, which contains one set of chromosomes (haploid) develops into a long, highly branched filament known as a protonema. After several weeks, buds form on the protonema. These buds develop into the gametophyte, the leafy green moss plant. The plant develops leaves arranged spirally and begins to grow taller, and near the base of the plant rhizoids develop to anchor the moss to its substrate. When mature, the leafy gametophyte produces sex organs at the tips of stems or on short branches. The female reproductive structure, the archegonium, encloses a single egg at its base. The male structure, the antheridium, encloses a mass of sperm. As the sperm mature, the antheridium swells and bursts open, releasing the sperm. A continual path of water (rain drops or dew) is needed for the sperm to swim to the archegonium and fertilize the egg. After fertilization of the egg, an embryo develops, which now contains two sets of chromosomes (diploid) that will become the sporophyte generation. A foot develops that anchors the sporophyte to the gametophyte and a capsule develops where spores are formed. The seta then elevates the capsule away from the gametophyte for greater dispersal of spores. A cap or calyptra form around the spores and as the mature capsule swells with developing spores, the calyptra falls away, which allows the capsule to dry and break open. The opening to the spore case is surrounded by teeth-like appendages called the peristome. These teeth are hygroscopic, meaning that they are very sensitive to changes in humidity. They move outward when the humidity is low, flinging the spores into the air, and as the humidity increases, the teeth move inward and close the mouth of the capsule until more favorable conditions for spore dispersal exist. Dispersed spores deposited on a suitable substrate will germinate and complete the life cycle of the moss. Moss spores can travel great distances on the winds and some spores can remain viable for up to 40 years due to a protective coating around the spore.

Mosses can be found almost anywhere on the planet. In fact, in the Arctic and in Antarctica, they are the most common land plants, and mosses can even be found in deserts. Mosses may be small in size, but they are one of the largest groups of land plants in the world



Bryophytes Mosses On Rocks

with about 25,000 species. By comparison, there are about 350,000 species of flowering plants in the world, and about 10,000 species of ferns and fern allies. Here in Delaware there are 211 species and varieties known to occur. [Editor's note: Ohio has about 420 species of mosses, according to the Ohio Moss and Lichen Association. http://ohiomosslichen.org/moss-photos/]

Mosses are generally classified into three distinct divisions, which indicates three separate evolutionary lines: the Bryophyta (true mosses), Marchantiophyta (liverworts) and Anthocerotophyta (hornworts). Collectively, these 3 divisions are known as bryophytes. Members within these divisions are very different in appearance from division to division, and perhaps are only distantly related to one another. But what they all have in common is their similar reproductive structures and life cycle. Of the three divisions, the greatest species diversity is found in the Bryophyta, with up to 15,000 species recognized. In Delaware, there are 167 species and varieties of true mosses known to occur. The true origin and evolutionary lineage of bryophytes is still uncertain since the fossil record is rather poor. But what is known is that bryophytes appeared about 400 to 500 million years ago in the Paleozoic era, about the same time as the vascular plants.

Mosses comprise a significant part of the biodiversity of our natural areas and most mosses can be seen throughout the year because they stay green all year. The best time to look for mosses is after a rain. At that time the plants are most vigorous and bright green in color. During times of drought, mosses tend to lighten in color and shrivel up due to water stress.

The ecological roles of mosses are many. They provide seed beds for the larger seed plants, they capture and recycle nutrients that are washed down



Bryophytes Mosses On Rocks

with rainwater from the canopy, they help to bind the soil to keep it from eroding, and they help soil to retain moisture.

Mosses are good ecological indicator species because they tend to be highly specific for particular microenvironments and respond to factors such as temperature, light, water availability, and substrate texture and chemistry.

Perhaps more than any other plant, mosses can handle extremes in environmental conditions, but are sensitive to air pollution, especially sulfur dioxide, which breaks-down chlorophyll. So mosses are good indicators of local air quality.

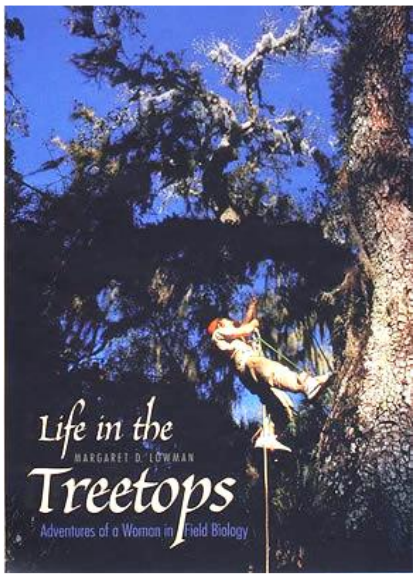


Hornworts include those bryophytes that are believed to be the closest living relatives of the vascular plants.

