Trumpet Vine

Knowledge for the Community From Loudoun County Extension Master Gardeners

Spring 2023

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LOUDOUN COUNTY EXTENSION MASTER GARDENER LECTURE SERIES

FREE AND OPEN TO THE PUBLIC

7 P.M.

HOSTED BY LOUDOUN COUNTY LIBRARY; PLANNED BY LOUDOUN COUNTY MASTER GARDENERS

Free Virtual Presentations via WebEx.

April 13, 7-8 p.m. The Awesome Health Benefits of Gardening, by Jan Lane, registered horticultural therapist

May 4, 7-8 p.m. Transitioning to Native Plants by Jane Kirchner, Master Gardener

June 1, 7-8 p.m. All About Lavender by Cyndie Rinek

July 13, 7-8 p.m. Invasive Plants by Joanne Royalty, Horticulturalist

August 3, 7-8 p.m. Fall Vegetable Gardening by Denise Palmer

Check the event calendar on our website for updates on topics and speakers.

Visit us on Facebook: Extension Master Gardeners of Loudoun County, Virginia.

What to Do This Spring

At this writing, spring is still a week away and already things are very strange. Eighty-degree days, then snow, plants blooming weeks early before the bees are out, and the few bees that do come out are killed by the cold. We are confused; the plants and animals are confused!

This is the time to closely adhere to your regular gardening schedule and horticultural best practices. Don't be fooled by the warm days and clean up or plant earlier than usual. Don't clean up your ornamental beds until mid-April; many native insects including butterflies and native bees are still sheltering in the plant litter. The vegetables that you normally plant after Mother's Day should be planted after May 14 regardless of the warm weather in March or April. As we had last year, we will most likely have a late, damaging freeze.

Start your tomatoes and peppers inside at the end of March, and then carefully harden them off and plant them outside on May 14 or later. Plant your early spring vegetables outside now. Beets, broccoli, cabbage, carrots, spinach and kale, radish, lettuce, arugula, and peas can be planted now. But watch them closely and protect tender plants from late hard freezes with plastic sheeting or row cover.

Increase your native plant beds to fortify your efforts to foster a healthy environment and make sure you are planting fruit-bearing plants to feed the birds.

Take advantage of this wet spring to remove non-native honeysuckle, vinca, English ivy, and pachysandra while the soil is soft.

Now it is more important than ever to adhere to science and good gardening practices.

Leesburg Flower and Garden Festival
April 15 and 16, 2023

The Leesburg Flower and Garden Festival was established in 1990 and features vendors, entertainment, and food. The Loudoun County Master Gardeners Association hosts a booth featuring native plants, high quality garden tools, small arrangements of succulent houseplants, and a garden clinic with master gardeners available to answer specific plant, pest, and environmental questions.

The festival is always a rain or shine event usually held the third weekend of April. The Historic District of Leesburg is closed to normal vehicle traffic allowing visitors to meander among more than 100 vendors, an entertainment stage, and children's activities. Typically, more than 30,000 people attend the festival during the weekend. Saturday hours are 10 a.m. to 6 p.m. and Sunday hours are 10 a.m. to 5 p.m.

There is no charge. Come and visit the Loudoun County Master Gardeners tent during this early spring event.

Ellen Paquette, Loudoun County Extension Master Gardener

Do You Know This Beauty?

Caliparpa americana (beautyberry bush) is valued for the beauty and utility of its berries, as the common name implies. Berries start to develop on the branches in late summer and are in full color by the fall. They are persistent into the early winter months, eye catching and interesting. They are a good food for several birds when the weather turns cold. Other common names are French mulberry, American mulberry, and Sour-bush.

Specifications:

- Height: 3-6 feet, occasionally taller
- Width: 3-6 feet
- Shape: long arching branches
- Leaves: length is longer than width, attach to the branches in pairs or threes
- Flowers: small pink or white in dense clusters at the base of the leaf clusters. Beautyberry flowers on new growth, so pruning in the later winter/early spring is recommended for best production of flowers and berries.
- Bloom time: May-July.
- Fall foliage: yellow.
- Pollinated: by bees and butterflies.
- No significant insect or disease problems.

Photo by Sally & Any Wasowski, Washdowns Collection (wildflower.org) Courtesy of Lady Bird Johnson Wildflower Center

The berries, called drupes, are iridescent magenta (sometimes white), about ¼" in diameter in round clusters around the branch stems at leaf axels. The berries remain clustered on the branches after the leaves have fallen, making a stunning effect in the fall and into winter. *C. americana* can self-pollinate but will produce more fruits per plant if several plants are grown together.

Wildlife value is high. *C. americana* is a caterpillar host for Spring Azure butterfly and Snowberry Clearwing moth. Berries are high in moisture and are eaten by purple finch, American goldfinch, hermit thrush, mockingbird, bob white, towhees, American robin, and bluebirds. The flowers provide nectar for butterflies and bees. Deer will browse beautyberry but rarely damage the shrub.

C. americana has a reputation as a folk remedy. A crushed leaf rubbed on the skin supposedly deters ticks, ants, and mosquitoes. In the early 20th century, farmers would crush the leaves and place them under the harnesses of horses and mules to repel mosquitoes. The farmers rubbed the crushed leaves on themselves to repel mosquitoes and biting bugs. A chemical called callicarpenol and intermedeol extracted from the plant has been studied as a possible insect repellent by the USDA.

Maintenance of *C. americana* is very low. They will grow in part shade to full sun. Soil moisture requirements are average to dry. *C. americana* can do well in full sun by a curb with no irrigation other than rain. It can grow in all Virginia soil types without amendments. Full sun and dry acidic soils tend to produce the most fruit.

C. americana can be used as an understory shrub or open hedge. To see beautyberry shrubs in the Leesburg area, a row is planted at the Marshall House in Leesburg along the fence bordering Market Street. Although not a showy summer shrub, beautyberry can be effective as an accent in a garden that is designed to highlight the berries in fall and winter. It's an excellent choice for an area planted with wild birds in mind. Birds flock to the berries as soon as the cold weather sets in.

Photo by Lee Page, courtesy of Lady Bird Johnson Wildflower Center www.wildflower.org

C. americana is a good choice in place of forsythia. The flowers are later and more subtle than forsythia's first-of-the-season bright yellow flowers. Forsythia becomes a non-descript shrub once its short-lived blooms are gone. In contrast, *C. americana* produces lovely berries in the fall, and provides birds with winter food and humans with the pleasure of watching the birds eat the berries.

Although the shape of the plant is similar to forsythia, with its arching branches it is a more attractive summer and winter shrub. *C. americana* can be placed at the back of a garden or yard where it can grow to its full height without once-a-year pruning. Or if it is used as an accent or open hedge, the entire plant can be pruned to 12" above the ground in late winter to enhance new growth and encourage a more compact shape.

Interesting companion plants include *Symphyotrichum oblongifolium* ("October Skies" aster), red chokeberry, *cornus florida* (flowering dogwood), and ground covers that are evergreen or semi-evergreen in the winter.

There are Asian beautyberry and hybrids of Asian and American plants on the market. They do not have as striking an array of berries in the fall and winter as the straight American species. The Asian species is more upright, taller and wider, and more branching than the American species. The Asian berries are smaller and are not arranged on the branches in as interesting a display. As with most (if not all) native plants, it is highly recommended to plant the straight species rather than cultivars, hybrids, or non-native selections. Straight (native) species are higher in food value for wildlife that depend on them for hosting larvae and providing nectar and winter food. Beautyberry varieties that are not native but may be sold at a nursey near you are:

- *C. bodinieri*
- *C. bodinineri* var. giraldii
- *C. dichotoma* "Duet"
- *C. dichotoma* "Early Amethyst"
- *C. dichotoma* "Issai"
- *C. japonica*. Note that C. japonica is considered invasive in several states.
- *C. japonica* "Leucocarop".

Callicarpa can be spread by birds that eat the seeds, which is another reason to plant native *C. americana* rather than non-native or hybrid varieties.

***Callicarpa americana* flower**.
Photo by Joseph A. Marcus, courtesy of Lady Bird Johnson Wildflower Center

C. americana can be propagated by seed, by transplanting volunteer plants, and by rooting soft wood tip cuttings. Small volunteer plants are very hardy and can be dug up and transplanted to different locations. Seed propagation is used most often. Seeds need cold stratification for at least a month. Sow the cleaned seeds lightly in a greenhouse kept just above 40 degrees in November. Seeds germinate in January and February and are ready to plant outside by April. Softwood tip cuttings should be taken from early May through June, just after the first flush of growth but before the plant has flowered. The cuttings should be 4 to 5 inches long with the leaves from the bottom half removed. Treat the cuttings with rooting hormone (5,000 ppm) and place gently in rooting material. Roots should begin to grow within 1 to 2 weeks. Hardwood cuttings should be 5 to 8 inches long, treated with rooting hormone (10,000 ppm), and placed under intermittent mist. While it's not expected putting cuttings directly in the ground will work very well, you may successfully separate large clumps of mature plants in the winter.

