

American Horticulturist

April 1995

A Publication of the American Horticultural Society

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JUNE 15-24, 1995 GARDENS OF THE ST. LAWRENCE

An exploration voyage on board the MV *Nantucket Clipper*, along the St. Lawrence from Quebec, Canada, to Rochester, New York, this program features an exceptional collection of private gardens. AHS member Mrs. Richard L. Turner has invited us to tour her garden, which was created by Fletcher Steele, one of America's greatest landscape architects. Ports of call along the St. Lawrence include Quebec, Montreal, Prescott, and Kingston. Visits to unique private gardens will be highlighted by special invitations ashore, including a luncheon reception at Le Domaine Cataraqui in Quebec and at Evergreen Gardens in Kemptville, home of Anstace and Larry Esmonde-White, better known to Canadian PBS viewers as the "TV Gardeners." Leading this program will be former AHS Board member Flavia Redelmeier of Richmond Hill, Ontario, and her husband, Ernest. Invited as guest lecturer for the voyage will be Dr. Peter Jacobs, professor of landscape architecture at the University of Montreal.

JULY 10-20, 1995 GARDENS OF THE SOUTHWEST, COLORADO ROCKIES AND CANYONLANDS

This unique program begins in Aspen, Colorado, and concludes in Santa Fe, New Mexico. From the alpine meadows of the Colorado Rockies to the desert plains of the Southwest, each day brings different gardens and experiences. Enjoy the beauty of Arches National Park, the Goose-necks of the San Juan, Canyon de Chelly National Monument, and, of course, the Grand Canyon. Our destinations include the Arboretum at Flagstaff, founded by AHS member Frances McAllister, and La Querencia, home and garden of AHS member Elsebeth Bobbs, where we have been invited for lunch. A visit has been arranged to Sol y Sombra, the last home of artist Georgia O'Keeffe, whose garden was created with extensive use of permaculture. Leading this program will be AHS Board member Nancy Thomas of Houston, Texas. Nancy is a past president of the Garden Club of America and will be joined by her husband, Sellers.

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Participants in our June trip will sail the St. Lawrence Seaway to visit breathtaking private gardens.

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American Horticulturist

Volume 74, Number 4

April 1995

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APRIL'S COVER

Photographed by Dorothy Long:
Photo/Nats

Native to Europe and Asia, *Solanum dulcamara* is widely naturalized in the United States, where it is found in semi-shady locations at the edges of woods and in vacant lots. Its flowers are a regal combination of deep violet petals and clustered golden stamens, while its green berry fruits ripen to a bright red. The taste of its fruit earned it the name bittersweet—the translation of *dulcamara*—among early European herbalists, but in America it is more commonly known as woody nightshade. Its historic reputation for various medicinal qualities has been replaced by due respect for its toxicity.

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The American Horticultural Society seeks to promote and recognize excellence in horticulture across America.

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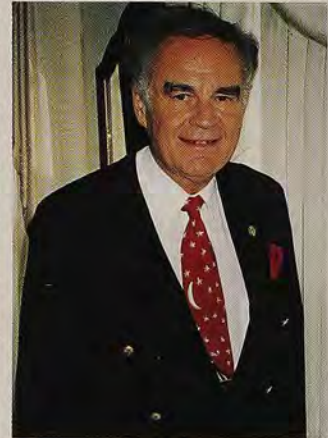
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COMMENTARY

The second-floor offices of George Washington's River Farm are reverberating with the sounds of work-boots and the voices of roofers. Outside, broken slate is raining down on the lawn as a band of agile workers replaces it with new tiles. New copper flashing reflects the sun, and the air is pungent with hot sealant tars. These sounds, sights, and smells are immensely rewarding. After occupying this historic property since 1973, the American Horticultural Society is putting a new roof on the aging main structure—the first step in a long-overdue restoration being undertaken as a result of our very successful fund-raising gala here last October.



Such outward signs of improvement are symbols of the progress we are making in many directions—not only to restore our headquarters, but also to help AHS focus its activities to serve our members and nation better. All of our programs are now operating on the black side of the ledger, each one dedicated both to service and financial responsibility. There is nothing like operating in the Washington, D.C., area to ingrain in anyone what can happen when you don't live within a balanced budget.

Our progress over the last three months in fund-raising and refocusing our priorities has brought a new level of enthusiasm for developing the programs that will make ours a nation of gardeners. Watch "Commentary" in upcoming months as more achievements unfold.

This issue of *American Horticulturist* reflects the scope of issues, ideas, and geographic regions that AHS must consider. "The Urban Gardener" department takes us to a shady city lot in Boston. Terry Schwartz, who works at Bailey Nurseries in Minnesota, tells us about spireas beyond the old-fashioned bridal-wreath—selections that bloom well into summer and survive the winters of the upper Midwest. Jack Henning writes about the neglected *Solanum* genus—shrubs and vines hardy only in our subtropics.

We also go to Denver, where author Rob Proctor has designed a new home garden that Panayoti Kelaidis of the Denver Botanic Garden calls "the Sissinghurst of the Rockies." It is not a shrine to native alpine plants, Proctor explains, because Denver is neither in the mountains nor an undisturbed ecosystem. If you love natives, turn to Shelly Stiles' article on native grasses, where you'll find a staggering selection for accents or ground covers, in beds and meadows, or for erosion-control situations.

It's extremely rare for us to reprint an article that has appeared in another magazine, but we thought it would be hard to improve on William H. Allen's *Bioscience* article on endangered plant reintroduction. Developers can build in areas where endangered plants are growing if they pay to establish them elsewhere, but biologists say they know little about how to do that successfully without creating other environmental problems.

Whether you're in boots or well-worn sneakers, we hope exciting things are beginning to happen in your home garden and that AHS is a part of that excitement. Join with us in sharing it with gardeners throughout the nation.

H. Marc Cathey, AHS President



MEMBERS' FORUM

Off With His Coconut!

In my Hoya article ("Proven Performers," February) I made a serious error when referring to the death of plant explorer C. B. Robinson. Although I had read several accounts of his attempt to re-collect Rumphius's plants, the only reference I saw regarding how he died referred to "an attack." That this meant a heart attack or stroke seemed to have been borne out when I consulted a person I thought to know a lot on the subject, but either she misunderstood my question or I misunderstood her answer.

Through two other sources I learned that Robinson's death apparently resulted from a lack of communication skills. He thought he was asking his helpers in their native tongue for "coconuts" (*kelapa*), but what he demanded of them instead was *kepala* ("heads"). As Dr. J. F. Veldkamp described it in his account: "The shocked natives thought this bearded, wild-haired, bespectacled apparition from the jungle was the devil incarnate coming for their souls!" As a result, they "done him in."

*Christine M. Burton
Porterdale, Georgia*

We'd say Robinson's error was a lot more serious than yours. We're extremely grateful that our readers don't react that strongly to our mistakes.

Know Thy Bees

Although I enjoyed the December article on honeybees, the fact that it was illustrated with a picture of a bumblebee is most curious . . . as handsome as that picture might be. Honeybees, in my view, are highly over-publicized, and perhaps eventually you will give equal time to bumblebees, carpenter bees, and the myriads of lesser-known but numerically superior solitary bees. I wonder sometimes if the ever-present honeybee doesn't receive credit that should rightly be given to its easily overlooked cousins?

*Eric Grissell
Silver Spring, Maryland*



We can't dispute that we seem to have grabbed a Bombus instead of an Apis. It's also true that researchers say our native bumblebee is sometimes the more efficient pollinator. The article was about beekeeping and gardening as companion hobbies, but knowing the native pollinators can also be rewarding. We'll try harder.

Know Thy Abies

Was someone asleep at the keyboard when you gave that fantasy scientific name for Douglas fir, instead of *Pseudotsuga menziesii* ("Natural Connections—Fragrance of Fir," December)? Every year my family scouts the small number of Christmas tree lots in Denver that sell our Colorado native white fir, *Abies concolor*, to buy our tree. Most lots will tell you, "Sure, we have firs—Douglas fir! Right over here." Then smiling sweetly and risking pedantry, I have to preach my little conifer lesson. "True firs have those lovely upcurving needles that grow skyward from the branch, as do the cones, and which give the tree that authentic European Christmas tree appearance."