Reprinted from *The Turk's Cap,* a newsletter of the Delaware Native Plant Society, Summer 2015, Vol 18, No 2.

Photos taken from http://www.worldbotanical.com/bryophytes.htm, unless otherwise noted.

## Book Review:




## Life in the Treetops
## Adventures of a Woman in Field Biology

## By Margaret D. Lowman

**Publisher:** Yale University Press, 1999
**Pages:** 207pp, + appendix
**ISBN-10:** 0300084641
**ISBN-13:** 978-0300084641
**Paperback**
**Price:** $13.95, new; used from $3.11

### Review by Jane McCullam

Margaret Lowman, the "real-life Lorax," is a field biologist who pioneered the science of canopy ecology. She is Director of Global Initiatives, Lindsay Chair of Botany and Senior Scientist in Plant Conservation at the California Academy of Sciences

Until she developed alternative methods for getting up to the treetops 100 feet away, the only way up was shooting an arrow over a branch with a rope attached, then climbing the rope. Not much experimental research had been done under these conditions. Dr. Lowman spent a great deal of time climbing ropes to study the life, death, and longevity of leaves in the high canopies of forests all over the world before she developed the canopy walk.

She invented and got funding for building these wooden bridges that hung between tall posts, creating a secure platform for researchers to conduct experiments and record data. These proved to be so popular that they can be found in many forests of the world. We even have one at the Holden Arboretum in northeast Ohio and an elevated walkway at the new Perkins Wildlife Center at the Cleveland Natural History Museum.

She worked for years in Australia, in rain forest canopies, and studying the factors contributing to the dieback of eucalyptus trees, as well as a project studying the vegetation on the Great Barrier Reef islands.

Lowman describes in lively and engaging detail the projects she worked on for her first twenty years of professional life and the methods and rationale for the studies. For the last ten years her son accompanied her on many of her field trips. As befits an academic scholar, she provides a wealth of information about trees and the forest ecosystem and does so in an entertaining and interesting way.

Jane McCullam is membership chair and a long-time member of the Native Plant Society of Northeastern Ohio.

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## Folklore:

### Winterberry Holly, *Ilex Verticillata*

### By Bob Edelen

**Natural History**

At the first mention of holly, one's thoughts typically lean to the American Holly, *Ilex opaca,* a stately evergreen tree with shiny (and prickly) green leaves and spectacular red berries that adorn landscapes throughout the country and whose festive greenery brighten homes during the holiday season. However, a winter stroll along waterways

and moist woodlands throughout Delaware will reveal another member of the holly family worthy of any landscape! Winterberry, *Ilex verticillata*, is a deciduous holly that thrives in moist habitats from Nova Scotia and Quebec, west to Minnesota and south to Arkansas and the Florida Panhandle. This relatively slow growing holly forms a dense well-rounded shrub that is ideal for low-nesting birds such as cardinals and mocking birds, and its diminutive flowers are a major source of energy for bees, bumblebees, small butterflies and other insects that act as pollinators in return for their nutrient-rich nectar. But it is during the fall and winter months that winterberry is unsurpassed for its beauty and value to wildlife. The Latin name '*verticillata'* translates as 'arranged in whorls', referring to the arrangement of the sessile fruits (and also referring to the flowers) in a 'pseudo-whorl' around the stems. The bright red and sometimes orange berries are born in large clusters that persist well into the winter months unless consumed by wildlife. Because of their relatively low fat content the bright red berries are not readily consumed, but as more desirable food sources diminish, the berries of winterberry become a welcome banquet to over 20 species of birds including bluebirds, robins, thrushes, mockingbirds, catbirds, cedar waxwings, sparrows, grouse, dove and woodpeckers, and mammals such as raccoons, squirrels, deer and mice that rely on the late season bounty.



