

Sempervirens

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Iceland: A “kudzu-like” problem & more

Article and images by Nancy Sorrells, *Sempervirens* Editor

Iceland and the American South have a similar invasive plant dilemma. Let me explain by starting here in the U.S. where between 1935 and the 1950s, the U.S. Soil Conservation Service and the Civilian Conservation Corps planted Kudzu (*Pueraria montana*) as a way to check the soil erosion that occurred during the dust bowl. During that time, more than 85 million Kudzu seedlings were distributed and planted across the American South.

We all know the results as those aggressive vines covered everything in their way and, without any natural predators, continue to swallow the landscape to this day.

At almost the same time on the edge of the Arctic Circle in Iceland, the people were struggling with severe soil erosion and devastating sandstorms caused by poor volcanic soils and deforestation. In 1945, government authorities decided that the versatile and hardy Alaskan Lupine (*Lupinus nootkatensis*) could help

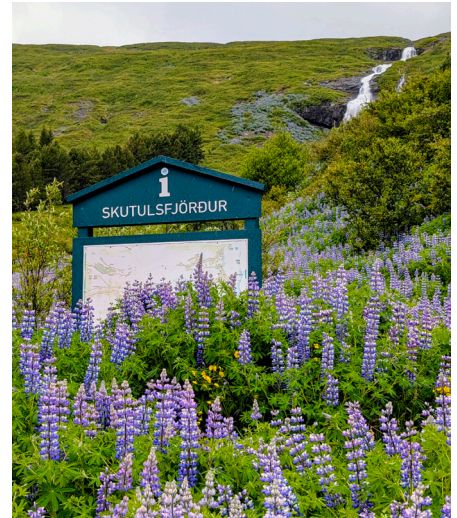
combat the problem.

Although much more visually appealing than Kudzu, the lupines are nearly as destructive. They spread rapidly, adapt to all environments, and aggressively push out native flora, particularly Iceland’s low growing mosses and berries. The Alaskan Lupine, like Kudzu, now dominates the landscape in many places.

Unlike Kudzu, which has very few supporters, Alaskan Lupines have some zealous fans who note that the tourists who flock to see the swaths of purple spikes across the countryside are providing an important economic punch to the local economies. The lupine has also been effective in erosion control and soil enrichment.

Like Kudzu, however, there is no putting these invasives back in the box. Even as we landed in Iceland and were taxiing toward the terminal on a recent visit in late June, I saw fields of these enticing purple spikes along the runway.

In the days to come I enjoyed the



In late June, enticingly beautiful and very invasive Alaskan Lupines dominate the Icelandic landscape.

opportunity to also meet some of the other floral players on the Icelandic landscape. Perhaps as ubiquitous as the lupines was a pretty yellow flower that we know as Dandelion, called túnfífil in Iceland (*Taraxacum* spp).

Today in Iceland the Dandelion is considered a native although the plant might have come with the first Viking settlement in the 9th century.

(See Iceland, page 11)

Explore southeastern Virginia at Annual Meeting, Oct. 2-4

Join us Oct. 2-4 for our annual meeting in southeastern Virginia at the Airfield 4-H Center in Wakefield where we will enjoy field trips to Longleaf Pine savannas and local natural area preserves. Field trip leaders include Flora of Virginia authors Chris Ludwig, John Townsend, and Gary Fleming. We also plan to arrange a botanical canoe or kayak trip around the 105-acre Airfield Lake.

We are pleased to have William “Bill” Cullina as the Friday night speaker. Bill is currently the executive director of the University of Pennsylvania’s Morris Arboretum. Previously he was president and CEO of Coastal Maine Botanical Gardens. Prior to that, he developed his credentials in native plant gardening when he was Director of Plant Research and Development for the

New England Wild Flower Society (now called the Native Plant Trust). In that position he established the largest native plant nursery in New England. He has written several books on native plant propagation. His lectures are science-based and include exquisite photos.

Watch your email box for more details and registration information as they become available.

My summer vacation: Visiting plants of the West



From the
President
Nancy Vehrs

As summer winds down and kids go back to school, we know that many of them will have to write an essay about “what I did on my summer vacation.” I will share mine here. Our Virginia summer started out very hot, and I was looking forward to finding cooler weather on a trip to Colorado in June with my dear friend Kim Largen. This was our third consecutive year of trips out West in early summer, and we try to fit in as many national parks and national monuments as possible.

We started our journey in Grand Junction in the western part of Colorado. I traded the hot, humid weather in Northern Virginia with high temperatures and dry air in the high desert. One of our first stops was a little community botanical garden in Grand Junction. Unfortunately, it was closed for a private wedding, and we had to content ourselves with a walk around part of its perimeter. We did discover a riverside park near the garden and took a stroll. Several people beat the heat by rafting down the river, but we bore the heat as we walked the unshaded trail. Next up was a scenic drive through the Colorado National Monument. Vegetation was scarce amongst the beautiful rock formations and canyons, and it was too hot and sunny for us to do much hiking there. We saw cacti, and a few were in bloom. We also were pleased to see a couple of bighorn sheep.



Lupines and Scarlet Gilia along a dusty trail in Crested Butte (left) and Northern Mule's Ears along the Snodgrass Trail. (All photos by Nancy Vehrs)

We headed to the quintessential western town of Ouray for the night. It is called “Little Switzerland” and is located in a big bowl surrounded by mountains. It also has a hot spring that feeds a large swimming pool. The town features a five-mile perimeter trail with two waterfalls found along it. We visited both. The first was a typical beautiful mountain waterfall, but the other was a spectacular forceful current of water coursing through a narrow box canyon. Ouray is also at the southern end of the Million Dollar Highway; a scenic mountain road created in the 1800s for a million dollars. It is narrow, winding, and lacks guard rails. Don't miss it if you're in that area.