Now I am nervous. Next December will my Christmas tree vendors be waiting, smugly waving your article? *Diane Ipsen
Denver, Colorado*

More Fragrant Firs

There are other fir species, in my opinion, that far outrank balsam in their fragrance. Grand fir (*Abies grandis*), a northwestern native, is perhaps the leader, with its tangerinelike scent and long, flat, dark green needles. Concolor or white fir (*Abies concolor*) is a close second with its long, blue, curving needles and citrusy fragrance. Both are now being grown by select Christmas tree farms.

*A.P. Fowler
Victor, New York*

Mr. Fowler also corrected our botanical nomenclature, for which we have no sane explanation. We must have been having a bad fir day.

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2300 South Ninth Street, Suite 501

Arlington, VA 22204-2320

(703) 892-0733

Color Separations

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Printer

William Byrd Press, Inc.

Back issues of AMERICAN HORTICULTURIST are available at a cost of \$5 per copy. The opinions expressed in the articles that appear in AMERICAN HORTICULTURIST are those of the authors and are not necessarily those of the Society. Botanical nomenclature in AMERICAN HORTICULTURIST is based on HORTUS THIRD. Manuscripts, artwork, and photographs sent for possible publication will be returned if they are accompanied by a self-addressed, stamped envelope. We cannot guarantee the safe return of unsolicited material.

AMERICAN HORTICULTURIST, ISSN 0096-4417, is the official publication of the American Horticultural Society, 7931 East Boulevard Drive, Alexandria, VA 22308-1300, (703) 768-5700, and is issued 12 times a year. The American Horticultural Society is a nonprofit organization dedicated to excellence in horticulture. Membership in the Society includes a subscription to AMERICAN HORTICULTURIST. National membership dues are \$45; two years are \$80. Foreign dues are \$60. Copyright © 1995 by the American Horticultural Society. Second-class postage paid at Alexandria, Virginia, and at additional mailing offices. Postmaster: Please send Form 3579 to AMERICAN HORTICULTURIST, 7931 East Boulevard Drive, Alexandria, VA 22308-1300.

Produced in U.S.A.

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OFFSHOOTS



BILL FIRESTONE

Monster

by Robert Klara

Last summer I was taking a familiar short cut through the New York Botanical Garden near my apartment in the Bronx. Ducking behind a rampart of thick hedge and brambles, I passed the Propagation Range, a fenced-in colony of low greenhouses set purposefully away from the walkways where all variety of horticultural feats are attempted and, when successful, sent to the conservatory to astound the public.

The Prop Range (as the garden people call it) is conspicuously absent from visitor maps, though what it may lack in public recognition it makes up for in its place in employee folklore. I know this because I used to work part-time in the garden's gift shop some years ago when I was a sophomore at Fordham University, just across Southern Boulevard. Through the tales of the ungreenthumbed (of whom I, as an English major, was perhaps the most ungreen), the Prop Range

was introduced to me as the garden's haunted attic, a place watched from a safe distance for signs of monstrous green tentacles encircling the ankles of unwary botanists. In the midst of my collegiate smugness, I never gave the mystique much thought. Then one afternoon when I was transporting a droopy collection of *Spathiphyllum*, Orin, a lanky staffer ever clad in bib overalls, pointed to the Prop Range and told me, "They're growing the largest flower in the world in there."

Orin had always had a better grasp of his trowel than of horticultural terms, so he never revealed the flower's name. He did, however, know two important things about it: It was as wide as you can spread your arms, and "it stinks."

In a debate over where to award the title of world's largest flower, a moldy botany text I checked was hung up on two tropical oddities found only in regions of Malaysia and Indonesia. Apparently *Amorphophallus titanum* and *Rafflesia arnoldii* competed for the honor. *Amorphophallus'* flower spike, or spadix, has been known to reach a



height of over eight feet and would seem the sure winner. But more scrupulous botanists point out that nestled deep in its spathe are thousands of tiny stamens and pistils that make *Amorphophallus*, to be technical, an inflorescence, and, therefore, more than one flower.

This is apparently why the Guinness people give the honor to *Rafflesia*, elsewhere called the Monster Flower, whose blooms can reach a diameter of three feet, though the unofficial record is 42 inches. The arms of most people can spread farther than that, but Orin's second observation is indisputable. *Rafflesia arnoldii*, a red parasitic blossom resembling a flattened mushroom with yellow spots the size of silver dollars, does indeed stink. Its funk has been compared to the smells of both rotting buffalo meat and rotting human flesh, though which one it resembles more has not been the subject of much argument.

When I phoned the plant information exchange at the garden, I was told by a botanist there that, disappointingly, the Prop Range had never attempted to grow *R. arnoldii*. With that I tossed away all hope of seeing one, and my esteem for the hitherto dauntless Prop Range staff was knocked down a notch. Then someone in my office told me she had seen a flower fitting my description growing at the Bronx Zoo, another place just across Southern Boulevard.

There, in an indoor exhibit known as Jungle World, just beyond the black panther and Malayan tapir, I spotted *R. arnoldii* in full bloom under a canopy of palm trees and strangler figs. Its propeller-like petals sprouted majestically in the mud from a gaping nectarium large enough to swallow an arm. I wondered how the zoo, saddled with so many animal worries, managed to beat the garden out of such a botanical boast. Later, when I called the zoo's exhibits division, I learned two more things about their *Rafflesia*: It is one of two they know of in the United States (the other reposes in a California museum), and both of them are made of latex. *Rafflesia* buds can take more than a year to mature before blooming, during which time nearly three-quarters of them die. Fabrication for exhibits, therefore, is necessary, and not only for the zoo. At the Tambunan *Rafflesia* Reserve in Sabah, Malaysia, the museum keeps two rubber *Rafflesia* specimens on permanent display (made by a firm in Japan for \$2,000 apiece) to delight the unknowing public.

Still curious about the flower Orin claimed was growing at the Prop Range, I decided to look into *Amorphophallus*.

In an inch-thick vertical file on *Amorphophallus* at the New York Botanical Garden library was a clipping from the *New York Herald Tribune* of May 31, 1937. "Largest Flower in the World Blooms Here Next Week," ran the headline above a photograph of *Amorphophallus titanum* bursting from a crate of soil under the iron and glass of the garden's conservatory. The rest of Orin's tale unraveled itself in a smaller headline: "Smells Bad, Botanical Officials Say." In fact, it was worse than that. Another line read: "Members of the staff were warned that if they wished to enter the greenhouse to witness the spectacle of the blossoming they should not eat dinner."

The garden had received the plant's five-year-old 60-pound corm from Sumatra in 1932 and gave it a home in the conservatory's Banana House. Over the next five years, the three gigantic leaves that had successively sprouted from the tub had died, and skeptical head-shaking was commonplace in the greenhouse. But in April of 1937, a bud appeared. A ruffled spathe grew visible as the bud scales drew apart. Now in the Tropical Aquatic House, staffers toiled with measuring sticks and clipboards in temperatures approaching 100 degrees. On May 31, the plant measured five feet, seven inches; by June 5, it was approaching eight feet. Fifteen gallons of water per day had yielded what looked like a corn husk on steroids. A towering yellow spadix encircled by a spotted green and deep maroon spathe split and peeled away, opening *A. titanum* to its greatest height (eight and a half feet) and greatest stink (like "a ripe dead rat," said one staffer) at 7:40 p.m. on June 8, 1937. Four hundred onlookers, including camera crews from six motion picture companies, witnessed the event. Though the garden's specimen lived only four days after opening, it didn't go without a proper memorial. On July 6, 1939, while the remains of the withered plant sat pickled and sliced for microscope slides, Borough President James J. Lyons designated *Amorphophallus* as the official floral symbol of the Bronx. "Anything can live in the Bronx," he said.