Common winterberry, *Ilex verticillata*
Photo taken from www.wildflower.org

**Where to Grow**

Winterberry is a must for any landscape. Though winterberry is a shrub of primarily moist woodlands and thus especially tolerant of poorly drained soils, it will thrive under many light and soil conditions given an ample supply of water and slightly acid soil. It can be planted in a forest understory, at the edge of woodland and along stream banks. It can be regularly trimmed to maintain a lush, impenetrable hedge. For the best fruiting, thickest foliage and most attractive shape and display, grow your winterberry in an open landscape with ample light. Since the fruits are only produced on the female trees, both male and female specimens are required to produce fruit. One male tree is suitable for pollinating from 3 to 5 female trees, but be sure to obtain plants from the same area (or hybrid) to ensure that flowering occurs at the same time each year. Your winterberry will tend to sucker and form dense impenetrable thickets 6 to 10 feet tall.



Foliage and unripe fruit in summer.
Photo taken from https://en.wikipedia.org

**Propagation**

Propagation of winterberry can either be accomplished from seed or by taking cuttings. Seeds will require 18 months to germinate, and are best sown in autumn as soon as they ripen. Collect ripened berries and separate from the pulp by maceration. Scarification, followed by

a warm stratification and then a cold stratification may speed up germination. Place the seeds in a mixture of equal parts peat moss, fine pine bark mulch and sand and place in a cold frame protected from the winter chill. Once large enough to handle, put the seedlings into individual pots and grow them in light shade in a cold frame for their first year. Grow them in their pots for a second season and then plant them out into their permanent positions in late spring or early summer. Seedlings should be provided a layer of organic mulch to prevent chlorosis and stunting in alkaline pH soils.



It is best to place the plants into their permanent positions as soon as possible, as transplanting of mature plants may provide protection during their first year. Alternatively, cuttings of almost ripe wood with a heel, taken in August and treated with a rooting hormone and placed in a shaded cold frame will also produce desirable results. Leave for 12 months before potting up. Best performance occurs in full sun in acidic, organically enriched, moist to wet soils, but winterberry is somewhat adaptable to soils that are occasionally dry provided ample watering and rich vegetative mulch.

**Lore**

Native Americans used various parts of winterberry for treatment of upset stomach, fever, lethargy, hay fever and diarrhea, hence the common name 'fever bush', and a tea was made from the dried and crumbled leaves. However, the fruit and leaves of winterberry contain a potential array of toxins that can result in moderate to severe nausea, vomiting and diarrhea. So, we highly recommend using winterberry for more traditional uses of beautifying your landscape and perhaps taking cuttings of the berry-laden branches to grace your holiday table—they will last a long, long time!

Reprinted from *The Turk's Cap*, The Newsletter of the Delaware Native Plant Society, Winter 2013/14, Vol 16, No 4.

Photo this page, taken from https://gobotany-dev.herokuapp.com/species/ilex/verticillata/. Common winterberry, *Ilex verticillata,*

## Trees Know When Deer Are Eating Them—And How To Fight Back

### By Sarah Kaplan

Picture the woods in early spring—the misty, pale green appearance of trees just starting to sprout, the young deer munching their way across the sun-dappled forest floor.

But behind that placid exterior, a battle of wits is raging. And despite not having a brain or any central nervous system to speak of, the trees are pretty wily.

In a study published in the most recent edition of the *Journal Functional Ecology*, scientists in Leipzig, Germany describe the brilliant way that wild maple and beech trees figure out when roe deer are eating them—and enact a strategy to make sure the critters don't return for another snack.

The stakes are high for young trees. If they can head off the threat from deer early, the saplings have a chance of catching up with their unbitten peers and making it to adulthood. But too much nibbling will make the trees stunted, or condemn them to death.



Photo taken from www.gardeningknowhow.com

So the plants have evolved a complex set of responses specifically to deal with herbivore threats. Whenever a branch is snipped—by a deer, insect or human—trees release "wound hormones" called jasmonates. These chemicals help with the recovery process. They also play a role in interplant communication; when one plant releases jasmonates, their neighbors start to ramp up their defenses against disease and insect attacks as well. It's like a forest-wide alarm system.

But the trees studied in Leipzig seemed able to recognize specific threats, and tailor their response accordingly. When a roe deer was eating their branches, the trees released a second set of chemicals: first the hormone salicylic acid, then bitter chemicals called tannins. The salicylic acid boosts protein production, allowing the trees to regrow what was lost, and the tannins make the trees distasteful to deer, which prevents further snacking.

"On the other hand, if a leaf or a bud snaps off without a roe deer being involved, the tree stimulates neither its production of the salicylic acid signal hormone nor the tannic substances. Instead, it predominantly produces wound hormones," Bettina Ohse, lead author of the study, explained in a statement.