And it was off to Gunnison and Crested Butte, the heart of Colorado wildflower country. The people in Ouray told us that we were too early for wildflowers, so my expectations were dampened. Gunnison is a lovely small town, but the town of Crested Butte was a lot smaller. A server at the restaurant where we



ate dinner assured me that there were plenty of wildflowers to see so we anticipated some spectacular botanical walks the next day. We were richly rewarded, and even saw Columbines, the state flower in bloom in the wild. We hiked the Snodgrass Trail where the hillside was awash in Scarlet Gilia (with visiting hummingbirds), Larkspur, Lupines, Iris, Paintbrush, and the large yellow Northern Mule's Ears. Corn Lily foliage was abundant, but its blooming season is in July. I was in heaven with the glorious view of distant mountains and nearby colorful hillsides of wildflowers. Crested Butte's annual Wildflower Festival is in July, but both June and August (my previous visit in the 1990s) are stunning as well.

We stayed a couple of nights in a private cabin on a dirt road in the mountains above the former mining town of Cripple Creek. I loved sitting on the deck and listening to birds in the morning. The town has retained many of its old buildings from its heyday more than 100



Although her summer vacation out in the western U.S. included plenty of plants, such as an opportunity to pose with Lupines (left), there were also other magnificent landscapes to enjoy such as Cascade Falls near Ouray.

years ago, but now they have been converted into casinos. At least they were preserved.

Since neither Kim nor I had ever been to Pike's Peak on previous visits to Colorado over the years, we decided it was time. The touristy town of Manitou Springs sports the cog railway that takes tourists to the 14,115-foot peak, and we decided that was the way we wanted to go. Lush vegetation and mountain creeks in the lower elevations changed to rocks and rubble as we approached the summit. Despite overcast skies, the views from the top were spectacular. And it was refreshingly cold! We even had some snow flurries. The visitor center at the top sold its famous donuts, and I bought a couple that we ate right away. We heard later that if visitors took them down the mountain to eat, they would flatten out because of the elevation change. Many people drove the 19-mile toll road to the top, but we didn't want to test our rental car that way.

Another floral highlight was a visit to the Denver Botanical Gardens in the heart of the city. One of my nieces lives nearby, and she joined us for our visit. Like botanical gardens everywhere, it

contains plants from all over the world. However, it does feature many plants native to Colorado along with the typical riot of colors from typical garden flowers. I highly recommend a visit to this 24-acre oasis if you are visiting the Denver area.

After Kim flew home, I visited with my college roommate Annie who lives in Wyoming. She came down to Colorado, and we visited the towns of Fort Collins and Boulder. Both have colorful potted plants decorating their respective cities. Annuals are the flowers of

choice for their continuous blooms, but I wish we would utilize some natives in potted plant displays.

Colorado is beautiful, but I prefer its cool mountains. This past winter had a dearth of snow, and the parched landscapes erupted in fires after we left. Ouray was threatened just a week after we left, but the fire took a turn away from the town. Water conservation measures were enacted in some of the towns, but many people still value their green lawns. Virginia's green trees and naturally lush vegetation make me feel at home.❖



Wyoming Paintbrush blooming along the Snodgrass Trail at Crested Butte (left) and Colorado Blue Columbine on the same trail blooming in partial shade near a group of Aspens.

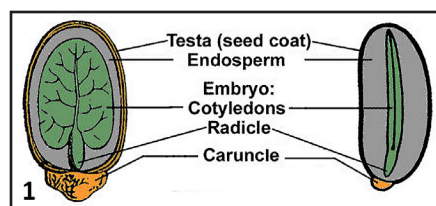
Dust Seeds of Ghost Pipes, *Monotropa uniflora*

Article and images by W. John Hayden, Botany Chair

Symbiotic interactions with fungi are at the core of Ghost Pipe biology. In previous *Sempervirens* articles about our current Wildflower of the year, nutritional dependence of mature Ghost Pipes was introduced. Nutritional dependence on fungi also characterizes seed germination and seedling establishment of these remarkable plants. This article describes the minute seeds of Ghost Pipes and outlines what little is known about their germination. Most of the information in this article is derived from publications by Olson (1980) and Baskin and Baskin (2020).

Seeds of flowering plants are truly marvelous structures. It is commonly known that seeds produce new plants. I am confident that many, perhaps most, readers of *Sempervirens* have had the experience of placing some seeds in moist soil and, like magic, within a few days, or longer, a new seedling plant emerges. In detail, however, seed structure and the process of seed germination is complicated. Seeds of flowering plants are mosaics of three genetically distinct tissues (Figure 1), each with a different function, and only one of these components becomes a new plant. Cells of the seed's surface layers provide physical protection; these multiple cell layers constitute the seed coat, a.k.a., testa, and these cells were made by the parent plant that formed the seed. Seed coat cells, therefore, are genetically identical to the parent plant that made the seed.