Amorphophallus titanum has, of course, yielded *Rafflesia arnoldii* its world record title by virtue of a frustrating, though significant, technicality. The garden's *Amorphophallus* has been dead for 57 years, and it never saw the floor of the Prop Range. I hope Orin doesn't read this.

Robert Klara is a free-lance writer still living in the Bronx.

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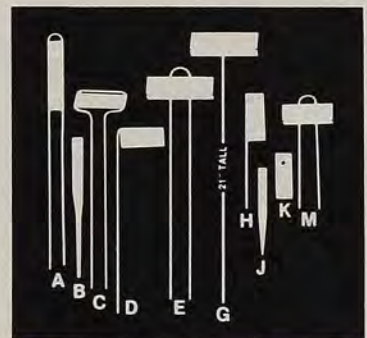
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GARDENERS' INFORMATION SERVICE

Q: *Help! My neighbors just put up a fence around their property—one of those charming chain-link types. I need to plant a fast-growing screen of trees in front of the side that faces my yard. What do you suggest? The fence is about eight feet tall, and the area receives full sun.*

—L.C., Wilmington, North Carolina

A: Some fences make better neighbors than other fences! You will probably want to plant an evergreen screen that will continue to give you foliage cover throughout the winter.

Widely considered the fastest growing evergreen is the Leyland cypress, *Cupressocyparis leylandii*, which averages three feet a year when young. It can grow to 100 feet in about 60 years, although the average height is 50 to 60 feet with a spread of 20 to 30 feet. If you don't want it that tall, or you want to shape it for a formal look, you can give it a hard pruning in late summer with no damage to the tree.

You can create a more interesting hedge by mixing your planting with some other conifers, or you can choose some Leyland cypress cultivars. 'Castlewellan' has yellow-golden foliage, 'Haggerston Grey' has green foliage with a hint of gray, and 'Silver Dust' has a bluish tint and is wide-spreading.

Buy container-grown Leyland cypresses, which transplant more easily than those that have been field grown. As long as your soil is well aerated, this tree grows in either acid or alkaline soils. It is hardy to USDA Zone 6 and is borderline hardy in Zone 5.

Q: *Seed packets and planting guides say to plant when danger of frost has passed. How do I know when that is?*

—S.P., South Bend, Indiana

A: In your area, April 30 is the projected date for the last killing frost, according to a map published in U.S. Department of Agriculture "Home and Garden Bulletin

202." This date could differ as much as one to two weeks within 10 miles of your home. It is best to check with your county Extension agent or local weather bureau.

Here is a way to determine a rough date for the last killing frost of spring for any area: If your home is north of Chicago or Boston, add a week to May 15 for each 100 miles of distance. If your home is south of those two cities, subtract a week for each 100 miles. Since altitude can affect this, add one day for every 1,000-foot increase in elevation from sea level.

Keep in mind that this is the average date for the last frost that will kill established perennials to ground level. When installing tender plants or sowing seeds, wait a few weeks so the soil can warm to a safe temperature.

Q: *Last fall I noticed squirrels digging in my garden and now none of my spring bulbs are blooming. Did those fluffy-tailed rats eat my bulbs? If so, how can I keep them from doing the same thing this fall?*

—D.R., Petersburg, Virginia

A: Squirrels like to eat and gather seeds, roots, berries, buds, and bulbs, so it's quite likely that your bulbs were stolen by your fluffy-tailed friends. There are several ways to deter squirrels from digging in your garden. One method is to sprinkle hot pepper in the hole when planting bulbs or mix a little with seeds before sowing. Screen can be inserted in the ground



around the bulbs. Mothballs in mesh bags scattered throughout the garden may help keep away squirrels as well as deer and skunks. Some people use deer repellent to rid the garden of these rodents.

Here at River Farm we have found that the dried blood usually used as fertilizer works temporarily when scattered on top of the soil. One staff member lays trimmings from rose bushes on top of containers and new plantings.

If all other methods fail, before deciding to use live traps check with your local animal control department. Many jurisdictions prohibit the release of animals into unfamiliar habitats. Use peanut butter, corn, oats, or nuts as bait. Do not use poison because it could be dangerous to other animals and pets who feed on dead rodents. Avoid handling squirrels because they carry parasites that can affect humans.

Q: *My water garden has been taken over by algae. Is it true that water hyacinth will kill it?* —F.S., Parrisburg, Ohio

A: *Eichhornia crassipes* can slow the growth of algae by feeding on excess water nutrients. Research has also shown that water hyacinths can clear polluted water by filtering out potentially hazardous chemicals.

It is illegal to transport water hyacinth across state lines, however, because it is a prolific grower that has clogged waterways in the South. Although this should not be a problem in the North, since the plant is killed by temperatures under 35 degrees, you may find it ultimately more rewarding to use what water garden expert Charles Thomas calls “nature’s way of dealing with excess nutrients in water”—a combination of attractive submerged plants and scavengers. Or consider buying more benign plants, such as water lilies or floating hearts (*Nymphoides* spp.), to cover about 60 percent of your pond’s surface.

Q: *Can a yucca be transplanted to Zone 5 in Michigan, and if so, how and when?* —J.C., Bradenton, Florida

A: There are many species of yucca and many are extremely cold hardy as long as they are protected from wind and given sandy or gravelly soil that will keep them from getting wet feet in winter. Also be sure to give yucca plants full sun.

However, there are risks involved in transplanting any plant from where you are in Florida to a new site so many zones farther north. You may want to consider finding a yucca from a source closer to Michigan because it will be better acclimated to the cold winters.

Yuccas with a fibrous root system can be easily transplanted in early spring while they are still dormant. If the roots are deep, you may want to detach rooted offshoots or suckers in early spring instead of uprooting the entire plant. Another alternative is to divide the plant immediately after it flowers.

—Kim Strader
AHS Intern

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NATIVES AT RISK



VIRGINIA MORAN AND BRIAN ANDERSON

Aleutian Shield Fern

by Mary Beth Wiesner

The Aleutian shield fern (*Polystichum aleuticum*) was discovered in 1932 on Atka Island in the Aleutians by W. J. Eyerdam, a botanist, and Eric Hulten, leader of a Swedish expedition to Alaska. Carl Christensen described and named the plant in 1938. While searching for mosses in 1975, David K. Smith, a bryologist from the University of Tennessee, accidentally found a second population of 15 plants on Mt. Reed, Adak Island, about 100 miles west of Atka. Subsequent surveys by Smith and other botanists have brought the total number of plants to 130.

Scientists speculate that the shield fern, which is one of the rarest plants in North America, is a relic of an earlier floristic period, isolated by glaciers. It is possible that grazing caribou or reindeer contributed to the rarity of the Alaskan native. Reindeer were introduced to Atka Island in 1914; caribou were introduced to Adak Island in 1958. Although private and commercial plant collectors don't seem to pose a threat to the shield fern, collecting for scientific and educational purposes has taken its toll. Visitation has also accelerated erosion of the shield fern's habitat.


Polystichum aleuticum is a tufted fern about six inches tall. Its fronds are leathery and somewhat brittle, with spiny-toothed segments that have distinctive straw-colored scales along the chestnut brown stems, or stipes. The fern rises from a stout dark brown rhizome with brown scales. *P. aleuticum* doesn't resemble any of the North American species of *Polystichum*; Christensen determined that it was closely related to *P. lachenense*, a species from western China.

The Aleutian shield fern is the only Alaskan native on the federal list of endangered plants. In part this is because the state hasn't been developed to the extent of Hawaii, California, and Florida—states with the highest numbers of threatened or endangered species—and very little of the state has been botanized. "It's very exciting to be a botanist in Alaska," says Virginia Moran, endangered species specialist and botanist with the U.S. Fish and Wildlife Service in Anchorage. "Every year botanists discover a new species."