To test whether this was truly a tailored response to a roe deer threat, the scientists in Leipzig attempted to do some outsmarting of their own. They simulated roe deer snacking by clipping the trees, then trickling deer saliva onto the broken branches with a tiny pipette. The fake deer attack sparked the same defensive response as an actual bite from a deer, suggesting to the scientists that trees are able to recognize deer saliva and respond to it. Now, Ohse and her team are performing the experiment on other tree species, to see whether some have better defensive mechanisms than others.

Keep that in mind the next time you consider matching wits with a tree.



Two of the study co-authors, Carolin Seele and Stefan Meldau, collect buds for the subsequent analysis of plant hormones and tannins. (Bettina Ohse)

Article taken from the *Washington Post* website www.washingtonpost.com, printed on 9/13/16. The article also appeared in *The Cleveland Plain Dealer* on 9/15/16.

## Website:

# National Wetland Plant List – What Is It and What Is It Used For?

### By Steve Eggers

Anyone not involved in the wetland regulatory arena may be unaware of an on-line resource containing a wealth of information on vascular plants that occur in wetlands of the United States. The *National Wetland Plant List* had its origin in the 1980s, a period that saw an explosion of interest in identifying and delineating wetlands for state and federal regulatory programs. A definition and method for identifying "wetland vegetation" was needed—one that would stand up to the rigors of the regulatory arena.

As part of the National Wetland Inventory undertaken by the U.S. Fish and Wildlife Service (Service), a wetland plant list was developed by the Service in cooperation with Federal interagency review panels. The list was published in 1988 and became an essential tool for delineating wetlands. Responsibility for the list was transferred to the U.S. Army Corps of Engineers in 2006. An extensive effort to update the 1988 list ensued and involved regional panels of botanists/plant ecologists, oversight by a national panel of experts, and a national public notice and comment period. The update was published in 2012 as the *National Wetland Plant List* (NWPL). The NWPL employs 10 regions. Figure 1 shows the seven regions in the Lower 48 to account for different ecological/climatological/geological factors across the United States. Minnesota lies within three of the regions: Great Plains, Midwest, and Northcentral/Northeast. Minor updates to the NWPL followed in 2013 and 2014, and 2015.

While cattails, *Typha* spp., bulrushes, *Schoenoplectus* spp., *Scirpus* spp., and water-lilies (e.g., *Nymphaea* spp., *Nuphar* spp.) are obvious wetland plants, what about plant species that occur in areas transitional between wetlands and uplands, or species that occur with equal frequency in both wetlands and uplands, (e.g., red maple, *Acer rubrum?* The NWPL assigns one of five indicator statuses to a plant species depending upon its frequency of occurrence in wetlands (Table 1).

Cattails, bulrushes, bulsedges, and water-lilies mentioned in the previous paragraph are examples of OBL species. Examples of FACW species include blue vervain, *Verbena hastata*, reed canary grass, *Phalaris arundinacea*, and swamp white oak, *Quercus bicolor*. In addition to red maple, other examples of FAC species—which occur with more or less equal frequency in both wetlands and non-wetlands—include plains cottonwood, *Populus deltoides* ssp. *Monilifera*, and curly dock, *Rumex crispus*. Canada thistle, *Cirsium arvense*, black cherry, *Prunus serotine*, and Indian grass, *Sorghastrum nutans*, are examples of FACU species. An example of an UPL species in the Northcentral/Northeast Region is common milkweed, *Asclepias syriaca*. The same plant species can have a different indicator status in a different region. Common milkweed is rated as FACU in the Midwest Region, for example. Plant species rated as UPL across all 10 regions are not included on the NWPL.

**Table 1**

| Indicator Status | Description |
|---|---|
| Obligate (**OBL**) | Almost always occur in wetlands |
| Facultative Wetland (**FACW**) | Usually occur in wetlands but may occur in non-wetlands |
| Facultative (**FAC**) | Occur in wetlands and non-wetlands |
| Facultative Upland (**FACU**) | Usually occur in non-wetlands but may occur in wetlands |
| Upland (**UPL**) | Almost never occur in wetlands |

How is the indicator status applied for purposes of wetland delineations? Plant species rated OBL, FACW or FAC are considered wetland plants, or hydrophytes (hydro = water; phyte = plant). Plant communities dominated by hydrophytes—hydrophytic plant communities—meet the vegetation criterion for wetlands.

Currently, over 8,000 species are on the NWPL. Subsets of the NWPL by state or region can be downloaded as pdf. or xls. files. The web page for each species includes distribution maps, biological attributes, photographs, ink drawings, external web links, and synonyms (more than one scientific name for the same plant species).