Many seeds also contain a food storage tissue, the endosperm, containing carbohydrates and/or proteins and/or oils to be used for growth and development of the new seedling. Endosperm cells are genetically complex, containing

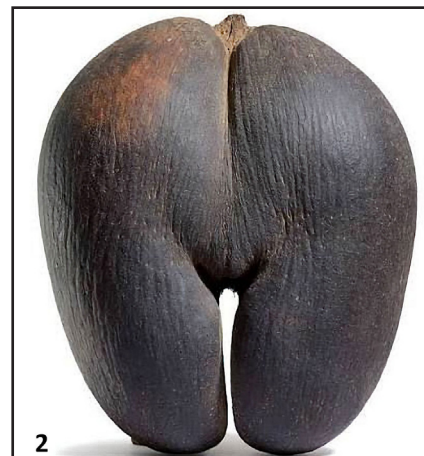


(Figure 1) Castor Bean (*Ricinus communis*), a typical example of a dicot flowering plant seed; original drawing from an 1887 textbook by Julius Sachs.

three (or more!) sets of chromosomes. Genetically, in the usual case, endosperm cells contain one set of chromosomes from the male parent and two sets of chromosomes from the female parent—but other proportions of chromosomes from the two parents can occur. Regardless of the details, endosperm cells provide nothing more than nutrients that are consumed during and shortly after germination.

Of course, the third component of a typical angiosperm seed is the embryo—this is the part of the seed that becomes a seedling and, eventually, a new plant. Typically, embryos in seeds develop from a zygote, the product of sexual fusion of sperm and egg, an event that took place shortly after pollination of the flower. Genetically, embryo cells contain one set of chromosomes from the ovule (“female”) parent, and another set of chromosomes from the pollen (“male”) parent. In some plants, of which legumes (e.g., beans and peanuts) are convenient examples, endosperm is present only as a fleeting developmental stage—mature legume seeds consist, essentially, of seed coat and embryo.

Seed size varies tremendously across the diversity of flowering plants. The largest seeds known to botanists are produced by *Lodoicea maldivica*, the Coco de Mer or Double Coconut, a rare palm tree known only from the Seychelle Islands in the Indi-



(Figure 2) Double Coconut (*Lodoicea maldivica*) seed, the largest and heaviest known flowering plant seed; image commonly reproduced on the internet.

an Ocean (Figure 2). Double Coconut seeds are huge, roughly a foot and a half in diameter, and they can weigh from 55 to 100 pounds. At the other extreme, there are numerous plants, like the Ghost Pipes, which produce “dust seeds,” fully mature seeds that are roughly one mm (ca four hundredths of an inch) in length and have a mature dry weight of almost nothing at all. To put this huge range of flowering plant seed sizes into perspective, consider that the width of a hardcopy of this issue of *Sempervirens*, when two pages are open, is 17 inches wide, close to the width of a Double Coconut seed, while the length of a typical dust seed would be equivalent to about half the length of the letter “i” without the dot, and much, much narrower!

Dust seeds are adapted for wind dispersal. Perhaps the most familiar plants with dust seeds are the orchids, but plants in at least 12 different flowering plant families also produce extremely small, dust-like, seeds. *Monotropa* is classified in the Heath Family (Ericaceae), and plants throughout this family have small seeds. First, let's consider the structure of ericaceous seeds that are small, but not small enough to qualify



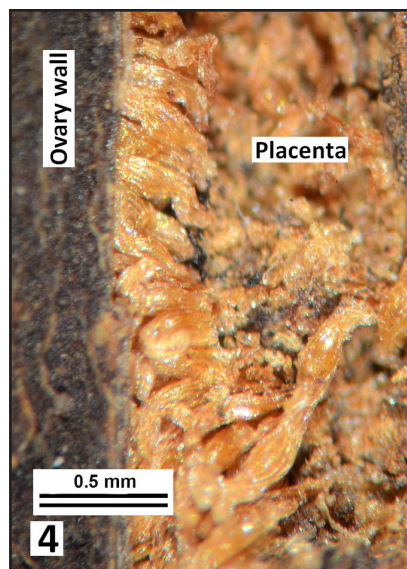
(Figure 3) Swamp Azalea (*Rhododendron viscosum*) seeds, a typical example of the small seeds found in the plant family Ericaceae; Hebb, Hebb, Hayden, & Crammond 77 (URV); photomicrograph by W. J. Hayden.

as dust seeds; Swamp Azalea, *Rhododendron viscosum* (Figure 3), provides a convenient example. Seeds, of course, are the products of ovules that have successfully completed the core steps of sexual reproduction. That fact that Swamp Azalea and most plants classified in Ericaceae have small seeds can be explained, in part, because ovules in this family contain only one layer of future seed coat cells instead of the more common two layers found in other flowering plants. Further, these future seed coat cells enclose very few cells that make up the body of the ovule—these ovules are stripped down to the bare essentials and as a result, mature seeds of Ericaceae are also small.

Nevertheless, apart from relatively small size, seeds of many Ericaceae are, otherwise, not particularly remarkable. There is a thin seed coat that is just a few cells thick, a population of food-storing endosperm cells, and a fairly typical embryo consisting of pre-formed root cells (radicle), seed leaves (cotyledons), and embryonic shoot system (epicotyl). Though small, embryos of ericaceous seeds are not particularly remarkable. Ghost Pipe seeds (Figures 4, 5) are smaller still; seeds illustrated here (Figure 4) are, approximately, just one half millimeter in length.