Of course the Aleutian shield fern isn't available from commercial nurseries, but several other *Polystichum* species are available for home gardeners. The Christmas fern (*P. acrostichoides*), also called dagger fern and canker brake, is probably the most readily available from commercial sources. This eastern North American native has sword-shaped, evergreen leaves up to two feet long. The Christmas fern is found on rocky hillsides and ravine slopes and adapts well to a variety of soil conditions. Anderson's holly fern (*P. andersonii*), native from Alaska to Washington and Montana, has three-foot-long leaves. The giant holly fern (*P. munitum*) has leathery evergreen plumes from three to four feet tall. Also known as the western sword fern, *P. munitum* is native from Alaska south to Montana and California. The giant holly fern is especially attractive in woodland gardens.




Mary Beth Wiesner is a free-lance writer living in Woodbridge, Virginia.


A scenic photograph of a garden with a pond, trees, and a bench. The pond is in the foreground, reflecting the surrounding greenery. In the middle ground, there is a wooden bench on a grassy area. The background is filled with lush trees and foliage. The sky is blue with some light clouds.


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AHS's 50th Annual Meeting in June will feature a tour of the naturalistic gardens of the Mount Cuba Center for the Study of Piedmont Flora.

PHOTO BY CHRISTOPHER STARR

ANNUAL MEETING

NATURAL CONNECTIONS

Radical Associations

The debate regarding old growth forests in the Pacific Northwest too often is characterized as the polarized interests of spotted owl lovers and the timber industry. This oversimplification sometimes obscures the message forest researchers are trying desperately to pass along—that the spotted owl is just the tip of the ecological iceberg in the complex web of life forms that call old growth forests their home.

Among the least publicized and least studied of these organisms are members of the fungal community. Fungi have long been divided into three simplified groupings: saprobic fungi that aid in decomposition of dead plant tissue; parasitic or pathogenic fungi that feed on living tissue and may damage the host organism; and symbiotic fungi that interact with host species in a mutually beneficial or benign manner. Among the most common plant-fungus relationships are those between soil fungi and plant roots, called mycorrhizal (literally “fungus-root”) associations. These species form a sheath or mantle of fungal tissue around the host plant’s feeder roots, extending the plant’s access to nutrients and water and even protecting the delicate feeder roots from certain pathogens.

The fungi also serve as a long-term repository for nutrients. “It’s important to remember that at any one time much of the nutrients in any ecosystem reside in the fungal mass, either in living fungi or in dying tissue that will be consumed by other fungi,” says Randy Molina, a research botanist with the U.S. Forest Service’s Pacific Northwest Research Station.

A 1993 report, *Forest Ecosystem Management: An Ecological, Economic, and Social Assessment*, lists 527 fungi closely associated with old growth forests, 109 of which are believed to be endemic to the Pacific Northwest and at risk of extinction due to habitat loss. Among the trees that host mycorrhizal fungi in the Pacific Northwest

are firs, pines, spruces, alders, birches, oaks, and willows. Host trees often form associations with many different fungi. Douglas fir (*Pseudotsuga menziesii*), for instance, is known to associate with almost 2,000 species. Although some fungi associate with a variety of tree species, some are genus- or even species-specific. The Oregon white truffle (*Tuber gibbosum*) associates only with Douglas fir.

The Forest Service, along with university researchers and state forest agencies, is trying to make up lost ground in the study of fungal species. The urgency stems in part from the awareness that, much like the situation in tropical rain forests, species with unmeasured pharmaceutical and ecological value are being lost forever as forests are leveled by clear-cutting or development. The task is daunting, because for every microorganism that has been isolated and studied there are hundreds of others that have yet to be identified. “There are far fewer specialists capable of identifying these organisms and understanding their ecology compared to other fields,” says Molina. “There’s also a much poorer understanding of how to measure fungi because they’re often invisible. Their reproductive structures often fruit only once a year, or not at all.”

The research is yielding practical applications to forestry and even horticulture. Foresters are testing tree-planting sites for the presence of known beneficial fungi. Where they are lacking, new plantings can be inoculated with spores derived from wild species. Inoculations have proven

most effective at ecologically devastated sites where strip mining or hazardous waste cleanups have removed existing topsoil and the indigenous fungi.

The importance of mycorrhizal associations is not confined to tree species. Bert Wilson, owner of Las Pilitas Nursery in Santa Margarita, California, which specializes in restorations of native plants, believes the most important element in successful restorations is the soil-plant-fungal relationship. He

studies the fungi associated with different native plants and adds appropriate combinations of the organisms to the soil during restorations. “We basically bet the entire nursery on mycorrhizae about four years ago. When you get the combination right, it’s incredible—you lose almost no plants at the site,” he says.

Edith Allen, an Extension specialist at the University of California at Riverside, is investigating how mycorrhizal fungi could be used to improve the performance of native plants competing against invasive species. Allen believes mycorrhizal associations have the potential to benefit both agriculture and horticulture. “Some cause increases in plant growth, and some can cause reduced growth. Whether the species you choose will give the desired effect is kind of trial-and-error at the moment.”

Wilson and Allen are pioneers in this area—there are few nurserymen or horticulturists with the training or experience to factor mycorrhizal associations into the ecological equation—but the potential applications for both silviculture and horticulture are mind-boggling to scientists, not to mention the average gardener.

Among the eventual beneficiaries of this research are those unlikely bedfellows, the spotted owl and the timber industry. As Molina points out, the fate of the organisms in the old growth forests are bound up in the intricate cycles that constitute all ecosystems. “When we begin to look at the other parts of the ecosystem that connect to the owl, we see much more than trees,” he says.

Among the owl’s favored prey is the northern flying squirrel. A principal component of the squirrel’s diet is truffle fungi, dug from the ground beneath trees. The owl consumes the squirrel, and the spores of the fungi pass through the owl and are spread throughout the forest. The spores germinate to form associations beneficial to other trees, which in turn provide shelter for spotted owls. “All the parts are of equal importance in a healthy ecosystem,” says Molina.

—David J. Ellis
Assistant Editor



BOOK REVIEWS

The American Gardener's World of Bulbs

Judy Glattstein. Little, Brown and Company, New York, 1994. 176 pages. 9 1/4" x 9 1/4". Color photographs. Publisher's price: hardcover, \$24.95. AHS member price: \$22.45.

Best Bulbs for Temperate Climates

Jack Hobbs and Terry Hatch. Timber Press, Inc., Oregon, 1994. 196 pages. 7 3/4" x 10 1/2". Color photographs. Publisher's price: hardcover, \$32.95. AHS member price: \$29.50.

Cape Bulbs

Richard L. Doult. Timber Press, Inc., Oregon, 1994. 290 pages. 6 1/2" x 9 1/4". Color photographs. Publisher's price: hardcover, \$34.95. AHS member price: \$31.45.

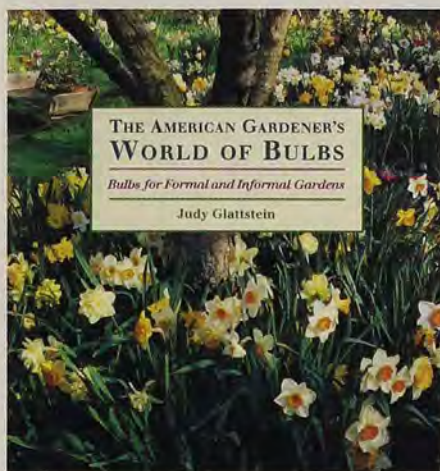
John E. Bryan on Bulbs

John E. Bryan. Macmillan, Inc., New York, 1994. 260 pages. Color photographs. 8 1/2" x 10 3/4". Publisher's price: hardcover, \$20. AHS member price: \$18.

Reviewing these books on flower bulbs (geophytes) is a real privilege. In the last five years, there has been a significant increase not only in books on flower bulbs but also in their garden use. Each of these books has a slightly different focus, reflecting not only the authors' personal interests or specialties, but also the general diversity of flower bulbs. All contain information that will be useful for growers of the various flower bulbs.