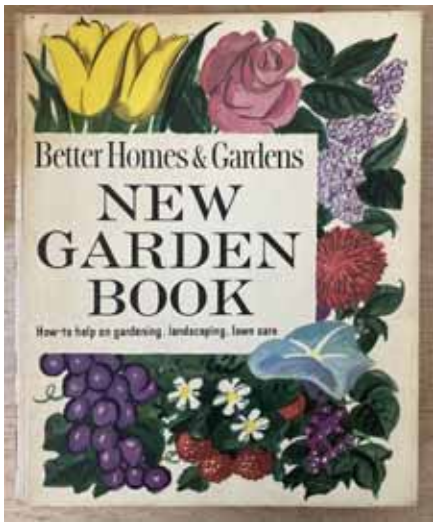
If you have space to plant *C. americana*, consider trying it. The pollinators and birds will appreciate it, and you will find it charming to watch it flower, set berries, and provide winter food.

Sharon Perryman, Loudoun County Extension Master Gardener

Spring Native Plant Sale at Morvan Park

The Loudoun Wildlife Conservancy's Native Plant Sale takes place on April 22, 9:00 am - 3:00 pm. Four local native plant nurseries will be participating: Hill House Farm & Nursery, Nature By Design, Seven Bends Nursery and Watermark Woods. Morvan Park, 17339 Southern Planter Lane, Leesburg, 20176.

Gardening 60 Years Ago--A Look Back



I inherited my mother's gardening books, and I thought I would look at them for some tried and true garden advice. *Better Homes and Gardens New Garden Book* was a very popular resource with lots of color photographs and sections separated by tabs. The 1961 edition is all about making your garden pretty with colorful annuals, adding plants for privacy, and hiding the foundation of your house.

There is a section on pests and diseases. You can blast your plants with chemicals: "Here's help in knowing which one of the **wonder-working chemicals** to choose in ridding your garden of diseases and pests." It lists chlordane, dieldrin, lindane, and malathion as some pesticides to use. All of these are now banned or severely regulated due to their toxicity. If your soil has nematodes, it says, use a fumigant such as ethylene dibromide to eliminate weed seeds, fungi, and soil insects. In other words, kill everything in the soil before you start planting (page 385). DDT was recommended to kill hornworms, rose slugs, may beetles, and flea beetles (page 391). Rachel Carson published *Silent Spring* showing the dangers of insecticides to bird life in 1962, but it was not until 1972 that DDT was banned in the United States.

Where did all the invasive plants come from that we are finding in parks and wild places and that are so difficult to remove? The experts at the U.S. Department of Agriculture and state extension services included them in their publications. For example, the Maryland Extension Service booklet "Ground Cover Plants" (1968 edition) recommended bugle weed with the note that it "may crowd out other plants," goutweed "spreads rapidly once established," kudzu vine "keep away from trees or shrubs, as it will climb into them and cover tops," and creeping buttercup "may become a lawn weed." These recommendations then are disseminated in popular books. The Better Homes & Gardens list of vines included Chinese wisteria, English ivy, wintercreeper, and kudzu (pages 152-154). Recommended groundcovers included pachysandra, periwinkle, ajuga, lily of the valley, and English ivy (pages 74-76). These plants spread quickly by runners, roots, or seeds and crowd out native plants. There is very little mention of native plants or their benefits. Some states have started to ban the sale of some invasive plants, but these states have received a lot of pushback from nursery growers and retailers.

Gardeners have a responsibility to be caretakers of the environment by creating gardens hospitable to wildlife and by avoiding plants and gardening practices that harm the environment. You can have a beautiful garden in harmony with nature!

Gardening is both an art and a science, but it must be based on knowledge gained through scientific observation and experimentation. The essence of all science is that it is continually evolving as new discoveries are made. You would not want your doctor to use only medical techniques from 50 years ago, and you should not use gardening reference material from that time either.

If you want to keep old garden books, test all the advice in them against our current knowledge. Better yet, discard them and use modern reference materials from trustworthy sources, whether in

books or online. Keep in mind that what we take as best practices today may be found to be ineffective or harmful in the future, so we should always be open to new discoveries in the wonderful science and art of growing and caring for the plants in our world.

Betty Hedges, Loudoun County Extension Master Gardener

Please support the Loudoun County Master Gardener Association in our community outreach and volunteer activities by participating in our community's largest day of giving all year! Give Choose is a 24-hour day of giving organized by the Community Foundation for Loudoun and Northern Fauquier Counties to benefit local nonprofits serving our community. Give Choose takes place all day March 28, beginning midnight and ending 11:59 p.m. You can make your donations up to two weeks in advance during Early Giving, which begins March 14.

We will have a challenge grant matching the first $1100 of donations! Please visit our Give Choose page at: https://www.givechoose.org/nonprofits/LoudounCountyMasterGardenerAssociation

Invasive Plants in Loudoun County

Several years ago, a neighbor admired the autumn olive bushes *(Elaeagnus umbellata)* on our HOA property—the silvery underside of the leaves revealed in the breeze, the delicate fruit—and encouraged the community to let them be. Now ten years later, it's impossible to distract him from his obsessive destruction of every autumn olive on our common property. That's what education about invasive plants can do!

On a warm spring day, the innocent may admire acres of Bradford pear blossoms (*Pyrus calleryana*) in bloom across Loudoun County. Perhaps they appreciate the profusion of white multiflora rose (*Rosa multiflora*) flowers. Or later in the season, they might like a mass of purple Canada thistle (*Circium arvense*) blooms. Once you can identify these plants, however, they become visually disturbing. What is beautiful to the uninformed is not appreciated by those educated about the threat of these alien invaders.

So, what are invasive plants and why should we care? All plants are native to somewhere in the world. Not all non-native plants, however, are invasive. A plant is invasive when it is introduced to an area outside of its native habitat and threatens the local ecosystem. What is invasive in one area is native to another area and may be introduced but not a threat in another area. The threat of non-native plants is region specific. Here are some basic definitions:

Native plants: A native plant is a plant that is a part of the balance of nature that has developed over a long period of time, hundreds or thousands of years, in a particular region or ecosystem. A plant may be native to Maine, but not Florida; native to Turkey but not Virginia. Native plants in the United States are generally considered to be those that grew here prior to European settlement (although there may be some exceptions).

Non-native plants: Non-native plants are those that were introduced intentionally or inadvertently to a region of this country where they did not grow prior to the late 15th century. Early European settlers and African slaves brought with them many plants and seeds from Europe and Africa. These plants were imported primarily for food, medicinal use, and gardens. Queen Anne's lace, chicory, dandelions, and Dutch clover are familiar sights in this area—plants that are naturalized but did not evolve here. Nearly all of our local vegetables as well as beloved garden favorites such as peonies and tulips came from other parts of the world. Most of these, however, do not represent an environmental threat. While some of our native plants are considered aggressive, the term "invasive" is restricted to plants that are non-native.

Invasive plants: According to federal Executive Order 13112 signed by President Clinton on February 3, 1999, an invasive species is defined as

> *A non-native (or alien) to the ecosystem under consideration; and,whose introduction causes or is likely to cause economic or environmental harm or harm to human health.*

Some invasive species were introduced intentionally for specific purposes. In the past, Bradford pears, Russian and autumn olives, as well as many other plants were imported for their beauty or hardiness or for erosion control or food production. For the most part, these plants were introduced prior to understanding their impact on the environment. Many plants, however, were brought to this country inadvertently. Japanese stiltgrass (*Microstegium vimineum*), for example, escaped

from packaging material used in shipments from Asia. Despite increasing awareness of the ecological damage caused by invasives, it is still possible to purchase known invasives from local nurseries. Unfortunately, generic nurseries and big box stores tend to know little about native plants and invasives. Fortunately, increasing public awareness is resulting in more legislation to prevent further distribution of noxious plants.

PUBLIC POLICY

Awareness of the environmental impact of invasives, both flora and fauna, is growing. Yet invasive plants proliferate. Many factors contribute to the problem, including land and soil disturbance, excessive deer populations (and their preference for consuming native plants), and climate change.