Ghost Pipes take the ericaceous theme of seed size reduction to an extreme by severely limiting the amount of growth that occurs as the fertilized ovule becomes a mature seed. A Ghost Pipe's seed coat thickness is limited to just two or three cells, the innermost of which becomes crushed

during seed development. Seed coat cell walls remain relatively thin, and the cells themselves are empty at maturity. Further, the thin roof-like outer cell walls of testa collapse inwards while the side wall cells remain, resulting in the presence of ridges on the seed surface. The food-storing endosperm of Ghost Pipe seeds is reduced to a mere 10 to 14 cells, just a small fraction of that present in seeds of typical Ericaceae. It should be noted that Figure 5 shows only seven endosperm cells because that image is based on a single thin slice through the seed—a few additional cells would be seen



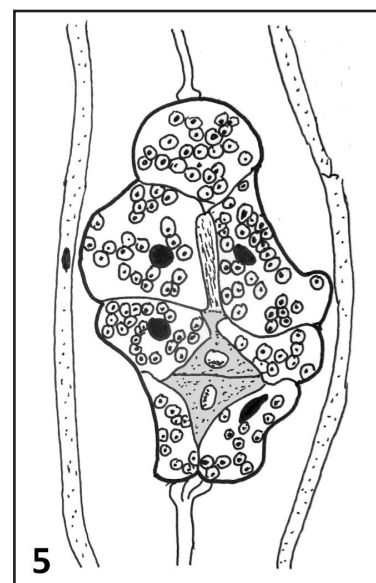
(Figure 4) Ghost Pipe, *Monotropa uniflora*, seed capsule from an herbarium specimen (Hayden 2118, URV); seeds are located between ovary wall and placenta; photomicrograph by W. J. Hayden.

in other planes of section. Finally, thanks to the study by Olson (1980) we know that Ghost Pipe embryos are downright minute; having studied serial sections of 100 Ghost Pipe seeds, Olson found embryos to consist of just two cells in 99 of the samples (Figure 5), the only exception being one seed with a three-celled embryo! At just two (or three) cells, Ghost Pipe embryos contain nothing identifiable as radicle (root), cotyledon (seed leaf) or embryonic shoot (epicotyl); lacking these features typical of most flowering plant seeds, embryos of Ghost Pipes can be described as rudimentary and undifferentiated.

Overall, *Monotropa uniflora* seeds are small because their ovules are small, like the ovules of typical Ericaceae, but the seeds are especially small because only limited amounts of cellular growth occur as the ovules become mature seeds.

So, how do the extremely small seeds of *Monotropa uniflora* serve to reproduce the plant? Obviously, small, light-weight seeds are well-adapted

(See Dust Seeds page 7)



(Figure 5) Ghost Pipe (*Monotropa uniflora*) seed diagram from a microscopic thin section; elongate cells on left and right margin are innermost cells of seed coat; cells with numerous inclusions are endosperm; two approximately triangular cells with gray shading are the embryo; redrawn from a photomicrograph by Olson (1980).

Summer: Restoring the land, one plant at a time

Sempervirens readers will enjoy the launching of this new seasonal series by Aaron Kershaw, VNPS Chair of the Belonging, Access and Opportunity Committee. The column follows Robert Boehringer, president of VNPS's New River Chapter, as he restores several acres of his property one invasive plant at a time. Over the coming year, we'll follow Robert through each season to explore how restoration changes with the landscape and we will learn what lessons fellow conservationists can apply in their own yards and communities.

Every landscape tells a story. Some tell stories of forests reclaiming old fields. Others tell stories of pollinators returning to native flowers after years of absence. And sometimes, a landscape tells the story of persistence—the quiet, steady work of removing invasive plants so nature has the opportunity to thrive again.

For Robert, stewardship has been shaped by a lifetime outdoors. Born in Casablanca, Morocco, in 1955, he moved with his family to California as a child, where he developed an appreciation for the natural world. After studying mathematics at the University of Vermont, he built a career writing software and now works for a company producing medical radioisotopes. Along the way, he spent years exploring some of America's wild places on extended outdoor trips that often lasted one to three years.

His journey into native plants began through an unexpected path: birding. Fellow bird club members introduced him to both the Virginia Native Plant Society and the Virginia Master Naturalists. As he learned more about the vital relationship

between native plants and healthy ecosystems, he began viewing his own property differently. Not simply as land to maintain, but as habitat to restore.

Robert never set out to become a chapter president for VNPS. After a period of transition within the New River Chapter, he stepped into the leadership role because the chapter needed someone willing to serve. Today, he hosts board meetings at his home, where members gather on his back deck during the warmer months. Looking out over the surrounding landscape inspired a personal challenge: if VNPS encourages Virginians to protect and restore native ecosystems, why not begin in his own backyard?

The answer has become a restoration project measured not in weekends, but in years.

"It's a multi-year investment," Robert explained. "You can't clean it out and then walk away."

That philosophy has become the foundation of his work.

Summer Means Action

Summer is Robert's busiest season for invasive plant management. His first priorities were Autumn Olive and Asiatic Bittersweet, two aggressive species that had established themselves throughout the property. Today, much of his attention is focused on Japanese Barberry, a thorn-covered shrub that forms dense thickets capable of crowding out native vegetation. He is also steadily removing Multiflora Rose and Chinese Privet. Once those larger woody invasives are under control, he plans to shift his focus to Japanese Stiltgrass and garlic mustard.

Summer offers one major advantage.

With plants fully leafed out, invasive species are easier to identify before they spread further. Seedlings become visible, root sprouts reveal underground networks, and problem areas can be addressed before another growing season allows them to expand.

Whenever possible, Robert relies on mechanical removal first, reserving carefully targeted herbicide applications only for situations where they are truly necessary. The process is physically demanding, particularly when tackling Japanese Barberry, whose sharp thorns make every hour of work a challenge.