In *The American Gardener's World of Bulbs*, Judy Glattstein provides a fresh approach to flower bulbs that is a delight to follow. She is one of the first garden writers to adopt the term "geophyte" for all flower bulbs, which, I feel, is a real step forward.

In contrast to most other bulb books, hers covers the geophytes that are adapted to each season, starting with spring. She first discusses the very early flowering



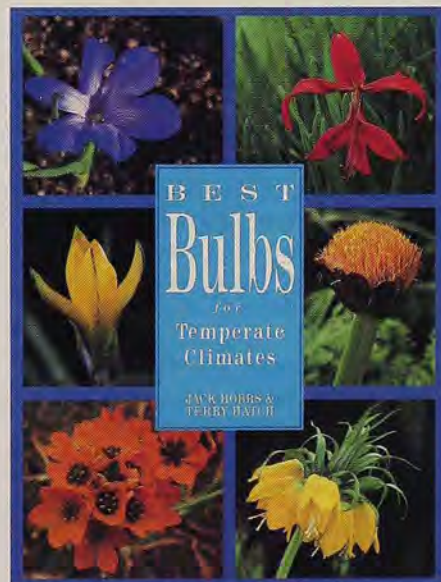
bulbs, *Chionodoxa*, *Crocus*, *Cyclamen*, *Galanthus*, and *Scilla siberica*, which are followed by a second wave of slightly later bloomers, *Camassia*, *Muscari*, and *Ornithogalum umbellatum*, to name but a few. The "big three" of daffodils (*Narcissus*), hyacinths, and tulips are covered, followed by offbeat bulbs, which she terms "neglected natives." Among these are bulbs like *Polygonatum* and *Trillium*. She divides summer bulbs into three parts: hardy species such as *Allium* and *Lilium*; tender species such as *Canna*, *Dahlia*, and *Zantedeschia*; and lesser-known tender bulbs. The latter include genera such as *Clivia*, *Crinum*, *Eucomis*, and *Watsonia*. Autumn bulbs are also divided into hardy and tender species.

Each of these groupings has one or more excellent diagrams providing annual growth and developmental cycles for some of the geophytes. This is an excellent resource, because most North American gardeners are interested in the perennialization of flower bulbs. In addition, many of these bulbs are superbly illustrated with color photos.

Glattstein ends her book with appendices on planting, cultivation, and propagation techniques, and sources for flowering bulbs. The latter are very important because of the breadth of geophytes discussed in this excellent book.

Clearly, a book's title should provide the reader with its basic content. In the case of *Best Bulbs for Temperate Climates*, the word "temperate" in the title is somewhat misleading. Most gardeners associate temperate with crops that either require, or survive in, climates that routinely receive freezing temperatures. This normally includes hardy trees and shrubs as well as geophytes. The flower bulbs covered in this book, however, are primarily mild-winter types that perform best in the warm microclimates of the North Island of New Zealand. For this area, as well as for regions with similar climates—California, for instance—this will be an excellent reference. The photos that illustrate the genera are, in most cases, superior to any I have observed in other books.

The book has two basic parts—six general sections and 142 pages devoted to specific genera. The latter provides a good description of the species, but lacks precise cultural requirements. More information in this area would have greatly improved the book. On the other hand, two other excellent features of the book are a section on the use of bulbs with ferns and in containers, and a list of specialty bulb suppliers.



Unquestionably, *Cape Bulbs* will be valuable not only for bulb specialists but also for California gardeners. It is a pleasant diversion from the Dutch-grown bulb selections that are dominated by spring-flowering bulbs like tulips and daffodils.

Doutt says there are 1,336 species of geophytes in the Cape region of South Africa, the largest center for them in the world. Unfortunately, many of them are threatened, and conservation is critical. Doutt says that one of the best methods for multiplying the species is by seed, which is especially true when they are sent to the Northern Hemisphere for growing, since bulbs and rhizomes do not acclimatize to different hemispheres easily.

The Cape region is characterized by cold, moist winters and warm, dry summers. Most of the geophytes discussed are, therefore, suitable for outdoor growing only in the Mediterranean climate found in parts of California, but are well suited for indoor growing elsewhere, requiring only good drainage and a rest period in summer.

In addition to the vast amount of cultural information, color photographs, and drawings of 74 genera that the book contains, it also has an extensive reference list. This unique book will become an invaluable resource for those interested in growing or learning about Cape bulbs.

John E. Bryan on Bulbs, in contrast to his two-volume treatise succinctly titled *Bulbs*, covers his personal views on how to grow bulbs in the garden. This addition to the Burpee Expert Gardener Series is written in a conversational manner starting with the botany, definition, and origin of flower bulbs. As you might expect, based on his expertise, these are well written. This is followed by three chapters that discuss planning a garden with bulbs, cultural procedures, and pests and diseases. Subsequent chapters chronicle some of his personal "Lessons Learned" and "Experience Gained." All of us who garden can appreciate these personal touches based on putting into practice what we think we know and learning to work within the framework of our personal microclimates.

The bulk of the book is devoted to a coverage of 82 genera, many of them illustrated with color photos. The clear and concise cultural information provided will make this a very useful reference for the average gardener. —August A. De Hertogh

A professor of horticulture at North Carolina State University, August A. De Hertogh is an expert on geophytes.

The Power of Trees: The Reforesting of the Soul

Michael Perlman. Spring Publications, Inc., Dallas, 1994. 264 pages. 6" x 9". Publisher's price: softcover, \$17. AHS member price: \$15.25.

The title of Michael Perlman's book might lead a reader to anticipate a book of New Age enthusiasms. The cover's evocative painting of a stand of conifers and leafless hardwoods against a conflagration of *aurora borealis* and stars would tend to confirm this expectation. If one notes, however, that the back cover identifies the author as a Jungian psychologist, then the text will come as no surprise. Perlman writes with psychoanalytic circumspection rather than New Age optimism, exploring the hard knots and gnarls, as well as the sunlit leaves, of people's relationship with trees. For me, also a psychologist, the result is more satisfying.

Parallels can be drawn between the book's structure, the process of psychoanalysis, and the metaphor of an old growth forest. Perlman moves freely among myth, poetry, literature, and interviews with a variety of people: residents of the most devastated areas of South Carolina and Florida in the wake of hurricanes Hugo and Andrew; urban dwellers in New York and Boston; and participants in a study of the American self. Like a good analyst, he introduces passages and interview excerpts, to later re-explore them in detail, unfolding their tensions and promises. Like the litter and snags of old growth, the result is a complex repetitive structure, and also a fertile one.

The archetype that Perlman elaborates as a leavening metaphor for people's contemporary connection to trees and nature is "Aphrodite's woods." These are sacred remnants of once vast primary forests, untouched by the ax because they have been dedicated to the goddess of "animal humanity." Here the souls of nymphs and trees coexist, not immortal but long lasting, and seedlings and saplings thrive on the rich decay of leaves and branches that once flourished. These sacred groves speak strongly to us, Perlman proposes, because all of the world's forests are now threatened remnants, and we cannot preserve them, to be animated by their physical presence and their spirit, unless we make our peace with the complex mixture of love, fear, death, and rebirth that trees embody.

A few of the people and trees in this book are exotic. Most, however, are your ordinary—may we say, garden—variety, in

city, suburb, and logged forest. Perlman determinedly digs and finds the extraordinary in the commonplace. For readers who are willing to have their own relationship with trees challenged—either because they have taken them for granted or regarded them with New Age enthusiasms—this book is a provocative guide. —Louise Chawla

Louise Chawla, who delivered a keynote address at the American Horticultural Society's children's gardening symposium in 1994, is a developmental and environmental psychologist at Kentucky State University, Frankfurt, and author of In the First Country of Places: Nature, Poetry, and Childhood Memory.