Both federal and state governments have addressed this issue, and legislatures continue to introduce bills to promote invasive control:

> Federal Executive Order 13751 (December 5, 2016)
> https://www.doi.gov/invasivespecies/executive-order-13751
>
> *It is the policy of the United States to prevent the introduction, establishment, and spread of invasive species, as well as to eradicate and control populations of invasive species that are established. Invasive species pose threats to prosperity, security, and quality of life. They have negative impacts on the environment and natural resources, agriculture and food production systems, water resources, human, animal, and plant health, infrastructure, the economy, energy, cultural resources, and military readiness. Every year, invasive species cost the United States billions of dollars in economic losses and other damages.*
>
> *Of substantial growing concern are invasive species that are or may be vectors, reservoirs, and causative agents of disease, which threaten human, animal, and plant health. The introduction, establishment, and spread of invasive species create the potential for serious public health impacts, especially when considered in the context of changing climate conditions. Climate change influences the establishment, spread, and impacts of invasive species*.
>
> Code of Virginia Invasive Species § 2.2-220.2.
> https://law.lis.virginia.gov/vacode/title2.2/chapter2/section2.2-220.2/
>
> *Development of strategies to prevent the introduction of, to control, and to eradicate invasive species. A. The Secretaries of Natural Resources and Agriculture and Forestry shall coordinate the development of strategic actions to be taken by the Commonwealth, individual state and federal agencies, private businesses, and landowners related to invasive species prevention, early detection and rapid response, control and management, research and risk assessment, and education and outreach.*

There are several proposed bills before the Virginia legislature now. As recently as January 19, Rep Elise Stefanik (NY) reintroduced a bi-partisan Stamp Out Invasives Species Act bill directed to her state, but reflective of national concern.

PRIVATE PROPERTY

As a landowner, whether gardening on a small lot or managing multiple acres, it is challenging to figure out a plan for combating invasive plants. There are no well-defined rules, and much depends upon individual resources and objectives. The task can feel overwhelming. With some research, thought, and planning, progress is possible, but it's important to be realistic. Invasive control is not a one-time undertaking. It's perennial. Invasives cannot be eradicated entirely, but it's rewarding to gain some local control over the worst invaders and witness the visible changes that are possible. There is a growing body of research about invasive plant eradication and many resources available.

It's important to evaluate your specific conditions and to be educated about options.

Know the plants: The first step is to become familiar with the worst invasives in the area. Invasive plants come in the form of trees, shrubs, and herbaceous plants, both perennials and annuals. The Virginia invasive species list prioritizes species most problematic in the state. It may not, however, reflect the biggest problem on your own property. Evaluate for yourself what is doing the most damage.

Virginia Invasive Plant Species List (Virginia Department of Conservation and Recreation)
https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2014.pdf

Note that plants don't heed manmade boundaries, and several states are contiguous to Virginia. The flora of Northern Virginia for the most part overlap with a large section of Maryland. While Nandina and Rose-of-Sharon (*Hibiscus syriacus*) are considered invasive in Maryland, they haven't (yet) been so designated by Virginia.

Identify similar natives: While some plants are easily identifiable, Autumn Olive and Tree of Heaven (*Ailanthus altissima*), for examples, other plants may closely resemble desirable native plants. Some plants in the legume family are highly invasive yet others are natives to be encouraged. These plants may look very similar to the uneducated eye. Many plants resemble species that aren't related and can easily be mistaken for desirable natives. This is especially true of grasses and sedges (*Carex* species).

There are several phone apps that can be helpful in identifying species. One of the most useful is "Seek" by iNaturalist; also useful is the free app *Flora of Virginia*. For more detailed information, a book, *Weeds of North America* (by Richard Dickson and France Royer), provides both identification and historical information about many of our locally invasive plants. Discerning differences between look-alikes can be challenging even for the best apps, and one of the most helpful resources (free online) is:

Mistaken Identity: Invasive Plants and Their Native Look-Alikes (University of Maryland)
https://extension.umd.edu/sites/extension.umd.edu/files/2021-03/Mistaken_Identity_Final.pdf

Understand species-specific control: Every species is different. Some can be pulled by hand, others by frequent mowing. Some plants have extensive rhizome or root systems that are encouraged to spread when the plant is cut at the base above ground. Autumn olive and Canada thistle are but two of the many species that are likely to sprout all over the place if only the above-ground part of the plant is removed.

Consult expert advice to consider your options for removal. While some plants can be removed easily by mechanical methods in small areas, larger areas may require other methods. Methods for plant removal include cutting, pulling, heat, mowing, fire, herbicides, and other chemical methods (vinegar, etc.). Your choice will depend upon your specific objectives and resources. Here are two excellent sources to review for specific information on species control:

Non-Native Invasive Species Control Treatments (Virginia Department of Forestry) https://dof.virginia.gov/wp-content/uploads/FT0031-Nonnative-Invasive-Plant-Species-Control-Treatments_pub.pdf

Blue Ridge PRISM (Partnership for Invasive Species Management) www.blueridgeprism.org

Seasons matter. Stiltgrass is an annual that can be pulled easily by hand or mowed prior to fruiting. Garlic mustard (*Alliaria petiolat*a), a biennial, can be uprooted by hand prior to flowering one year and can be uprooted while green in a nonflowering year. Many of these plants, however, contain numerous seeds that can easily be spread. Dropping a plant back on the ground after pulling can result in continued maturing and seed production.

In general, herbicides are most effective when used in the fall and into winter when plants are transporting essential nutrients to roots. Once leaves have fallen, late fall and winter are good times to see and remove invasive vines and thorny shrubs, etc.

Consider your resources: Invasive removal requires time, money, equipment, and supplies. Once you understand what invasive controls will be most effective for the worst invasives on your property, evaluate how much you are willing and able to invest in the effort. Invasive removal isn't a one-time job. Do what you can.

Heed safety: Safety covers a broad area--from thorn sticks to poison ivy exposure and safe handling of chemicals and equipment. Ensure that you have a thorough understanding of the proper application of every herbicide or chemical you use and prepare with proper protective attire. The same, of course, goes for all equipment, especially power tools. Consider whether there are children and animals in the area. Plan for what you leave behind. Will cut brush become an obstacle or will a Tree of Heaven you hacked-and-squirted potentially fall on a house some year in the future?

SUMMARY

Chances are, if you own acres of property or even a residential lot, you have your work cut out for you. If this isn't enough, however, consider aiding the effort in other ways. Note and report invasive plants:

Early Detection and Distribution Mapping System (EDDMapS) https://www.eddmaps.org/about/

Consider volunteering for the many organizations that recruit volunteers to remove invasives on public property and designated conservation areas. Finally, promote legislation that promotes the effective control of damaging invasives—and educate others.

Ellen Ruina, Loudoun County Extension Master Gardener

Why Are *Keystone Plants* Important?

A large number of factors may be considered when selecting plants for the home garden. The most basic factors include the need to identify what plants will grow well in your target environment, accounting for hours of sunlight, soils, water, and temperature. In addition, we commonly consider a range of aesthetic traits such as plant and flower color, structure, texture, scent, and the time of flowering. In recent years, gardeners are also looking for plants meeting environmental goals such as biodiversity, and those supporting insect pollinators, butterflies, and hummingbirds.

While our choice of cultivars in nurseries and plant catalogs is expanding, our selection criteria are becoming more and more complicated. In this context, Doug Tallamy argues that a few plants, which he calls *keystones*, ought to be considered as a component of every garden (1). These are plants or genera offering unusually large contributions to biodiversity.

Tallamy's concept of *keystone plants* derives from a theory of *keystone species* originally proposed by the zoologist Robert Paine in 1966 to designate any species with a disproportionately large effect on its environment relative to its abundance (2). Based on research on the Pacific coast of Washington state, Paine found that the removal of starfish led to an overpopulation of mussels, and a reduction of populations of various seaweeds, sponges, and anemone. In effect, the ecology began to collapse as mussel populations sharply expanded. Since then, this concept has been applied broadly to describe a range of important predators that help support biodiversity by keeping the populations of other plants or animals in check.

Tallamy, an entomologist at the University of Delaware, is particularly concerned about preserving the size and diversity of Lepidoptera (moth and butterfly) populations. Various estimates place the decline of insect populations at about 1 to 2 percent per year, and evidence of broader declines in butterfly numbers is accumulating (3). Monarch butterflies, in particular, are now considered an endangered species. The decline in Lepidoptera has, in turn, been linked with a decline in bird populations, which are estimated to have dropped by 28 percent since 1970 (4).

Many factors are contributing to these losses including the use of pesticides, deforestation, the expansion of farmlands with a limited range of crops and varieties, the growth of urban and suburban landscapes and lawns, the expanded area allocated to non-native plants, and light pollution. Tallamy argues the value of reducing the use of pesticides, replacing lawns with more native plants, and minimizing light pollution. But he also highlights the need to encourage the production of more Lepidoptera and their larvae. Almost all birds (96 percent) rely on caterpillars to feed their young. And Tallamy notes that it takes 6,200 to 9,100 caterpillars to raise one nest of chickadees (5). But how can this be accomplished?

In a key study published in 2020, Desiree Narango, Doug Tallamy, and Kimberly Shropshire found that a small percentage of plant lineages support the larval development of the vast majority of moths and butterflies (6). In the United States, an average of only 14 percent of local plant genera support 90 percent of Lepidoptera. Here was proof of the concept of keystone plants, and the identity of a few critically important keystone genera. At the top of this list is the genus Quercus (Oaks), which was found to support at least 436 different caterpillar species. By comparison, the majority of the over 2,000 plant genera studied supported few if any caterpillar species. This study also highlighted the fact that woody plants were substantially more likely to support more

Lepidoptera larva than herbaceous plants. The latter were more likely to support a greater diversity of pollinators.