The high volume of changes in nomenclature has caused frustration among wetland practitioners and others. Red-osier dogwood, for example, has had three scientific names applied in recent years: *Cornus stolonifera* Michx., *C. sericea* L. and the currently accepted *C. alba* L. The NWPL makes it easy to determine the currently accepted scientific name for a species. Using the search function, type in the scientific name for a plant species and regardless of whether the name you use is a synonym or the currently accepted scientific name, the NWPL will direct you to the web page for that species. I have received more than a few inquiries from wetland practitioners as to why the NWPL omitted a plant species known to occur in wetlands. Several involved *Rhamnus frangula* (glossy buckthorn). Type in *Rhamnus frangula* in the search function and the NWPL will direct you to the web page for *Frangula alnus*, the currently accepted name for glossy buckthorn.

The web page includes technical papers and even a video series on "All Things Wetland Plants." Google "national wetland plant list" or type in: wetland_plants.usace.army.mil.




Figure 1

Reprinted from the *Minnesota Plant Press*, a Minnesota Native Plant Society newsletter, Spring 2016, Vol 35, No 1.

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## Invasive:

### White Pine Blister Rust & Ribes

**By Akiva Silver**

White Pine Blister Rust**,** WPBR, is a complicated disease with a great story. The rust is a fungus, *Cronartium ribicola*, which requires two host plants to complete its life cycle. The disease is able to kill all five-needled pines. When it was discovered that *Ribes*—gooseberries and currants—served as the alternate hosts, the lumber industry waged war on the *Ribes* populations.



*Cronartium ribicola* on *Ribes* sp.
White Pine Blister Rust

There are more than 70 species of *Ribes* native to North America. They are small shrubs that often thrive in the shade of forests. The berries have fed woodland songbirds and rodents for millennia. The color of currants and gooseberries can range from translucent white to green to red to purple to black. The flavor can vary just as much, from terrible to delicious. Many cultivars of both native and Eurasian species abound in gardens and nurseries across the temperate world.

WPBR does not affect *Ribes* too much, but it often kills young White Pines, *Pinus strobus*¸ and injures older trees. In some stands, mortality of young White Pines can be near 100%, though more and more resistant pines are showing up and being bred.

Originally from Asia, WPBR was introduced into Europe, and then accidentally brought to North America. In the eastern U. S., towering White Pines dominated the landscape. The lust for their valuable timber led to their rapid destruction. The trees were used to build first British and then American naval ship masts. White Pines were so valuable in colonial times that it was illegal for colonists to cut them down. But down they came in great numbers, and by the late 1800s, it was realized that our forests might not last forever. Replanting programs began, but American nurseries were unable to keep up with the demand for White Pine seedlings. We looked to Europe, already well-practiced in replanting forests, to supply us with White Pine seedlings. Many thousands of seedlings were shipped from nurseries in Germany, and along with the trees came WPBR.

The disease was first discovered in Geneva, N.Y., in 1906. Very soon afterwards, *Ribes* eradication efforts began. WPBR has two different types of spores. One type moves from White Pines to *Ribes* plants, and is capable of traveling 100 miles or more. The other type of spore travels from *Ribes* to the pines, and is only capable of moving a few hundred yards—and herein lies the weakness in the disease. By removing all the cultivated and wild *Ribes* from the immediate vicinity of a valuable White Pine stand, the pines could be protected.

Growing *Ribes* became illegal under federal law (this ban was lifted in 1966, with individual states taking over from there). Work crews hired by the government, mostly through the Civilian Conservation Corps (CCC), systematically swept through and around valuable White Pine stands, uprooting gooseberries and currants. At one point in the 1930s, there were over 11,000 men ripping *Ribes* plants out of the ground. It is hard to imagine how many plants were destroyed, and what effect this had on local ecosystems.

Wild *Ribes* are far more common than most people realize. They are inconspicuous plants that thrive in the shade and tangles of thick woods. Here in upstate N.Y., virtually all woodlots have some wild gooseberries or currants growing in them.

Amazingly, the eradication efforts were considered successful at the time. They drastically reduced the spore inoculum and thus the spread of WPBR. However, as time went on, and eradicated sites were not revisited, the



Symptoms of white pine blister rust infection may be difficult to spot at first; it may simply appear as small yellow or red spots on a few needles. Usually within a few years' cankers can be found on the branches. These cankers will generally appear as a swollen area that may have a greenish-yellow to orange margin. As the cankers mature they will girdle the branch or stem causing death of living tissue beyond that point. The distinctive orange blisters are visible in later spring and early summer.

disease came back and spread. Today, WPBR is a serious threat to five-needled pines that grow at high elevations in the Rockies and Sierra Nevadas.