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PLANTING THE FUTURE

Cultivating Ideals

When Rudolf Steiner, an early 20th century philosopher and scientist, founded the first Waldorf School in 1919 in Stuttgart, Germany, he espoused the importance of educating the whole person in mind, body, and spirit. An originator of biodynamic farming, an organic system that is totally self-sufficient, Steiner saw that children growing up in the city had lost touch with agrarian lifestyles and the lessons learned from growing and nurturing plants. Therefore, he established a standard gardening curriculum adopted by all the schools in the Waldorf School movement—100 in the United States and 500 worldwide. One such school is the Princeton Waldorf School in Princeton, New Jersey, a kindergarten through eighth-grade school established in 1983 with approximately 180 students.

Located for the past five years on 20 acres of an old dairy farm, the school strongly emphasizes gardening and community service as part of the children's education. Two acres are set aside as pasture for farm animals, and two more acres are used for a large organic garden and orchard. Here the students spend from two to four hours a week throughout the school year learning about seeds, composting, insects, growing methods, and, of course, plants. In addition to providing the students with a stimulating learning atmosphere, the garden also produces herbs and vegetables that the school donates to local food banks—an early lesson in the value of community service.

From the children's first day of school, the garden serves to illustrate lessons learned in the classroom, but the school's formal gardening curriculum begins in the third grade when students follow the cycle of a field crop, such as wheat, from seeding through harvesting. The students even grind the wheat and bake bread in brick ovens. In the fourth grade, children learn to build a compost pile, to seed and



COURTESY OF ESPOMA COMPANY

John Ryan, left, and students at the Princeton Waldorf School improved the worn-out clay soil in their garden by adding organic matter.

maintain the pastures, and to care for the school's livestock.

In the fifth grade, the children focus on botany as they learn about soil preparation and cultivation and the care of plants. The sixth graders concentrate on crop rotation, composting, cover crops, raised-bed gardening, and soil amendments.

In the seventh and eighth grades, the students' gardening abilities are translated into community service as they take charge of the vegetable garden, donating the crops to local food kitchens. In addition to vegetables, the students also maintain a cutting-flower bed and an herb bed.

The school's administrators and teachers hope that the children are gaining more than practical gardening experience.

"We're not trying to make great backyard gardeners out of the children," says Patti Cuyler, Waldorf School administra-

tor. "Most people come to that point on their own. We're using the garden to teach the most important lesson of science—the ability to observe. It's so much easier to instill this fundamental part of science into the children using the garden than through a dull classroom lecture. It's fun and gets them to think for themselves."

The garden also offers the children lessons often overlooked in school—how to grow and nourish something living, and an appreciation for agrarian cultures and the benefits of hard work.

According to John Ryan, the school's first gardening instructor, the land used for the garden had been farmed with chemicals for years and was hard to convert to organic methods. Its heavy, clay soil had to be drastically improved through the addition of organic matter. Several local organizations came to the school's aid: Espoma Company, a Millville, New Jersey, organic plant food manufacturer, donated a variety of organic amendments; a nearby New Jersey Department of Corrections farm donated cow manure; and the M. H. Martin Company donated mushroom compost.

Establishing a new school garden requires key ingredients such as land, tools, and gardening supplies, and, if the garden is to survive from spring through fall, summer maintenance help. But Ryan advises first considering the reason for starting a garden. A pretty garden, he says, is not enough to merit such work without an ideal, such as Princeton's community service program, to support it.

"Kids at that age need to know that they're working for a better purpose," Ryan says. "They can do so much for communities if given the opportunity."

Ryan adds that a common cause helps overcome other obstacles such as finding help to maintain the garden in summer and getting parent support. And there's no denying that everyone's the winner when the children, the school, and the community all work together.

—Nikole Williamson
Editorial Assistant



THE URBAN GARDENER



PHOTOGRAPHS BY MARTY CARLOCK



Undaunted by a lack of space and sun, China Altman has designed a lilliputian garden at her Boston brownstone that features white double begonias and browallia, left, as well as catmint (Nepeta mussinii) for Misty Blue, far left.

A Back Bay Front Yard

by Marty Carlock

Designed to resemble a grand French boulevard, Commonwealth Avenue in Boston is a European-looking street in what is sometimes called America's most European city. Rows of townhouses, four and five stories high and clad in brick, brownstone, and granite, stand in proper, regimented rows. Down the center of the avenue is a leafy mall punctuated with statuary.

Each house, alongside its stone staircase, has a plot of ground measuring possibly 10 by 14 feet, fenced in wrought iron. Most of these once-patrician houses are divided into apartments whose occupants don't have much time to garden, so they fill their mini-yards with pachysandra and think they've done well. But China Altman was determined to have something more interesting.

Commonwealth Avenue is famous for the saucer magnolias (*Magnolia x soulangiana*) that overpower the streetscape with creamy, raspberry-stained flowers each May. One of them shades Altman's entire plot, eliminating all options except a shade garden. She's a novice gardener, but as a writer she knows how to do research, so she went to the

Boston Public Library and hit the books.

Still, she says, "A lot of what I've done has been pure dumb luck. People have come by and said, 'You can't grow Corsican mint there.' I'd say, 'Well, I've already put it there, so let's just see what it does.'"

Cultivating alongside a busy downtown sidewalk, Altman finds herself easy game for passing "experts." Her first gardening venture, four seasons ago, was to plunk down a row of bicolor marigolds, 'Bonanza Spry', along the sidewalk edge just inside the iron fence. People paused and said, "You can't grow marigolds there. It's too shady." The marigolds have flourished, self-seeding every year.

"That was my first indication that things would happen, sometimes, outside the rules," she muses.

In this intensely cultivated space, Altman has crammed hundreds of plants representing 70 varieties. Many of them are tiny, but she also finds room for single specimens of lofty goatsbeard and lobelia.

Thinking lilliputian, Altman designed her plot like a full-sized garden and executed it in miniature. Its two paths set the scale: They are eight inches wide, the length of a common brick. They wind sinuously through the little plot, one brick wide and 93 bricks long. Though small, the walkways enable Altman to work

without fear of stepping on something important—a misstep could be a disaster. Some "beds" are no bigger than a footprint. The largest are perhaps one foot by two.

The writer has given whimsical names to more than a dozen small areas. "It helps me think about them, about where things are," Altman explains. "Vita Sackville-West," named for the English poet, novelist and gardener, is a major showplace. "Herb-land" and "Fernland" are self-explanatory.

The oxbow bends of the paths help to separate distinct microclimates. "Leo," named for the midsummer sign of the zodiac, gets the most sun. "Treefeet," up against the magnolia's trunk, is a hard-knocks locale where plants compete with tree roots. The Corsican mint is planted there.

"There's more scope for happy accidents if you don't know too much about what you're doing" is Altman's motto. Take *Brunnera macrophylla*, for instance. "I bought it bare-root, and it was so strange-looking, I planted it upside down," Altman confesses. After the better part of a year, a gardening friend looked at it, identified the problem, and said, "There's a lot of life left in this plant. Just replant it rightside up." Its big, heart-shaped leaves and forget-me-not flowers are now a special source of satisfaction.

Her artemisia, which should grow large, has remained a small, in-scale mound. "If I had known it gets big, I wouldn't have



planted it. But I think the conditions here made it 'bonsai' itself."

Altman's goals have been twofold: to have a specimen shade garden, discovering what works and what doesn't in a Back Bay front yard, and to have constant flower color from frost to frost. In the city, some 10 to 15 degrees milder than the suburbs, the killing freeze can be late. Last December the garden still displayed flowers of plumbago and cranesbill geranium, as well as the tiny lilac blossoms of catmint (*Nepeta mussinii*).

Scattered throughout the garden are anemones, alliums, and astilbes, with emphasis on the earliest and latest blooming varieties. Small, white *Allium neapolitanum* (syn. *A. cowanii*) flowers before its peers, while an unidentified pink anemone struts its stuff in autumn. *Astilbe chinensis* offers a late pink plume in fall. The shadiest spots are given over to Irish moss, white creeping phlox, vinca, *Hosta* 'Krossa Regal', and a specimen of Japanese painted fern (*Athyrium nipponicum* var. *pictum*).

The dappled-shade "Meadow" hosts sweet woodruff, blue-purple browallia, and white double begonias. Scattered throughout the garden are the little faces of torenia, a bicolored annual with blossoms that include blue and white, peach and

white, and magenta and white.