Tallamy is most interested in those keystone plants that support a diverse array and larger number of Lepidoptera. However, the Narango, Tallamy, and Shropshire study (6) also notes the value of tracking host plant specialization for Lepidoptera species threatened by extinction. Some endangered moth or butterfly larvae seem to feed exclusively on unique host plants. In this case, these plants may be considered keystones for that particular species.

By corollary, we may contribute most to biodiversity (at least for Lepidoptera) by adding a small number of key (or keystone) plants to our gardens. Not all native plants are equal. And not all plants attracting butterflies and their larvae, or those attracting pollinators, are equal. Further, if we increase the diversity of butterflies in our gardens, we are also likely to increase the number and diversity of birds.

Tallamy has since collaborated with the National Wildlife Federation (NWF) to compile a list of keystone plants for Lepidoptera and pollen specialist bees in the United States refined by agroecology (7). Table 1 displays the top five genera of caterpillar supporting plants and pollen specialist bees for the Eastern Temperate Forest Region. A larger set of listings is available at the NWF website: Garden for Wildlife.

Table 1. Top Five Keystone Plant Genera for Butterfly and Moth Caterpillars and Pollen Specialist Bees

Plant Genus	**Sample of Common Species (not all encompassing)**	**Number of Caterpillar Species That Use as Host Plant**	**Number of Pollen Specialist Bee Species That Rely on This Plant**
Quercus	White oak (*Quercus alba*), Black oak (*Quercus velutina*)	436	
Prunus	American plum (*Prunus americana*), Black cherry (*Prunus serotina*), Chokecherry (*Prunus virginiana*)	340	
Salix	Prairie willow (*Salix humilis*), Black willow (*Salix nigra*)	289	
Bertula	River birch (*Betula nigra*), Sweet birch (*Betula lenta*)	284	
Populus	Eastern cottonwood (*Populus deltoides*)	249	
Helianthus	Woodland sunflower (*Helianthus divaricatus*), Small woodland sunflower (*Helianthus microcephalus*)		50
Solidago	Stiff leaf goldenrod (*Solidago rigida*), Atlantic goldenrod (*Solidago arguta*)		42
Symphyotrichum	Blue wood aster (*Symphyotrichum cordifolium*), Smooth aster (*Symphyotrichum leave*)		33
Grindelia	Curlycup Gumweed (*Grindelia squarrosa*)		31

Rudbeckia	Black-eyed susan (*Rudbeckia hirta*), Green-headed coneflower (*Rudbeckia laciniata*)		29

Ultimately, Tallamy is arguing that keystone genera should be an essential component of whatever plant selection a gardener makes. Gardeners can continue to apply a wide range of selection criteria when identifying a broader portion of their garden stock, including color, texture, structure, and longevity. Tallamy prefers the planting of natives. But he is not overly concerned if these are mixed with a few remarkable non-natives. Regardless, at least some garden selections should be keystones supporting inordinately larger populations of insects and the diversity in our wider ecology.

David Rohrbach, Loudoun County Extension Master Gardener

(1) Tallamy, Douglas. 2019. Keystone plants. Pennsylvania Native Plants Society Notes. Vol 21, No2. http://www.panativeplantsociety.org/uploads/1/7/8/2/17829397/notes_nps_sept19.pdf

(2) Paine, R. T. 1966. Food web complexity and species diversity. American Naturalist 100, 65–75.

(3) Wagner, David et al. 2021. Insect decline in the Anthropocene: death by a thousand cuts. PNAS Vol 118 No2 e2023989118.

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The Phenology It Is A-Changin'

As I write this, you may be planning to hop on the Silver Line to visit the Tidal Basin to enjoy Washington's iconic Yoshino cherry trees in peak bloom. The trees reached the second stage of bloom on March 1, 2023, when the first visible floret was recorded on what's called the "indicator tree". (The indicator tree – whose location is not secret, by the way - reliably blooms a week to ten days ahead of most of the trees around the Tidal Basin.)

For the past several years, we've been seeing signs that Spring is arriving earlier and earlier, and this year, we may well be seeing the earliest arrival of Spring in the past 40 years. Daffodils are not just poking out of the ground – many, if not most, are in full bloom. Crocuses are blooming, forsythia are flowering, spring peepers are peeping, and Daylight Savings Time hasn't even started yet. WHAT IS GOING ON??!! To paraphrase Bob Dylan, "The Phenology It Is A-Changin'!"

The Oxford Dictionary defines Phenology as "the study of cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life." The word is derived from the Greek words 'phaino' (to appear) and 'logos' (to study) – in other words, the science of appearance. A simpler way to describe phenology is to think of it that it is the calendar according to nature – when cherry trees bloom, when a robin builds its nest, when leaves turn colors in the fall.

The founding father of phenology is considered to be Robert Marsham. He began recording the appearance of spring species and events back in 1736 on his family estate near Norwich, Norfolk, UK, and called them his *Indications of Spring*.

On this side of the pond, Henry David Thoreau recorded his observations about plant and animal life around Walden Pond between 1851 and 1856. As he walked around, he would measure the depths of snowpack in the woods and the ice on the rivers and ponds, record them in a journal and then chart them in his *Kalendar of Concord*. (Kalendar was Thoreau's term for phenological phenomena of a local ecology, in Thoreau's case, Concord, Massachusetts) His journal included first-flowering date observations for close to 500 species around Walden Pond.

Plants take their cues from the environment - such as variation in day length, temperature, and precipitation – to determine when to put out new leaves, open flowers, or ripen fruits. These events – termed phenophases – are sensitive to small variations in climate, especially temperature. Phenologists can use these changes in phenophase timing, such as the comparatively earlier fruiting and flowering of observed plants, to identify trends and understand how climate may be impacting plants.

In plants, the appearance of life cycle events has long been of interest to humans as they kept track of natural cycles to determine the best time to plant crops, gather edible fruits and nuts, and plan hunting expeditions. The first written observations of plant phenology were recorded by the Japanese over 1000 years ago. In Northern Europe, records dating back to the 1400s indicate that's when agriculturists began to make detailed notes tracking the emergence of phenophases in plants.

Indigenous peoples and native communities have long relied on phenological knowledge to guide their harvesting and gathering, and it is inherent within their tribal knowledge and language systems. The Menominee Indian Tribe of Wisconsin have centered their cultural practices, ceremonies and rituals around such phenological events as the change of seasons, ripening of

berries, and bird/animal/fish migrations or spawning times. Their harvest of black ash for basket-making usually coincides with the appearance of wild strawberries.

Most of us are familiar with full moon names – for example, Harvest Moon, the full moon closest to the autumnal equinox (this year, September 23, 2023). Native Americans named the monthly full-moon cycles after certain phenological events. For the afore-mentioned Menominee, April is the Sugar Making Moon and May is the Budding Moon. Closer to home, we are coming up on the Full Pink Moon (April 6, 2023), so named by the Algonquin Indians, because this is the time when the North American eastern native wildflower, *Phlox subulata* (Creeping phlox) blooms.

Back to cherry blossoms, here are the six stages that the National Park Service (NPS) tracks:

1. Green bud – observed this year on February 23, 2023
2. Florets visible – observed this year on March 3, 2023
3. Extension of florets
4. Peduncle elongation
5. Puffy blossom
6. Peak Bloom – predicted this year between March 22 and 25, 2023

Other familiar examples of Phenology that can be tracked:

- First bud (of various plants)
- First bloom (of various plants)
- First animal migration.
- First appearance of different insects.
- First emergence of hibernating animals.
- First amphibian

Some Ways That Gardeners Use Phenology:

- Plant potatoes when the first dandelion blooms.
- Plant peas when forsythia blooms.
- Plant beets, carrots, cole crops, lettuce, and spinach when lilac is in first leaf.
- Plant cucumbers when lilac flowers have faded
- Plant tomatoes when flowering dogwoods are at their peak
- Treat crabgrass when forsythia blooms

Normally, the changeover from winter to spring gives us warm and fuzzy vibes, and we may even become afflicted with spring fever. As welcome as the early arrival of spring may be, it may carry potentially devastating consequences for some of our most crucial animal species.

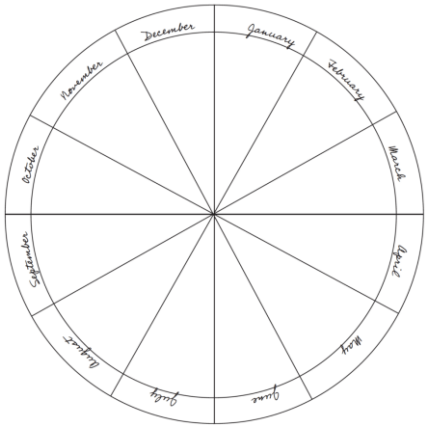
The USA National Phenology Network (USA-NPN) collects data on seasonal events and has observed events occurring earlier this year than ever in the past 30 years. Normally, bees and butterflies will time their emergence to coincide with certain flower plants that they use for nectar, and leaves for caterpillars, but if these events are "off" – if the flowers bloom too early and the pollinators are too late – there is a phenological mismatch. The pollinators will have less nectar and pollination rates will decrease.