However, new research has proved that *Ribes* are not the only alternate host. Indian Paint Brush, *Castilleja* sp., and Snapdragons, *Antirrhinum* sp., have also been shown to spread WPBR to pines.

While eradication and the banning of *Ribes* plants was the focus in the U.S., in Europe the aim was to breed resistant pines and *Ribes*. This is largely because currants and gooseberries are so popular in Europe. American nurseries and fruit growers wanting to grow *Ribes* pushed for the legalization of resistant varieties. While countless wild plants existed all over, many states decided to permit the sale of resistant *Ribes* varieties. And then, amazingly, in 2012 it was discovered that WPBR has mutated in New Hampshire. There is now a new strain of the fungus that overcomes the resistance in many varieties. Gooseberries and currants that have been advertised as immune by multiple nurseries across the country are actually totally susceptible to the mutated fungus.

Growing *Ribes* has dramatically increased in popularity in the U. S. in recent years. So-called "resistant" and "immune" varieties helped gooseberries and currants get a foothold into American gardens and farms. They are delicious, useful berries, and easy to grow. With outstanding health benefits, *Ribes* have become a growing component of the local food movement. So what now? Since there are virtually no *Ribes* that can be guaranteed to be resistant to WPBR, is it okay to grow them?

This is a choice for individual landowners to make. Here are some key points to consider: Are there young, desirable White Pines growing nearby? Are you willing to watch the pines and prune out infected limbs (an effective control measure, since 99% of infections on White Pines take place lower than 9 feet high)? Are there wild *Ribes* already in the vicinity? Snapdragons or Indian Paint Brush?



Orange Blisters - Blisters of orange spores on cankers (in spring) and branch swellings



White pine blister rust

Resistance in pines is known and growing. About 20% of unselected White Pines are able to fend off the disease, even while young. About 75% of selected pines from breeding programs are resistant. These numbers will likely only go up with time, as the genotypes of the most susceptible trees are killed off.

It is interesting to know that in the Czech Republic and Poland, our native Eastern White Pine, *Pinus strobus*, is increasingly naturalized. This is a part of the world with a high level of European Black Currant, *Ribes nigrum*, production. *Ribes nigrum* is considered the most susceptible of all the *Ribes* species. Black Currants are not just found on a farm level, where plantings are extensive, but also at individual homes. Over 90% of homes in Eastern Europe have Black Currants planted. Despite this massive presence of the most susceptible *Ribes* species, White Pines have been able to naturalize themselves into the landscape.

To me, growing gooseberries and currants is a wonderful addition to the garden and to the land. Wild plants abound and have lived alongside White Pines for thousands of years. I understand the controversy surrounding growing *Ribes*, and welcome any comments or questions.

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All photos for this article were taken from www.fs.fed.us.

# Daughmer Prairie Savannah State Nature Preserve


Spotted St. Johnswort, *Hypericum punctatum*



Burr Oak grove in Daughmer Prairie.



Spiderwort, *Tradescantia* L.

When early settlers first arrived in Ohio, most of the state was dense forest. However, when settlers reached the Sandusky Plains, they encountered a vast expanse of grassland with trees scattered here and there. When the trees in a grassland are so widely spaced that the canopy never closes, the area is called a *savannah*. Typically, savannahs remain grassland because they undergo long periods without precipitation between periods of seasonal rain. However, in Ohio there is enough rain to transform any grassland into a forest. This didn't occur in the Sandusky Plains.

Factors that contributed to the prairie habitat preservation included its agricultural use and fires. It was most often used to graze sheep which inhibited invasion by woody seedlings. Although some of the native forbs (wildflowers) were eliminated by the grazing, the overall effect was positive. Another factor that assisted prairie habitat preservation was fire. Whether sparked by lightning strikes or set by native Americans to corral game, the fires helped the prairie plants regenerate and also killed tree saplings. The large Bur Oak Savannah that remains is a special Ohio and Midwest environment.

In addition to the Bur Oak savannah, the preserve also contains other plant communities. This habitat includes mesic prairie, wet prairie, sedge meadow, bluejoint swales and prairie pothole marshes. Stands of big blue stem and little bluestem grasses occupy the dry prairie. Species such as prairie cord grass can be found in the wet areas.