In midsummer "Highlands," where the plants, not the topography, are higher, flaunts digitalis, a blue *Phlox paniculata* 'Franz Schubert', and the spectacular white panicles of goatsbeard (*Aruncus dioicus* 'Kneiffii')—at 40 inches Altman's tallest plant. Altman has sited gold marsh marigold (*Caltha palustris*) and *C. biflora*, a white variety, there; these fall under her see-what-works philosophy, as the spot is not wet.

Viola 'White Czar' and ajugas—including 'Royalty' and 'Silver Beauty'—"are good for weaving in," Altman says. In the "Near Reaches" are Jacob's ladder and primroses, along with *Aquilegia* 'McKana Hybrids' in yellow, cream, pale purple, and mahogany. "Herbland" is largely occupied by a healthy stand of catmint, planted for the pleasure of Misty Blue, Altman's gray cat. There's also aromatic black peppermint, pennyroyal, and *Lamium maculatum* 'Pink Pewter'.

Weeds aren't much of a problem because the plot is so densely planted. At first Altman had a lot of trouble with chives—she thinks a previous tenant must have grown them. Besides the magnolia, the only other plants she inherited were azaleas "with this strange orange color." To bloom simulta-

neously with them, Altman has planted white and black tulips. "It's really striking," she says. "There are often tourists in front of the building, taking pictures."

In the darkest space against the building Altman has placed one ostrich fern that rises among vinca, white astilbe, and white creeping phlox. *Hypoestes phyllostachya*, the polka-dot plant, an annual with pink-spattered foliage, flourished both here in the garden and, this winter, indoors.

A success in "Fernland" has been Japanese toad lily, *Tricyrtis hirta* 'Alba'. "The buds look like little toads perching on this arching stem," explains Altman. Another surprise has been delphinium—a plant not supposed to do well in shade.

Altman has just begun another experiment: sea lavender, *Limonium latifolium*, a delicate but sun-loving static. One of her gardener friends says it will fail. Altman says she'll just wait and see.

The Corsican mint? Although about half of it died back last summer, it has filled in again and, like everything else here, should soon silence the critics.

Free-lancer Marty Carlock writes about nature, art, and education for the Boston Globe and other publications.

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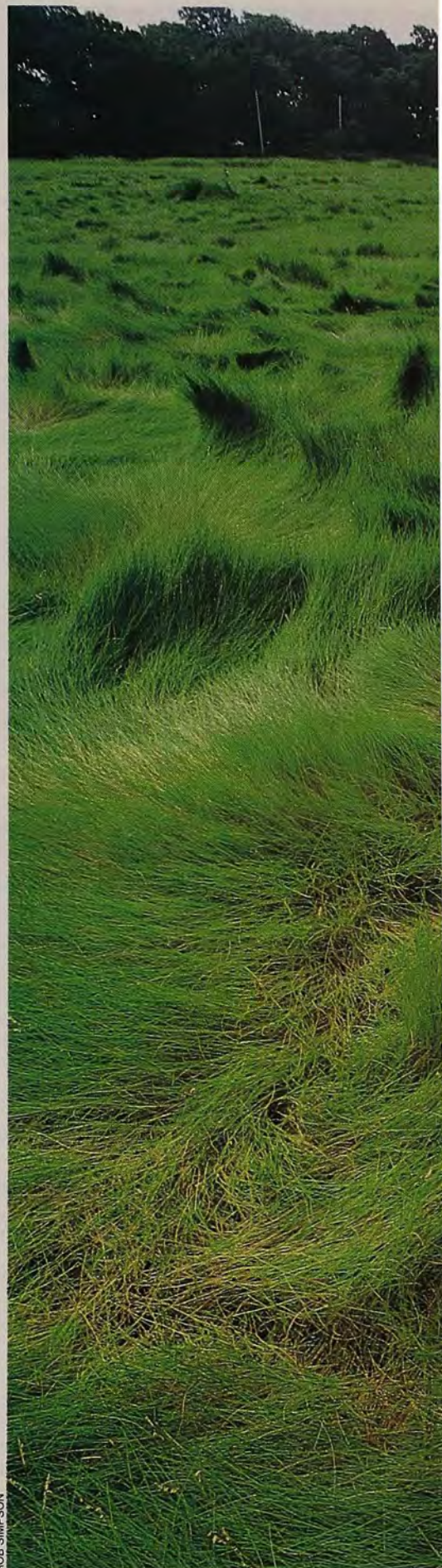
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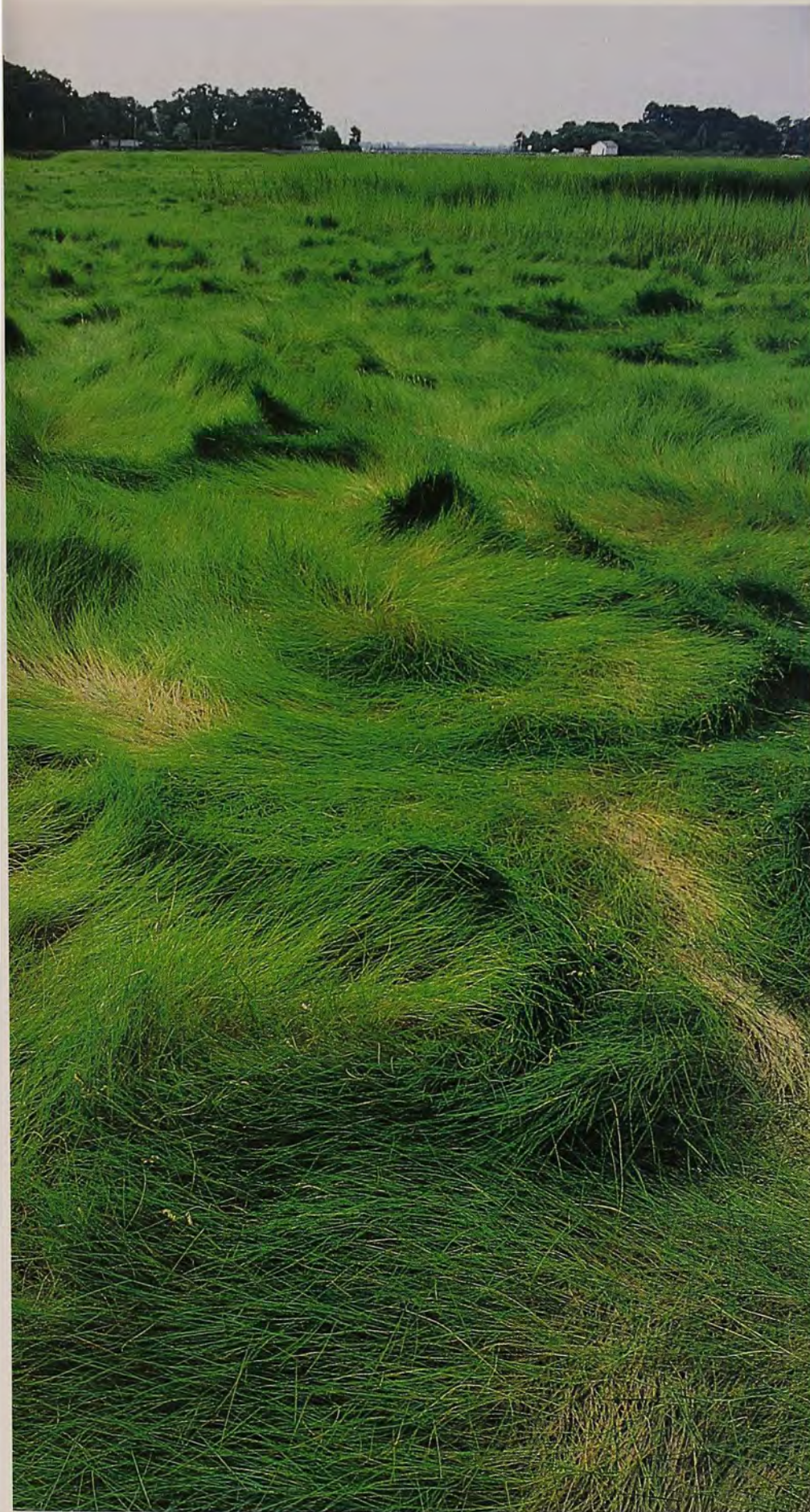
In my years of tramping fields and woods conducting botanical surveys, collecting seeds and cuttings for riverbank renovations, and propagating materials for wetland restoration projects, I have seen the future of the American garden. And I'm not alone. Although it hasn't yet the momentum of an August thunderstorm building over the Dakota prairies, gardeners' interest in native grasses and their grasslike relatives is growing fast.