Bird species time their northern migrations by daylight hours and will be unaware that spring has arrived early. Insects may have hatched early and by the time migrating birds arrive, there may be no insects available for the birds to eat.

You can become a citizen scientist by observing and tracking phenology. The National Phenology Network (NPN) brings together volunteer observers, government agencies, non-profit groups, educators and students of all ages to monitor the impacts of climate change on plants and animals in the United States. The NPN has set a goal this year of collecting 4 million records (and as of this writing, they have collected about 500,000). You can enroll in their Nature's Notebook project and become a phenology observer in areas that especially interest you – pests, monarchs and other pollinators, lilacs and dogwoods, *Quercus* (oaks), redbuds, and even pollen, to name a few. You've probably already done some of your own observations, maybe noting the dates that you observed the first hummingbird at your feeder or first monarch on your milkweed.

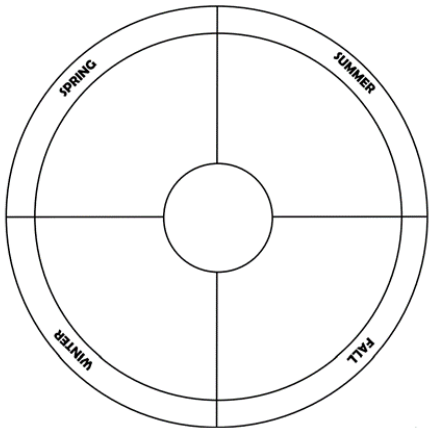
Project Budburst is sponsored by the National Science Foundation and run by the National Ecological Observatory Network in partnership with the Chicago Botanic Garden, Project BudBurst is now a flourishing network of volunteers across the United States who monitor plants for seasonal changes. Volunteers choose a plant to monitor and then use a standard form to describe the location and observe seasonal changes.

You may choose to just keep your own phenology records independently, and then you may want to take it to the next level and create a phenology wheel. Phenology wheels are used by scientists (and artists too, I might add) to track phenology and they can be as simple or complex as you like. The U.S. Department of the Interior Bureau of Land Management offers a downloadable phenology wheel learning activity, complete with templates and a data collection sheet, that is suited for all ages and abilities. Phenology can be tracked by month or season, and best of all, you can start at any time during the year.



Phenology Wheel by Month template, US Bureau of Land Management

Seasonal Round by Ellen Knight, Montana Natural History Center



Phenology Wheel by Season template, US Bureau of Land Management

Jeanette Gandhi, Loudoun County Extension Master Gardener

Resources:

National Park Service, *Bloom Watch,* https://www.nps.gov/subjects/cherryblossom/bloom-watch.htm

Phenology 101 for Educators: *What is Phenology?* https://phenocam.nau.edu/education/U1_WhatIsPhenology_Background_Final.pdf

National Phenology Network, *Why Phenology?* https://www.usanpn.org/about/why-phenology

Historic Concord, Massachusetts, *Thoreau, Emerson, Hawthorne, Alcott*. https://theconcordexperience.com/thoreaus-kalendar/

College of Menominee Nation Sustainable Development Institute, *Phenology*. https://www.menominee.edu/sustainable-development-institute/phenology

Iowa State University Extension and Outreach, *Crabgrass Control*. https://hortnews.extension.iastate.edu/1992/4-8-1992/crab.html

The CoolDown, Kenneth Ehman, *New Study Shows Why Spring 2023 Could Be Catastrophic for Some of Our Most Crucial Animal Species.* https://www.thecooldown.com/outdoors/national-phenology-network-study-spring-2023-february/

National Phenology Network, *Citizen Science and Education.* https://www.usanpn.org/citizen-science-education

Project Budburst, *A Citizen Science for All Seasons*. https://www.chicagobotanic.org/research/citizen-science/budburst

U.S. Dept. of the Interior Bureau of Land Management, *Phenology Wheel Activity*. https://www.blm.gov/alaska/public-room/educational-material/phenology-wheel-activity

Montana Natural History Center, *Make Your Own Phenology Wheel!* https://www.montananaturalist.org/blog-post/make-your-own-phenology-wheel/

Woodland Phlox

Woodland phlox, *Phlox divaricata*, is an eastern North American native plant used in gardens for its attractive bluish flowers. I first planted it about ten years ago. It is one of my favorites because it always heralds the arrival of spring. It is one of the first blossoms to appear in a shady garden adjacent to our patio. It can also be found growing in dappled shade in open woods and partially shaded meadows. It is taller than the very common sun-loving creeping phlox. Woodland phlox plants grow from a shallow root system, slowly spreading over time. The flowering stems die back after seeds are produced, leaving a rounded mound of semievergreen dark green foliage to produce and store energy for the development of the following year's flowering shoots. When not in bloom, the plant is fairly nondescript.

For about a month in late spring--usually mid-April in Northern Virginia--plants produce loose clusters of flowers at the stem tips. Each tubular flower, about 1 inch wide, has five flat petal-like lobes at the end. The sweetly fragrant flowers come in shades of blue from pale lavender to violet-blue and occasionally pastel pink or white. The showy flowers attract butterflies, moths, bees, and flies. The flowers (which require cross-pollination to produce seed) are only pollinated by long-tongued insects including butterflies (especially tiger swallowtails), skippers, hummingbird clearwing and sphinx moths, and bumblebees, which are able to reach the nectar produced at the base of the long tube, but the flowers are visited by many other insects that feed on the pollen produced near the end of the tube. Flowers may be followed by rounded fruits that start out green and eventually dry to brown oval seed capsules that split to release several small black seeds. Phlox will self-sow but the plant is not aggressive, and unwanted seedlings are easily pulled up or transplanted.

I have planted woodland phlox in a mostly shady garden near our patio where the lovely scent can be appreciated when they are in bloom. I have combined it with other shade-loving plants such as small to medium hostas, astilbes, columbines, hellebores, and lungwort where it can spread around other plants then fade into the background after flowering. As its name suggests, woodland phlox plants do best in woodland conditions in partial shade and rich, moist, well-drained soils. It is very adaptable and will tolerate dry and clay soils and is even drought tolerant once established. Partial shade is best. Mulch lightly to retain moisture and keep the roots cool through the summer. Prune after flowering, if desired, to tidy the plant's appearance but wait until spring to clean up the clump, only removing winter-damaged foliage.

This plant is a delight and you won't be disappointed when the fragrant blue flowers faithfully appear each spring.

Beatrice Ashford, Loudoun County Extension Master Gardener

Photos by Beatrice Ashford

Beavers in Our Environment

In today's world, we seem to easily underestimate the beaver, even though the beaver is North America's number one ecosystem engineer. The beaver is Canada's official national animal, and it is also the state animal of both New York and Oregon. We celebrate the beaver on April 7, International Beaver Day. When Europeans first traveled to the Americas, the word "beaver" was used to describe these fur-bearing rodents, which hunters and trappers found in abundance. Beaver fur was and still is highly valued for its warmth and beauty. Scientists estimate that before European contact, North America was home to between 60 million and 400 million beavers. It took barely 400 years to trap them almost to extinction.

There are two species of beavers, the American Beaver and the Eurasian Beaver, although many mammologists consider them to be the same species. Beavers are related to other small mammals that gnaw, such as mice, marmots, and ground squirrels. The beaver is the largest rodent in North America and the second largest rodent in the world after the capybara of South America. Rodents are mammals with continually growing front incisor teeth. Their incisors are large in size and dark orange in color. Forty percent of all mammals are rodents.

American Beaver *Photo: University of New Hampshire.*

Many people overlook beavers' remarkable engineering skills and view them as a nuisance. Their most impressive engineering skill is building dams designed to hold back flowing water. A beaver dam can widen a stream channel and create a new pond or make an existing pond bigger. Beavers build elaborate dams and lodges. Their dams are built of woven sticks, reeds, branches, and saplings and caulked with mud. The largest beaver dam in the world (over half a mile) can be found in and around Wood Buffalo National Park in Canada.

Beavers have very large, plump, round, bulky bodies with large, flat tails. They have a rounded head and small rounded ears. Their dark brown fur is fine and soft. Male and female look alike. They can grow to 70 pounds although the average weight is between 30 and 60 pounds. Beavers never stop growing so the older the individual, the bigger it will be. They mate for life and can live up to about 29 years in the wild. They are strict herbivores, eating the bark of birch, cherry, and maple trees, as well as water lilies and water plants. They are one of the few mammals that can digest cellulose.