But each shrub removed represents another step toward restoring the landscape.

Making Room for Nature

One of the most rewarding parts of Robert's project has been discovering what was waiting beneath years of invasive growth.

As dense patches of invasive shrubs disappear and sunlight once again reaches the forest floor, native plants are beginning to reemerge. He's uncovered native ferns, orchids, Jack-in-the-pulpit, and other woodland species that had quietly persisted beneath the invasive canopy, waiting for the opportunity to thrive again.

Wildlife has responded as well.

Deer now move more freely through areas that were once nearly impenetrable, while hummingbirds regularly visit the habitat surrounding his home, which is a reminder

(See Restoring page 7)

Dust Seeds

(Continued from page 5)

for wind dispersal. But what about germination and seedling establishment? The inescapable expectation is that germination and early seedling growth will be found to be another aspect of the fungus-dependent biology of this species. As a matter of fact, many of the other angiosperms with dust-like seeds also appear to rely to some extent on nutritional support from symbiotic fungi. Details of germination and early seedling growth for *Monotropa uniflora*, however, remain essentially unknown. The same is true for many other plants with dust-like seeds.

The one exception to this general state of ignorance about dust seed germination is the orchid family. Wind disperses orchid seeds widely across the environment, but only those that land in close proximity to a compatible fungus have a chance to germinate. If all goes well, the fungus and orchid embryo cells form a structure called a protocorm, a mixture of orchid cells and fungal hyphae. Protocorms grow

relatively slowly, but eventually, a first leaf and first root emerge and, given the additional boost from leaf-based photosynthesis, the orchid seedling begins to develop more quickly. A brief summary of orchid seed germination was published in an earlier issue of *Sempervirens* (Hayden 2016).

So, what happens when Ghost Pipe seeds germinate? What role does a fungus provide? Well, we just do not know; science has not yet progressed beyond a few rudimentary observations. Perhaps something comparable to the orchid protocorm forms—but this is mere speculation on my part. In contrast to orchid seeds, which have no endosperm, Ghost Pipe seeds do contain a small amount of stored food (Figure 5). But whether Ghost Pipe endosperm resources are allocated strictly to the embryo, or whether they may play a role in initiating symbiosis with a fungus is completely unknown. I find it interesting that Olson (1980) illustrated granules that resemble

starch grains in the endosperm cells of *Monotropa uniflora* (Figure 5), but his histochemical tests failed to demonstrate the presence of starch anywhere in the seeds. Olson did, however, find callose, a polysaccharide distinct from starch, in the seeds he studied. Perhaps the structures in Ghost Pipe endosperm cells that look like starch grains are composed of callose, and perhaps this odd bit of seed chemistry plays a role in its fungus-assisted germination process . . . but this, again, is speculation. Opportunities for clever investigators to make important contributions to the understanding of Ghost Pipe seed germination abound! ❖

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Restoring

(Continued from page 6)

that restoring native plants means restoring the relationships between plants, insects, birds, and other wildlife that depend on them.

Removing invasive plants isn't simply about taking something away. It's about making room for nature to return.

Progress, Not Perfection

For anyone looking across their own property and wondering where to begin, Robert offers simple advice: start.

He encourages homeowners not to be discouraged by the size of the task or afraid of making

mistakes. Restoration is a learning process. Occasionally removing the wrong vine or overlooking a seedling is inevitable.

The important thing is to stay committed. Every season builds on the last, and every invasive plant removed creates more opportunities for native species to flourish.

As Robert has learned, restoring a landscape isn't about achieving perfection overnight. It's about showing up again and again, year after year.

Looking Ahead

As summer gives way to fall, Robert's work will begin to shift.

With many native plants entering dormancy, invasive species often become easier to spot as surrounding vegetation dies back. Fall also brings new opportunities to evaluate this year's progress and prepare for the next stage of restoration.

In the next installment of *Pulling Invasives with Robert Boehringer*, we'll explore how the changing season influences invasive plant management and discover what homeowners can do in autumn to continue restoring native habitat.

Take it from Robert. Restoring Virginia's natural landscapes isn't measured in days or even seasons.

It's measured in years, one native plant at a time. ❖

Virginia's conservation agencies mark anniversaries

This year, 2026, marks the 100th anniversary of the Virginia Department of Conservation and Recreation, the 90th anniversary of DCR's Division of State Parks, and the 40th anniversary of DCR's Division of Natural Heritage. In this article, the first of two

From Your Natural Heritage Program

By Rob Evans
Natural Areas Land
Protection Manager



parts, some of the earliest land protection efforts by the Commonwealth of Virginia are summarized. Part two will highlight the accomplishments and milestones of the Natural Heritage Program over the past 40 years.

Our story begins in the roaring 20s, when eastern National Parks were a novel concept. However, Virginians wanted one and lobbied hard. Congress finally supported the idea, but ONLY if Virginia purchased and donated the land. Virginia Governor Harry F. Byrd saw the opportunity to build Virginia's prosperity and prestige. His call for a state commission to implement the park vision was formalized when the State Commission on Conservation and Development was established on March 17, 1926. The commission immediately began to secure private donations, advertise the potential tourism values, and eventually handle the onerous task of acquiring several thousand parcels needed for a park.

Commissioners also began to think more broadly. The State Forester suggested, "The State owes it to its people" to "have a larger park program" and proposed a careful study of the State's best recreational and scenic areas. The State Geologist suggested abandoned, federally owned "light-house reservations" for the inaugural

state park system. However, the National Park project left little room for such pursuits. It took a full decade to formally dedicate Shenandoah National Park, thereby clearing the deck for other work.