Located on this Prairie Savannah are threatened bicknell's sedge and the potentially threatened wheat sedge and flat stemmed spike-rush, as well as its namesake, the towering majestic bur oaks that are over 200 years old. This is one of the best remaining oak savannahs in the United States.

Daughmer Prairie Savannah is the largest and best preserved remnant of the unplowed, deep soil prairies and savannahs that were present at the easternmost extension of America's prairie heartland. Once covering 192,000 acres in Crawford, Wyandot and Marion Counties, the Sandusky Plains have been reduced to less than 75 acres. The fact that this area remains prairie to this day is thanks to the stewardship of Hazel (White) Daughmer's family. Through five generations this family maintained the prairie habitat by controlled burns and light grazing.

The 33 acre Daughmer Prairie Savannah was purchased by the Ohio Department of Natural Resources in January of 2011 using funds donated by conservation minded tax payers. Those taxpayers earmarked part of their refund to be used for preservation of Ohio's natural areas. When the Daughmer Savannah came up for public auction in November of 2010, it had never left the White family, who had owned it for over 160 years. The Daughmer name honors Hazel White-Daughmer, who built her home on a corner of the savannah and prized the special environment that she owned.

This preserve is open to the public for low impact recreation including hiking, birdwatching, and research by permit only. While owned by the Ohio Department of Natural Resources (ODNR), it is managed by the Crawford Park District.

Daughmer Prairie Savannah is located at 786 Marion-Melmore Road, Bucyrus, Ohio 44820, centered between Upper Sandusky, Bucyrus, and Marion.

Content for this article taken from the websites of naturepreserves.ohiodnr.gov, www.ohioprairie.org, www.crawfordparkdistrict.org/daughmer.html and trekohio.com.

## Interesting Factoid:

# Using Plants to Counter Antibiotics Crisis?

### By Ferris Jabr

Botanical treatments are often overlooked by Western medicine.

Ethnobotany is a historically small and obscure offshoot of the social sciences, focused on the myriad ways that indigenous peoples use plants for food, shelter, clothing, art, and medicine. Within this already-tiny field, a few groups of researchers are now trying to use this knowledge to derive new medicines.

By revealing the elemental secrets of these plants, Dr. Cassandra Quave, a researcher, has discovered promising candidates for a new generation of drugs that might help resolve one of the greatest threats to public health today: the fact that an increasing number of disease-causing bacteria are rapidly evolving immunity to every existing antibiotic. Without effective antibiotics, common bacterial diseases that are curable today will become impossible to treat; childbirth, routine surgeries and even the occasional nick could turn lethal. The widespread emergence of resistant bacteria already claims 700,000 lives a year globally.

Between the 1940s and 1960s, the golden age of antibiotic discovery, researchers and pharmaceutical companies harvested such molecules from soil microbes and chemically tweaked them into dozens of new commercial drugs. Some antibiotics, most famously penicillin, came from fungi, but soil bacteria were so abundant and so easy to collect that they remained the center of attention. Researchers soon discovered, though, that only about 1 percent of all bacterial species could be grown in sterile laboratory conditions. By the 1970s, scientists had squeezed almost every potential drug out of this small circle of amenable microbes. In subsequent decades, many large pharmaceutical companies turned away from nature as a source of antibiotics, diverting resources to the promising new field of synthetic drug development.



Combinatorial chemistry, which emerged in the 1980s and was adopted by the pharmaceutical industry in the 1990s, enabled chemists to rapidly generate immense libraries of potentially novel drugs by mixing and matching their molecular building blocks. Ultimately, however, human chemists have been unable to emulate the ingenuity and complexity of organic molecules produced by eons of evolution. Nature is a superchemist. It's been doing this for a lot longer than we or even mammals have been around. Plants have been doing this for about 400 million years. That puts people—even very smart people—at a competitive disadvantage.

Ethnobotany offers a few distinct advantages. It is the only strategy that benefits from a pre-made guide to some of nature's most potent drugs, honed by thousands of years of trial and error in traditional medicine. And as far as organic drug factories go, it's difficult to beat the complexity and ingenuity of plants. Plants are nature's chemical wizards. If a plant finds itself in an unfavorable situation—feasted on by pests, ignored by pollinators—it cannot kick up its roots and relocate. Instead, plants regulate the chemistry of their environment, perpetually suffusing the ground, air and their own tissues with molecular cocktails and bouquets intended to increase their chances of survival and reproduction.