They are semiaquatic mammals, making their habitat in rivers, streams, marshes, lakes, and ponds. Beavers are often widespread along rivers, in shallow lakes, and in forest swamps throughout most of North America, but they are less common in the South. They are abundant in much of Alaska and Canada. Their range is most of Canada and the United States, except for most of Florida, much of Nevada, and all of southern California. They are active throughout the year and primarily nocturnal, most likely to be seen in the evening hours.

One of the most common complaints about beavers is that they fell trees we would prefer to see alive and upright. To beavers, trees are all just a source of building material and food. People also object when flooding caused by beavers creates inconvenient or dangerous situations. They plug

culverts, which can cause flooding and washouts. Damming can raise water levels to a point that beaver ponds overflow into yards, gardens, or farm fields. High water is great for beavers, but less so for people who want to use the land or flooded buildings.

Beavers only attack when they feel threatened, but they will occasionally attack swimming dogs. Their teeth can cause serious or even fatal injuries. Another complaint about beavers is that they are responsible for an illness known as beaver fever. To be on the safe side, never drink straight from a beaver pond or any untreated water source.

Unfortunately, if we get rid of the beavers, we lose out on all the beaver benefits including habitat creation, community building, and water stewardship. Beavers are outstanding water stewards, and in today's world with its climate crisis, that's more important than ever.

They work to create wetlands and healthy river habitats that benefit both plants and animals. They fight wildfires, drought, and climate change. Beavers are stewards of healthy waterways, and it would be to our benefit to work with them and not against them.

Beavers create wetlands, including ponds, marshes, and swamps, that provide essential habitat for many animals and plants. Wetlands are among the world's most biologically productive ecosystems. Wetlands are a home to a greater variety and abundance of plants and animals than most other ecosystems. Wetlands are one of the world's most threatened habitats; many of the plants and animals that live in wetlands are in danger of becoming extinct. Wetlands cover only a small percentage of the Earth's surface but are among the world's most valuable ecosystems. In our country, North America, we have beavers to thank for developing and maintaining much of our wetland habitat.

Beavers manage and take care of water by storing it behind dams. This helps raise the water table instead of water rushing downstream. Water stored by beavers also helps fight wildfires. Animals fleeing the flames use beaver-created wetlands as a refuge. Beavers make streams clearer and cleaner. Their dams help clean up pollution from fertilizers or pesticides that get pushed off farm fields and into waterways.

As our landscapes are drying, hazards such as wildfires and drought will continue to occur. This will make the area less hospitable to both people and animals. Today the wetlands of the West have been reduced to two percent of the land surface, while it has to support eighty percent of the area's variety of life in the world. Beaver ponds support wet soils and green vegetation, even during periods of drought.

Beavers can turn streams into lakes and change the shape of valleys. Beaver ponds and canals offer a wide range of real estate options for fish, amphibians (frogs, toads, and salamanders), turtles, and semiaquatic mammals such as muskrats and otters. Trees killed by beaver flooding are useful because they become homes for birds and give the birds areas in which to make their nest holes.

The list of species that depend on beavers and their engineering work varies from place to place. No matter where they are found, beaver habitats are always lively places with many animals and much plant life. Beaver-created wetlands provide refuge for animals to escape to during a fire. There is a relationship between beaver activity and carbon storage. It is believed that the widespread restoration of beavers to the landscape will have a beneficial impact on global climate.

No one knows exactly how many beavers live in North America today. Their populations are widespread, and they live in many out-of-the-way places. They are plentiful in some areas, but scarce or nonexistent in many other areas where they used to be common. As our climate changes, the challenges are increasing, and so is the importance of having beavers in arid areas.

Despite the advantages of living peacefully with the beaver to benefit human, plant, and animal life, relentless trapping still kills an untold number of beavers each year--in the tens of hundreds of thousands. People killing these ecosystem engineers ignore the collateral damage that widespread slaughter of these stewards will create.

Conservation of beavers should be included as part of natural solutions to climate. Beavers, once headed for extinction, have made some recovery. Beaver advocates began by pushing for trapping regulations since their extreme decline. The government placed rules that limited the number of trappings, and it was necessary to obtain a trapping license. Reserves and parks were also established that were completely off limits to trappers. Beavers' survival will happen only if we make space for them to thrive across the landscape.

Humans have taken over much of beavers' territory by draining swamps, plowing up beaver meadows, straightening out creeks, and cutting down trees. There are effective and humane solutions to coexisting with beavers. These alternatives involve leaving beavers where they are but preventing them from bothering their human neighbors. The beavers get a comfortable home, and we get beaver benefits. Living together or coexisting means everyone wins.

When a beaver dam causes flooding problems, a solution would be to lower the water below flood level while ensuring that the pond remains deep enough for their needs. This can be accomplished by installing a flow device. This is a long pipe that runs through or over the top of a dam and creates a permanent leak. Flow devices are often referred to as pond levelers because they regulate water levels. Clogged road culverts can be eliminated by keeping beavers away from the culverts so the beavers can't dam them up. The use of a well-designed exclusion fence, paired with a pipe system, will work toward that goal. This fence and pipe system is known as the "beaver deceiver." The beavers are tricked, but they survive, and this helps with coexistence.

There are ways to help the beavers. First of all, find out what is happening to them in our area. How are they regarded in Loudoun County? Are there any local organizations working on a beaver conservation project? Beavers are believed to inhabit almost every area of Loudoun County. They can be found at the Dulles Wetlands and at Banshee Reeks.

The protection of natural places and the conservation of wildlife needs to continue to protect the life support systems we depend on. Our mutual beneficial partnership with the beaver is not only critical to them, but it is crucial to us living on this Earth. Beavers need to be recognized as the protectors of water and various ecosystems that they are.

Heather Keith, Loudoun County Extension Master Gardener

Making a Terrarium

It's late January as I write this, and even though it's one of the warmest Januarys on record, gardening outside is still a few months away. As winter closes in and closes us inside and you can't be working in your outside garden, bring your garden inside—start a terrarium. A terrarium is a collection of small, decorative plants growing in an enclosed environment. Terrariums enable you to design and create little ecosystems with small plants and other decorative elements within a glass enclosure. Terrariums are generally low-maintenance, requiring less attention than most other houseplants. With proper care they can last for several years. You probably have a few jars or other glass containers around your house that would make very nice terrariums. Or you can buy inexpensive terrarium containers at craft stores or nurseries. Some are open and some come with doors that open and close so that light and heat get in without moisture getting out. The miniature terrarium plants only cost a few dollars each, and the planting materials and soil are also inexpensive. Make one for yourself and one for a special friend's birthday. The best part about a do-it-yourself terrarium is that you are creating something that is one of a kind.

PREPARATION: YOU WILL NEED THE FOLLOWING

- A clear glass container.
- Small stones or pebbles for drainage. Clean aquarium gravel or small crushed stones work well. Using brightly colored aquarium gravel will give your terrarium a pop of color.
- Potting soil. Most box stores and nurseries sell terrarium potting soil. You can use regular potting soil if it is high in organic matter and does not contain fertilizer.
- Activated charcoal to keep your terrarium water fresh and control the growth of bacteria. (Found at a nursery or pet supply store.)
- Some miniature gardening tools. A miniature rake and trowel would be great to have. If you don't have miniature tools, improvise. You can use a regular pencil with an eraser on the end or a cork on the end of a skewer for tamping down the soil. Try using a long-handled spoon (like an iced tea spoon) or chopsticks as substitutes for miniature tools.
- Plants.
- Decorative objects (rocks, shells, little fairy benches).
- Moss (sphagnum and sheet).
- Spray bottle.

STEP ONE: CHOOSE YOUR CONTAINER

Choose a clear glass container with no drainage holes, preferably with a lid or door. You can use either plastic or glass containers; each material has advantages and disadvantages. Glass is cheaper and more widely available. A plastic terrarium is more durable and lighter weight, but it is also prone to scratches and discoloration. For my money, glass is much nicer because you can see the plants through the glass and the glass can be more easily cleaned. Big, clear glass cookies jars make great terrariums. Other suitable containers include aquariums, goldfish bowls, bell jars, apothecary jars, and large brandy snifters. Some advice—the jars need to be larger than you think, with wide openings. Those tiny little terrariums filled with tiny little plants were made by tiny little gnomes with tiny little hands. Neither you (nor I) will ever be able to get our big hands inside that little jar to tend the plants! Terrariums look best when the top of the plants hit about the one-half to two-thirds mark inside the container. Also keep in mind what the diameter of the bottom of your

glass container is if you want to fit in more than one plant. And if you want to spend several hundred dollars on your container, you can buy terrariums that look like a miniature Victorian greenhouse or conservatory.