Fast forward several decades. Impending logging along the Maury River alarmed local citizens who pleaded with Virginians to "write, telephone, or telegraph legislators in Richmond to act immediately" to save "magnificent old growth trees" at Goshen Pass. The governor got the message and was quoted as saying, "Naturally, I am interested in its preservation." In January 1954, the Department (then known as the Department of Conservation and Development) went on record favoring protection of Goshen Pass and "agreed to cooperate with the local people and the General Assembly in every way possible toward that end." Locals paid the logger \$1,000 to buy time, and the Perry Foundation provided funds to purchase nearly 900 acres. Decades later Goshen Pass would come to be recognized as Virginia's oldest state-managed natural area.

In May 1960 the Department (renamed Department of Conservation and Economic Development) "gladly agreed" with a proposal from the Old Dominion Foundation (ODF) to purchase "wilderness properties" on the Eastern Shore and transfer them to the department. ODF involved several influential people, including Donald Stough and Fitzgerald Bemiss, who were both present at the founding of Virginia's Chapter of The Nature Conservancy (TNC) a few months later. In October, the board reported completion of "first land acquisition for the new natural areas program." By year's end they



had accepted properties at both Parkers Marsh and Bone Island intending to preserve them in their "wilderness state." The department, with the agreement of then Governor James Lindsay Almond, adopted a written statement documenting the premise, qualifications, and standards for maintenance of the "Natural Areas System of Virginia."

In 1961, the board transferred the Goshen Pass property into the Natural Areas system and a year later approved a land donation offer of a small tract along the Blackwater River that was later accepted into the National Natural Landmark Program of the National Park Service. While the department actively investigated other prospective sites throughout the state for addition to the "State System of Natural Areas," the groundbreaking report of the Virginia Outdoor Recreation Study Commission was published (1965). Under the leadership of the aforementioned Fitzgerald Bemiss, this document laid out an expanded vision for state parks and highlighted prospective natural areas, which it defined as "small museums for the protection of those few rare spots where the ecology is yet undisturbed by man and where there exists a natural condition of great distinction. . . ." The report is widely credited for ushering in Virginia's modern conservation era.

(See Natural Heritage, page 9)

Natural Heritage

(Continued from page 8)

In 1970, TNC hired an influential ecologist named Bob Jenkins. Among his many accomplishments was co-authoring a 1975 report that not only called for “The creation of a nationwide system of protected ecological reserves, consisting of natural areas of national, state or local significance. . . .”, but also for significantly improved methods upon which to base conservation action decisions. Jenkins believed unplanned conservation was as perilous as unplanned development. His remedy was to codify “Natural Heritage methodology” and establish heritage programs to create and maintain data to support systematic conservation planning. In 1979, TNC tried in vain to convince Virginia’s state government to “follow the lead of 27 other states which had inaugurated state Heritage Programs” and transferred substantial start-up funding to Maryland instead.

In 1980, TNC decided they “dared not wait any longer before starting an important inventory” so they established a “database and operations center” at Virginia Tech’s herbarium in Blacksburg. The Virginia Natural Diversity Information Program, led by Steve Croy, was tasked with developing a “Status of Natural Diversity Overview,” as well as recommendations for “Priority Potential Preserves” and “Preserve Design Packages” for use by the conservancy. This program operated until the state agreed it would house the program. That agreement came in 1986 when the General Assembly approved two years of funding to establish the Virginia Natural Heritage Program and a contract

was signed between the Commonwealth and TNC to produce “an inventory of the Commonwealth’s natural heritage, including significant sites, habitats; and animal, plant, insects, and other life forms element occurrences.”

During discussions about potentially placing the program in DCR, TNC offered Maryland’s Program as an example, which was ironic because it was created with funds originally intended for Virginia. One of Maryland’s reported successes was spending “\$1.2 million per year on acquisition of ecological priorities.” In hopes Virginia would follow that lead, TNC offered to donate \$500,000 to help Virginia acquire the “best natural areas as identified by the state’s own Natural Heritage Program.” In 1988, the General Assembly appropriated a \$1,500,000 match to TNC’s funds and the “Partners in Conservation Program” was born. The intention was to purchase and “dedicate” tracts as nature preserves *permanently* (previous state natural areas were administrative designations only). This new dedication mechanism, recorded on land deeds, was authorized by the Virginia Natural Area Preserves Act, passed in 1989. The act also formally established the Virginia Natural Area Preserves System and directed DCR to main-

tain a Natural Heritage Program with a duty to select and nominate natural areas suitable for dedication as natural area preserves.

TNC purchased and transferred approximately 10 tracts to Virginia under the Partners Program. The first of these established The North Landing River Natural Area Preserve in 1990. By the end of 1991, Bethel Beach, Poor Mountain, Johnsons Creek, and Big Spring Bog Natural Area Preserves were also established and dedicated. Over the following decades Virginia has remained committed to the preserve system, having dedicated over 225 more individual tracts, using an expanded set of funding sources and partners.