Upon graduating from Emory, Quave turned down her acceptances to medical school and pursued ethnobotany instead. After working as an ethnobotanical research assistant in Ginestra, a tiny village in southern Italy; earning a Ph.D. in biology at Florida International University in 2008; and completing postdoctoral fellowships, Quave landed her current job as a medical ethnobotanist and assistant professor of dermatology at Emory in 2013. She has conducted most of her fieldwork with traditional healers in rural regions of Italy, Sicily, Albania, and Kosovo. Her recent researching is quite enlightening:

- Quave and her research team have discovered that an extract of Brazilian peppertree berries—an invasive species common in many warmer parts of the United States—prevents MRSA from forming skin lesions in mice and shrinks biofilms formed by the bacteria. "I really believe these kind of inhibitors are a major part of the solution to antibiotic resistance," Quave says. "We can shut down bacteria's most dangerous machinery without killing them." She envisions using such drugs as prophylactics in surgeries with a high infection risk, or in combination with other antimicrobials if a serious infection is already established.
- In southern Italy, Quave discovered that healers use elmleaf blackberry to treat boils and abscesses. She gathered a few bags of blackberry roots, sliced and dried the samples, vacuum-sealed them in plastic bags and shipped them back to her lab in Atlanta, where her colleagues ground them to a powder in a mill and extracted organic molecules using various solvents. When they added different combinations of blackberry molecules to brothy wells of MRSA—a particularly antibiotic-resistant species of Staphylococcus bacteria—the botanical extracts did not kill the microbes as typical antibiotics do. Rather, they prevented the bacteria from forming slimy, intractable mats called biofilms, which allow them to adhere to living tissues and medical devices like catheters in hospitals.

This is exactly the kind of antibiotic that can foil the evolution of resistance. A few lone bacteria drifting about are not particularly worrisome. It's when pathogenic microbes team up that they become a greater threat. Bacteria rely on a form of chemical communication known as quorum-sensing: When they form a critical mass, they start churning out toxins, exchanging genes for antibiotic resistance, and protecting themselves with a thick shell of sugar molecules that is impermeable to many drugs. But if an antibiotic could disrupt bacteria's ability to collaborate, instead of killing them outright, it could render them more vulnerable and "sidestep resistance," as Quave puts it. "It's like a magician's trick. You're distracting the bacteria, saying, 'Look over here!' Meanwhile your own immune system can clear away the microbes." Because such an antibiotic would not be directly responsible for the microbes' death, there would be much weaker evolutionary pressure to develop resistance against it. "Ever since Fleming discovered penicillin, we've been in the mind-set that we need to kill microbes," Quave says. "What we need to do is find a balance."

Given such promise and the desperate need for new antibiotics, you might think that the path from lab to pharmacy would be expeditious. It is anything but. In many cases, plant-based remedies work best as complex mixtures of many distinct molecules, as opposed to a highly refined one- or two-molecule extract. In the past decade, the Food and Drug Administration has approved just two commercial botanical drugs: Veregen, a medley of green-tea-leaf compounds used to treat genital warts, and Fulyzaq, an antidiarrheal derivative of tree resin with so many molecular constituents that some remain unidentified. Despite these successes, there is continued opposition in the pharmaceutical industry to developing complex botanicals because they are perceived as too messy and too difficult to evaluate and standardize for mass production. University scientists often rely on drug companies to fund the costly and time-consuming clinical trials required for approval from the F.D.A., and major pharmaceutical companies have little interest in antibiotics. If a candidate antibiotic is some motley herbal treatment—if it has the whiff of mumbo-jumbo folklore—the opposition is stronger still.

During her two-week expedition in the marshes, wetlands and forests of Florida, Quave had already collected close to 175 species—primrose willow, carnivorous sundew, toothache grass, gallberry, black nightshade—but she could not pass this one up. "This is Plantago!" she said. "It's known for applications for skin infections." One species of the plant, she later explained, can stop a bleeding wound; another can heal abscesses. "It's easy to dig up. Let's get some bags. Grab as much as you can."

Ferris Jabr is a writer based in Portland, Ore. He last wrote for *The New York Times* magazine about breeding wheat for more flavorful and nutritious bread.

Photo is of a Brazilian peppertree, which is being studied for antibiotic potential. Damon Casarez for *The New York Times.*

This information was excerpted from an article from *The New York Times* that appeared in the September 14, 2016 Sunday magazine. To read the entire article go to http://www.nytimes.com/2016/09/18/magazine/could-ancient-remedies-hold-the-answer-to-the-looming-antibiotics-crisis.html**.**

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