Should your terrarium be open or closed? That depends on what plants you plan to grow. With the exception of succulents, most terrarium plants like a warm, moist environment. So unless you are going to grow succulents, a closed container is better. In a closed terrarium without air holes, the air is recycled, forcing a humid environment that will help the right plants grow happily without a lot of watering. An open terrarium receives fresh air and has easier access for the gardener so the plants tend to grow a little faster. Also, the risk of mold is reduced. Because the air can flow freely around the plants, succulents do great in an open terrarium. The photo on the left above shows a closed terrarium with a door that opens and closes, and the photo on the right shows an open terrarium.

STEP TWO: CHOOSE YOUR PLANTS

The same rules that apply to your outside garden may also be appropriate for your inside garden—RIGHT PLANT, RIGHT PLACE. When you choose your plants, choose them not only on their looks but also consider their compatibility with the terrarium environment and with each other. Options for terrarium plants are endless. Things to consider when deciding what to plant in your terrarium are: Can the plant withstand the high levels of humidity inside the container? What are the sunlight requirements? What is the growth rate? You want to choose slow-growing plants and plants that are small enough to fit inside the container without touching the sides. Most garden centers sell miniature plants for terrariums. I've also found them at Walmart, Home Depot, and Lowe's. Consider adding some fairy garden accessories to your aquarium for interest.

Here are a few suggestions for plants that grow well in a terrarium. All of them love high humidity and moisture with medium-to-high indirect light.

- ARTILLARY FERN (*P. microphylla)* – Easy to grow with minimal care in a closed terrarium.
- ALUMINUM PLANT *(Pilea Cadierei)* – Easy to root and it grows quickly. You might have to occasionally pinch it back.
- POLKA DOT PLANT *(Hypoestes phyllostachya)* – This is a cheerful plant that comes in red, pink, and silver. It may need to be pinched back if it gets too long or spindly or leggy. Planting it in a closed terrarium will help keep its growth in check.
- PRAYER PLANT *(Maranta leuconeura)* – This beautiful plant got its name because it folds up its leaves at night as if in prayer. If it's not getting enough water, the leaves will remain closed during the day.
- GOLDEN POTHOS VINE *(Epipremnum aureum)* – A meandering vine that looks fabulous in a terrarium. It has a reputation of being an indestructible house plant and that turns out to be even more true in the closed environment of a terrarium.
- PEPEROMIA *(peperomia caperata)* – There are more than 1,000 peperomia cultivars that have either all green leaves or leaves with a little red. It's a slow grower that sometimes produces colorful flower spikes that could add a nice pop of color to your terrarium.
- BABY TEARS (Soleirolia soleirolii) – A small plant with creamy ivory flowers that is known by many names—angel's tears, mind-your-own-business, peace-in-the-home, Pollyanna vine, mother-of-thousands, and Corsican's curse. When grown outside it can be seriously invasive but in a terrarium it behaves well.

- BUTTON FERN *(Pellaea rotundifolia)* – Button ferns come from New Zealand. They are somewhat "mop-headed" but, at the same time, delicate and elegant. They are hardy and drought tolerant so an open terrarium works great for them.
- CROTON *(Codiaeum Varegatum)* – This plant will add BLING to your terrarium! Its shiny, thick leaves come in a multitude of amazing colors and shapes. Crotons aren't usually thought of as terrarium plants, but they work well in an open terrarium. Foliage is green, gold, and salmon.
- HENS AND CHICKS *(Sempervivum tectorum)* – Succulents are great open terrarium plants. Hens and Chicks stay small, forming small rosettes and offshoots. Foliage can be red, green, blue, gold, or copper leaves.
- AFRICAN VIOLETS – They love, love, love bright, warm, and humid environments like those in closed terrariums. Just be careful that the leaves don't touch the sides of the container or water will collect on the leaves and blossoms and cause rot. African violets colors are white, pink, red, blue, and purple.

(TIP: Let the soil completely dry out before you water.)

African Violet

- NERVE PLANT *(Fittonia albivenis)* – This plant is a classic closed terrarium plant because it is attractive and slow-growing and it loves humidity and warmth. It's often chosen as the main plant in the terrarium.
- SPHAGNUM MOSS *(Sphagnum capillifolium)* – Sphagnum moss is the most important plant in any terrarium because it is both practical and decorative. It stores water for other plants to use, and it works great in either an open or a closed terrarium. Mist it frequently but don't overwater.

Other plants to consider include Moon Valley (*Pilea involucrata),* Starfish plant (*Cyptathus)*, Sweet Woodruff (*Galium odoratum)*, Meadow Spikemoss (*Selaginella apoda)*, Inch plant (*Tradescantia zebrine)* and Lucky Bamboo.

STEP THREE: ADD DRAINAGE LAYERS

Terrariums don't have drainage holes so you will need to add a drainage layer to keep water away from the roots of the plants. Start with a 1-2" layer of gravel or crushed stone at the bottom of the terrarium. Aquarium gravel will add a nice punch of color to the terrarium. Keep in mind that a tall, narrow terrarium will need a deeper layer of drainage stones than a broad, shallow one. Next, use a large spoon or miniature trowel to add a one-quarter to one-half-inch layer of activated charcoal on top of the stones. The charcoal will help with drainage and control any odors. Stop every few minutes to check your progress and make sure the terrarium looks like what you want it to look like.

STEP FOUR: ADD MOSS AND POTTING MIX

Add a layer of sheet moss across the stones and charcoal to keep the potting soil in the next layer from mixing in. The moss also adds a touch of visual interest to your terrarium. Next, take the time to find the right soil for your plants. Home and garden stores sell potting soil made especially for terrariums. If you use regular potting soil, make sure it is high in organic matter and doesn't have fertilizer already in the mix. You want your plants to stay small so you shouldn't encourage them to grow too much. With a small trowel or large spoon, add slightly damp, sterile potting soil on top of the moss. Add at least 2 inches of potting soil (more if you have room) but make sure not to add too much. You want to keep the soil level low enough that the plants will fit inside the container with a little room to grow without touching the top of the container. You can use the pots the plants came in to estimate the depth your soil mix needs to be. At this point the terrarium should be about one-third the height of the container with the soil being the thickest layer. Tamp the soil down to get rid of air pockets.

(TIP: Use a cork on the end of a skewer or the eraser end of a pencil to tamp down the soil.)

STEP FIVE: ADD THE PLANTS

Before adding the plants, decide on the design of your terrarium. Think about where you might want to put tall or short plants or where you may want to create mounds and dips in the soil to make interesting contours. Start by planting the biggest plant first. Remove the plant from the nursery pot. If the plant is root-bound, separate the roots, trimming away some of the longer roots if necessary. Pruning the roots will slow down the plant's growth. Trim away any dead or damaged leaves. Shake off excess soil. Using a long-handled spoon or your fingers, dig a hole for each plant, nestle the plants in the holes and gently pat down the soil to eliminate air pockets. Make sure the plants are secure in the potting soil. It's easiest to work from back to front. I like to end with a layer of pebbles on top. There's no rhyme or reason, no right or wrong, to the design of your terrarium. Play around with the design and don't forget to have fun!

STEP SIX: FINISHING UP

If you want to make your terrarium more interesting, add some decorations such as figurines, shells, decorative stones, or other whimsical accents among the plants. Check out the fairy garden sections of nurseries for some cool ideas. Finally, use a spray bottle or small watering can with a rose attachment on the spout to water the new plants—just enough so they are damp but not soaking wet. Use the spray bottle to clean any dirt off the sides of the container. Perhaps you'll want to clean off the outside of the glass with some glass cleaner. Never use glass cleaner on the inside of the glass as it's harmful to the plants.

STEP SEVEN: MAINTAINING YOUR TERRARIUM

Lightly mist your terrarium every few days. If you have an open terrarium, water the plants about once a week, being careful to avoid the moss, which doesn't need much water. The soil should be barely moist, not wet and not bone dry. If your terrarium is closed, it will almost never need water.

Be careful about putting your plants in direct sunlight. That amount of light and heat will cook your plants. When the plants start to look crowded, prune them and remove dead foliage.

WHAT'S WRONG WITH MY TERRARIUM?

If condensation forms a fog on the inside of the glass, it means you've probably watered the plants too much. Take the lid off for a few hours to clear it up.

Too much light can cause the temperature inside the terrarium to rise quickly and before you know it your terrarium is a steamy sauna. The glass can act like a magnifier and burn the plants. Most plants can't tolerate this kind of heat so it's best to keep your terrarium out of direct sunlight. Too little light is also problematic. Most plants need at least some light so if your terrarium is not getting enough indirect light, you might consider using grow lights or fluorescent lights to provide additional light. You can also move the terrarium closer to a window with good but indirect light. Every so often clean the terrarium inside and outside. Use a damp piece of newspaper or a lint-free cloth. If the glass is dirty or foggy, it's harder for light to reach the plants.

Obviously don't put your terrarium on or near a radiator or heating vent because the heat generated by these (or any heat source) can quickly kill your plants. Keep your plants neat and tidy by trimming them when they become overgrown and are crowding the terrarium space. Pruning their roots will also control the plant growth.