A century ago, our predecessors, no matter how prescient, had little inkling of their work’s long-term impact. They certainly couldn’t imagine the lengthy processes, detailed negotiations, formal agreements, bureaucratic approvals, deed transfers, funding mechanisms, and stewardship challenges that would ultimately be necessary to protect our “common wealth.” Along the way, there have been so many stories. Some of these must be told and new ones crafted as DCR evolves into the next era of conservation for the Commonwealth. ❖



Sempervirens (ISSN 1085-9632) is the quarterly newsletter of the Virginia Native Plant Society, Blandy Experimental Farm, 400 Blandy Farm Lane, Unit 2, Boyce, Va. 22620, 540-837-1600, info@vnps.org. Nancy Vehrs, President;

Nancy Sorrells, Editor; Karen York, Office Manager. Original material in *Sempervirens* may be reprinted if credit is given to the Virginia Native Plant Society, to *Sempervirens*, and to the author of the material, if named. Readers are invited to send letters, news items, and queries for consideration. E-mail items to Nancy Sorrells at lotswife1959@gmail.com.

Next submission deadline:

Oct. 15, 2026

Explore the botany bookshelf in new book review column

Botany Books Lately

by Kevin Howe
1st Vice President & Grants Manager

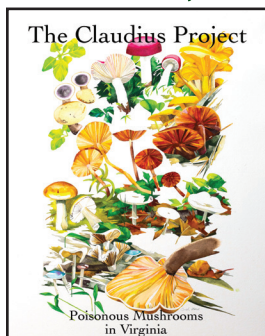


(I love books and thought a book review column would be a good addition to Sempervirens.--Kevin Howe)

The Claudius Project: Poisonous Mushrooms in Virginia. 2025. By a Team of Authors, UVA PRINT

When I was an undergrad, mycology (mushrooms) were considered members of the plant kingdom. While they are no longer in the plant kingdom, they are native and grow from the earth. So, they are rather relevant to plant people. And some can make you very sick or even kill you. A few years ago, a team of Virginia Master Naturalists and University of Virginia (UVA) Health Doctors teamed up to write a book on the poisonous mushrooms of Virginia. UVA Health had seen a rise in mushroom poisoning and believed a publication would be very useful for physicians, veterinarians, school nurses, and the public. In December of 2025, the team effort was completed, and a 127-page guide was published filled with information, descriptions and color photographs of the most significant poisonous mushrooms found in Virginia. It's named after the Roman Emperor Claudius, who was poisoned by mushrooms in 54 CE. This publication is now available online and may be downloaded at no cost from <https://med.virginia.edu/brpc/the-learning-center/the-claudius-project/> or by searching "Claudius Project Virginia Master Naturalists."

The Claudius project team authors are scattered throughout the state and are happy to offer an in-person or Zoom program about poisonous mushrooms to your VNPS



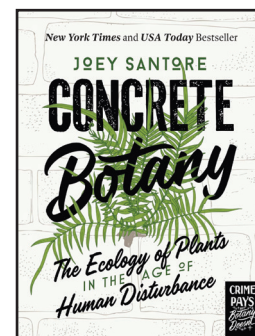
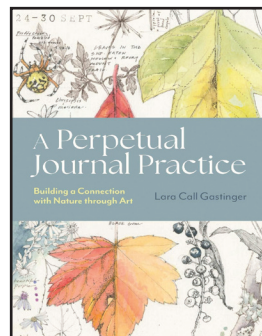
Chapter. If interested, please contact Kevin Howe at kevinmhowe@gmail.com to arrange for a program by Zoom or in-person.

A Perpetual Journal Practice: Building a Connection with Nature through Art. By Lara Call Gastinger. Published 2026 by Timber Press

Many of you may know Lara either through VNPS, Virginia Master Naturalists or her botanical artwork. She was the chief illustrator for the Flora of Virginia Project as well as a lecturer at UVA's Landscape Architectural Program. Or perhaps you know her beautiful artwork or her advocacy about Perpetual Journaling.

About 25 years ago, Lara developed her own journaling technique, which she calls a Perpetual Journal. Nature journaling goes back to such notables as Henry David Thoreau, who kept a detailed nature journal about Walden Pond, and Joseph Grinnell, a biology professor at the University of California, Berkeley, in the early 1900s who developed the "Grinnell" Method for field biologists/naturalists commonly used even today.

Lara, however, has taken journaling to another more personal level, and her book describes how she did it and how you too can do it. She begins telling us what it is—a living, active document that is continuous through time and can be reread as you proceed along journaling. Her journaling pace is slow, an entry or so a week, but it is continuous throughout each year. Following the "What" of



the perpetual journal is the "Why" of the journal. We learn this will cultivate mindfulness, foster curiosity and wonder; and provide personal satisfaction while demanding little from us and improving our knowledge and drawing skills. And there is much more as we learn about the organisms we write about and draw.

In the next section, Lara shares pages from her 2016-2023 Perpetual Journal. She is a phenomenal artist, and each page of that journal springs forth with information and color. Following that section is one on Tips and Techniques with all you need to know to start your own Perpetual Journal. From pens to watercolors to brushes to the journal itself, she leads the reader through the requirements. Following the materials section, she tells us how and what to focus upon. Then Lara addresses "Drawing" itself with tips on page composition, sketching, water coloring, text, and other approaches.

One of the book's best sections contains her thoughts on Common Concerns readers might have such as "I cannot draw," "I have not enough time," "I made a mistake and cannot erase with a pen," and others, all of which are questions most of us would have. Good stuff!

In closing, there is a section on Beyond Your Perpetual Journal and a Conclusion with motivating words as to why we all need to keep a Perpetual Journal. It is an inspiring read.

(See Botany Books, page 12)

Iceland

(Continued from page 1)

Since then, it has been fully incorporated into the landscape and the culture where Icelanders celebrate the bright yellow blooms as a sign of the arrival of summer and the midnight sun. And, quite frankly, I have a new appreciation for the bright yellow flower that seems to grow to prodigious sizes, especially in the north where nearly 24 hour sunlight in the summer seems to spur them on.

Most of the other flowers that I saw in Iceland on my visit were much subtler and lower growing than either the Alaskan Lupines or the Dandelions, a consequence of the harsh climate and volcanic landscape. Nonetheless, the mounds of mosses and berries and the low-growing heathers were delightful surprises like hidden jewels scattered on the landscape.

One of the more ubiquitous of those gems is the national flower, Mountain Avens (*Dryas octopetala*), a small white flower with eight petals. The leaves are an important source of food for a native ptarmigan, and are also used to make a cold-remedy broth for humans.

For many of the plants growing in



Dandelions, which might be native or might have come with the Vikings more than 1,100 years ago, brighten up the summer landscape in Iceland.

this harsh landscape, such as Sea Thrift, Moss Campion, and Sea Mayweed, it is hard to tell whether they are native or arrived on purpose or accidentally with the early Norse settlement centuries ago. Most of these plants are now not only an essential part of the Icelandic ecosystem but are also part of the folklore and herbal medicine traditions of the people of Iceland.

Needless to say, if I saw an interesting plant in Iceland, I stooped low and snapped a picture. One particularly beguiling flower, Hrafnaklukka, is a type of toothwort or cuckoo flower; but better botanist minds than I have not been able to parse out the exact species. I particularly liked the photo that I took of this flower because front and center on one of the flowers is a midge, a small but irritating gnat-like insect that appears in swarms during certain seasons in Iceland. Appropriately when I snapped the photo we were visiting Lake Mývatn, which literally means "Midge Lake."

You will notice that I keep referring to "stooping" as I photographed the flora of Iceland. That's because most of it is low growing, up against rocks, and in crevices for protection. Centuries of Viking settlement reduced the Icelandic forests by an estimated 40%; however, even those forests contained no towering giants such as those found in the North American landscape. The only native tree species are Downy Birch, Rowan, Tea-leaved Willow, European Aspen, and Common Juniper, none of which grow to stupendous heights.

Of those, the Downy Birch (*Betula pubescens*) is the only one that grows in groups large enough to form forests. Knowing that it is easy to understand the common Icelandic joke:



(Top) The eight-petaled white flowers of Mountain Avens (the national flower) are seen here among a huge variety of low growing mosses and berries, a common sight in the nearly treeless landscape. At center, a toothwort plays host to several insects including a midge on the middle flower. (Bottom) A mound of sea thrift or sea pink ekes out an existence in the sterile landscape of a thermal spring.

Question: "What do you do if you get lost in an Icelandic forest?" Answer: "Stand up!"

Although I did not get lost in any forests, I did find myself getting left behind on walks because I stopped to photograph the interesting flora of the Icelandic landscape. I hope that one day you, too, can visit this fascinating island in the far north and explore its natural wonder. ❖

Botany Books

(Continued from page 10)

Concrete Botany: The Ecology of Plants in the Age of Human Disturbance. By Joey Santore. Published 2026 by Cool Springs Press

I find that the life stories of authors are sometimes nearly as interesting as the books they write. The life story of this author sure fits that statement. Joey Santore grew up in Chicago spending much of his childhood at the Field Museum interested in science but was kicked out of school as a teen. After spending three years traveling the U.S., he took a few college classes (too boring) followed by spending 15 years working on the railroad while “studying” native plants and their ecology. Botany became his life, his destiny. Eventually he ended up in Texas and started a YouTube show called “Crime Pays But Botany Doesn’t.” He describes the show as a “low-brow, crass approach to plant ecology and evolution as muttered by a misanthropic Chicago Italian.” I do not disagree and have watched his two episodes that focus on Virginia.

Check them out. He also has a podcast of the same name.

Concrete Botany is his first book, and it is interesting, educational, and sometimes crass. His goals in writing this book can be summed up in his words—“The choices of modern civilization have led to a f***ed-up planet, scraped bare and covered in concrete and invasive species. We’ve wiped out entire ecosystems, moved invasive plants to new continents where they don’t belong, and, in a few hundred years, we’ve managed to muck up the intricate balance of a planet that has been evolving for eons. The consequences of our actions are now at our doorstep, ready to strike a match.” He sets the stage for action by first discussing the Age of Human Disturbance (Anthropocene) and how messed up ecosystems have become. He follows with discussions of ecology, ecosystems, native plants and what we need to do about those topics. I especially liked his various discussions of those awful lawn habitats especially how to “Kill Your Lawn.” He is a good writer.

The book is certainly a call to look around at our backyards, neighborhood parks, and even sidewalks because urban ecology is right in front of us and we can and should do something about it. He describes how he learned botany and plant identification—keeping a detailed journal and making notes on plants and their habitats. The book is partly an introduction to botany, covering topics like allelopathy and polyploidy as well as emphasizing that an understanding of ecology is vital to all who have an interest in plants. And it is a conservation call to do your part for native plants such as getting rid of that lawn and how to do it. He writes mostly in the first person, but it is urgently relevant with a push to educate and correct our “horticultural atrocities planted in most landscaping around human developments.” Given that he is self-taught and has limited formal schooling, his book is impressive and I believe anyone will get a great deal out of reading this book. My only complaint is that while he does mention Doug Tallamy in one paragraph, he does not reference any of his books. But it is still worth reading. ❖

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