If one of the terrarium plants starts looking diseased, dying, or not thriving, take it out of the terrarium immediately so the problems won't infect the other plants. Use a small trowel, terrarium tool, or chopstick to very carefully remove the plant, being careful not to disturb the roots of the other plants. Replace it with a plant of similar size and light and water requirements.

Overwatering your terrarium? One way to control overwatering is to use a spray bottle instead of a watering can. If you do overwater, wipe up the excess water with a paper towel and leave the top off until the soil has dried out. What about if you overfertilize? Well, you shouldn't even be fertilizing terrarium plants at all! You want your plants to stay small and if you feed them, they will quickly grow out of their space.

Succulents love bright light, low moisture environments with unrestricted airflow around the plants so an open terrarium works better for cacti and succulents. If you planted succulents in a closed terrarium and they aren't looking healthy, move them to an open glass container in a sunny window and don't water them for a while.

Making a terrarium is a terrific project for kids. By midsummer, children are usually bored and you're looking for things to occupy them and burn up some daylight hours. Making a terrarium will do both of those things as well as provide a little science lesson on contained ecosystems. And you'll end up with a lovely terrarium for your coffee table!

So give it a try—plant a terrarium. It's easy, it's fun, it doesn't cost an arm and a leg, and you can make a beautiful terrarium in about an hour.

THE WARDIAN CASE

The Wardian case was an early form of the terrarium, and it was discovered by accident. In the nineteenth century, it was a challenge to send live plants to other parts of the world. Just keeping plants alive on the long sea voyage was touch and go. As time went on, the exchange of plants worldwide increased, and horticulturalists began searching for a better way to transport plants. Seeds and cuttings were easy to ship, but some plants had to be sent as specimens. The Wardian case was a simple design, made of glass and wood, and named for its creator, Nathanial Bagshaw Ward, a London physician with an interest in horticulture. He proposed an airtight system in which transpiration inside the case provided the moisture the plants needed to live for long periods of time.

In 1833, Ward successfully transported a packed, sealed glass case of ferns, mosses, and grasses from London to Sydney, Australia. The return trip was longer and much more challenging. The air temperature when they left Sydney was 86° F; when they rounded Cape Horn the temperature climbed to 104° F, and 8 months later when the ship sailed up the Thames, it was 39° F. Despite these adversities, the Wardian case had successfully transported a delicate coral fern, a plant never seen before in Great Britain, thousands of miles. During the Victorian age, most upper class homes had a Wardian case filled with ferns on display in their house. A Wardian case was exhibited at the Great Exhibition in 1851. The Wardian case was used extensively by many different groups of people around the world to move many different kinds of plants—scientists to gardeners, ferns to roses, from Australia to New York. In the nineteenth and early twentieth centuries, the Wardian case led the big plant migration across the world. The networks established by the Wardian case are still used today.

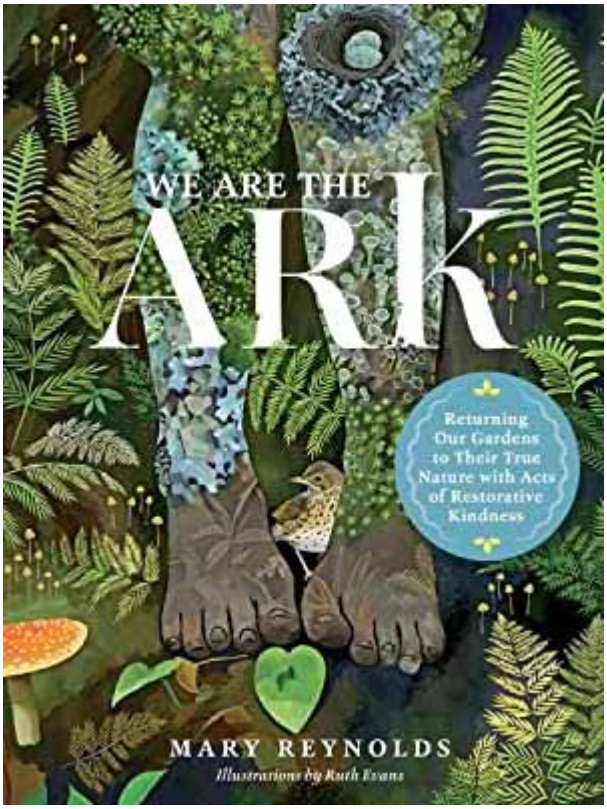
Want more information? Check out "The Wardian Case: How a Simple Box Moved a Plant Kingdom" by Luke Keogh in Arnoldia, Volume 74, Issue 4.

Jayne Collins, Loudoun County Extension Master Gardener

Photograph of Wardian case by Economic Botany Collection, Royal Botanic Gardens, Kew.
All other photos by Jayne Collins.

We Are the ARK: Returning Our Gardens to Their True Nature Through Acts of Restorative Kindness

by Mary Reynolds



Reading is a favorite way of mine to spend time, particularly when it involves learning something new about gardening. Having read several of Doug Tallamy's books, his review comment on *We Are the Ark*, "Mary has seen the future of conservation. You may be surprised to learn that it is you!" sealed my interest, although yet another book shaming me for loving all the non-native plants in my garden set me a bit at defense! Regardless, when my local library sent out a brief on this new offering, I reserved and checked it out. Its premise immediately captured me, as did the whimsical illustrations that accompanied the text.

Reynolds, a self-described "reformed landscape designer" argues for a radical shift in how and why we garden. However, she writes in a way that imagines how we might try to devote at least part of our outdoor space and return it back to nature. While acknowledging that gardening is a creative act, and that creativity is vital to most gardeners, she advocates that one can be creative without harming other creatures. Reynolds refers to such a space as "an ARK for the Earth," the genre of garden that is a kindness to the Earth, featuring native plants that provide for native animals, insects, and birds.

Not only are basics in ecology presented in an easily understandable way, but the practical "how" of making and sustaining an ARK provides steps for both small and drastic changes that undoubtedly will appeal to readers at varying points in their gardening journey. Reynolds includes plant choices, placement, and layering and offers suggestions for sharing what is learned with neighbors, other gardeners, and "influencers" who can expand this vision into the mainstream.

One of her introductory excerpts includes how her vision for the "ARK" came into being:
"It wasn't the startled fox that grabbed my attention from the drawing board where I was daydreaming out the window at home. It was the pair of hares that were chasing the fox across the garden. Soon, I spotted a hedgehog scurrying along the hares' path but well tucked under the protection of the thick hawthorn hedge that edged the lawn in front of me. They disappeared into the wildness that was one-half of the land I was minding, taking refuge in an acre of self-willed land—a mix of thorny shrubs, brambles, grasses, and rushes to the west of my garden. Seeing as it was early winter and a bright mid-morning, I figured something must be amiss for the normally hidden, feral creatures to cross my path in such a manner, so I got up from my work and went outside to investigate. I followed the direction they were coming from and wandered up the end of my lane onto the quiet country road where I live In Ireland. Not so quiet today, however. Today a big yellow monster of destruction had landed. My neighbors had finally gotten planning permission to build a house, so they did what everyone does: they sent in a digger to clear out "the mess"

and make a garden without any thought for the multiple families who already called it home. I stood in absolute horror, forgetting to breathe. I had done this myself many times in many places over twenty years as a garden designer, carrying out similar unconscious devastation everywhere I worked. It was suddenly blindingly obvious to me that these creatures we are supplied to share our Earth with have fewer and fewer safe places left to go. Their habitats and foraging places are being torn out at a rapid rate. There is no sanctuary for them in our gardens, which we fill with purchased, pretty, non-native garden plants. Gardens are controlled and poisoned to the point of being a still life with no room at the inn for anything other that our own visions of how we want things to be. I went back inside and started researching the collapse of the natural world, learning very quickly that the biodiversity crisis is even more insidious and dangerous than the looming threat of climate collapse because it is not understood nor given attention. The web of life is being pushed to the edge, and we are unquestionably and indivisibly tethered to that web. Multiple species are now falling prey to extinction every single day. They are never coming back. This is the great forgetting. Knowing I couldn't take on the whole world, I tried not to get overwhelmed and instead put the kettle on and sat down at my kitchen table to think about what one person could do that would really make a difference to our current trajectory."

Thus, the idea for a grassroots movement called "We Are the ARK" (for Acts of Restorative Kindness to the Earth) was born. Reynolds' writing style is readable, convincing, and challenging, all in a good way. The big question for us gardeners is: who will embrace it? The alternative appears bleak.

Pamela McGraw, Loudoun County Extension Master Gardener

2023 Symposium is Scheduled for the Fall

The Master Gardeners are planning an in-person Symposium to be held on Saturday, October 14. Our new, spacious venue is the Academies of Loudoun, 42075 Loudoun Academy Dr, Leesburg, VA 20175, just off Sycolin Road.

The Symposium Team is planning to host 4 great speakers. Please watch for the Summer Trumpet Vine and our website for complete information.