With good reason. Among our native grass, sedge, and rush species—together known as “graminoids”—are species that serve admirably as accent plants, in meadow settings, and even as turflike ground covers. Some are especially adapted to wet or dry, acid or alkaline, rocky or poor soils. On the whole, they require little maintenance. And they're in sync with the habits of sparrows, quails, skipper butterflies, and other bird, insect, and mammal species that call our continent home. Our native graminoids, says John Greenlee, owner of Greenlee Nursery in Pomona, California, and author of *The Encyclopedia of Ornamental Grasses*, “go across the board in the roles they play in the garden.”

The grass family, Gramineae or Poaceae, is one of the largest among the flowering plants. Nonetheless, we rarely think of them as having flowers. Like those of other wind-pollinated species with no need to attract insects, their individual flowers are little more than male and female parts, only subtly attractive to the naked eye (though exquisite under a dissecting microscope). En masse, however, whether panicle or raceme or spike, grass flowers can be among the most eye-catching in nature. Striking inflorescences can combine with striking foliage to create some of the most dramatic plants that we can choose for our gardens.



ROB SIMPSON



JESSIE M. HARRIS



DAVID CAVAGNARO



GALEN GATES



Salt-meadow cordgrass, left, forms "cowlicks" in a marshy island meadow. Grasses can provide interest with their flower and seed heads, as with inland sea oats, top; foliage color, as with new growth of 'Albous' little bluestem, center; or shape, as with corkscrew rush, above.

SOWING AND GROWING A MEADOW

Lauren Brown, author of *Grasses, An Identification Guide*, says that after seeing her small meadow overrun by goldenrod and Norway maple seedlings, "I'm a little disenchanted with the meadow movement. It's not, after all, self-maintaining. You have to work at it." Yet compared to other herbaceous plants, graminoids require little care.

Most gardeners keep accent grasses in their borders neat by cutting them back once a year, just before active growth begins in spring or at the start of the rainy season. Mowing every one to three years will maintain most established meadows. Where legal and safe (which excludes most of California and parts of the Northwest), many grassland gardeners use controlled burning to maintain their meadow landscapes, as I have done (just once—I had to put in an emergency call to my village's community fire department to put it out), and as does Sara Stein, author of *My Weeds* and *Noah's Garden*. Stein, a resident of southeastern New York state, burns her little bluestem meadow around April 15, or when the maple leaves begin to unfurl. She used to burn it annually, but is now on a three-year schedule because, she says, "annual burns favor the grasses over the wildflowers."

Cutting back and burning is about all Stein does to care for her established plants. She doesn't feed or water because, she says, "all you're doing is encouraging European weeds." There are plenty of them around. "When I just let the lawn grow up," says Stein, "about 95 percent of the species were alien. That's what's in the soil, in the seed bank."

Controlling exotic invaders is one of the hardest parts of growing upland graminoid gardens. (Wetland gardens are easier, because relatively few alien species are adapted to soggy soils.) Before seeding an area, Stein prepares it by spraying with Roundup, then tilling, and then spraying with Roundup again to kill the newly germinated seedlings. Hand weeding will still be necessary later. "The difficulty," she says, "is knowing which is what." (She's heard of gardeners who lay a strip of paper down in the seed bed at sowing time and remove it shortly afterward. Whatever comes up in the formerly covered location serves as a guide to what doesn't belong elsewhere in the seed bed.) A salt hay or oat straw mulch helps protect the seeds from drying out or washing away. But even with all that care, graminoid seedlings can be a test of patience. "Don't give up too quickly," says The Nature Conservancy's Brian Martin. "Give a large seeding at least three years, since many native seeds are unusually slow to break dormancy." Some natives, however, are occasionally too successful from seed. Stein says she's had to behead the bluestem in her terrace garden because it was self-seeding "all over the terrace."

Wetland seedings are feasible except in standing water or in floodplains where moving water would wash away your efforts. Seed beds can be prepared in seasonally wet locations by rototilling during the dry months. Wet spots can be prepared at any time by scarifying the surface with a hand cultivator. Mulch the seeded areas with salt hay or oat straw, or sow a nurse crop such as Canada wild rye, *Elymus canadensis*, a bluish-foliaged, attractively seeded, widely indigenous native. For areas where seeding isn't practical, you will have to use transplants. I've grown my own in flats or pots lined with heavy plastic and placed in a light-shaded area to keep evaporation down.

—Shelly Stiles

Deer grass, *Muhlenbergia rigens*, native from Texas through New Mexico and Arizona into California, is "extremely versatile," says Greenlee, appropriate for wet or dry conditions and sun or shade. An evergreen species growing about three feet tall and wide, it produces taller cylindrical flower spikes that he describes as "see-through and constantly in motion." Mass plantings are effective, he says, but so is just one. "It's sort of like an exclamation point."

For gardeners along the country's south-

ern tier from North Carolina to Texas, Greenlee recommends purple muhly, *Muhlenbergia filipes*, for its cloudlike panicles of purple blossoms. In southern New England, down to the mid-Atlantic states, and in parts of the Midwest, the closely related hairgrass, *M. capillaris*, sports a similar purple panicle.

Brian Martin, director of conservation programs at The Nature Conservancy's Dakotas Field Office in Bismarck, North Dakota, suggests prairie sandreed, *Calamovilfa longifolia*, for a garden accent. Its

six- to 15-inch-long straw-colored panicles mirror the color of its fall foliage, which turns from pale green to amber and then pale gold at season's end. Although sandreed is strongly rhizomatous, Martin says it's not invasive, but instead tends to form circular clonal clumps. Prairie sandreed is found on sandy soils and dry slopes throughout much of the central and northern prairie states.

Other good flowers include the open, purple-hued spikes of blue joint, *Calamagrostis canadensis*, for moist soils across the East, the Midwest, and California; the fluffy white cottonheads of satintail, *Imperata brevifolia*, and the airy panicles of Indian rice grass, *Oryzopsis hymenoides*, both suitable for gardens in California and throughout the arid Southwest; the long-bristled florets of purple three-awn, *Aristida purpurea*, for Arkansas and areas southwest; and the pendant, flat flower heads of inland sea oats, *Chasmanthium latifolium*, for the Midwest and South.

Favorites of mine include twisted sedge, *Carex torta*, for moist soils and streambanks in the northeastern and north central states and along the Appalachians; the tall spikes of Indian grass, *Sorghastrum nutans*, native to most of the country east of the Rocky Mountains; the lavender panicles of tall redtop, *Tridens flavus*, a native of much of the Northeast and central states; and frothy wood reed grass, *Cinna arundinacea*, for moist, shady sites throughout the East and Midwest. Tall redtop and wood reed grass look best planted in groups.

Many nurseries and seed suppliers describe their grass offerings as either "warm season" or "cool season" species, denoting the time of year in which their foliar growth is most vigorous. But this distinction, important when choosing turf grasses, is out of place in the natives context. Several worthy southern and western species can be thought of as both warm and cool season grasses: They respond to moisture rather than temperature. And choosing a native based on when it is greenest ignores its potential interest during the dormant season. Attractive autumn or dry-season color is a strong point of many natives. And graminoids at maturity are of real use to designers for the many forms their seeds and seed clusters take.

Lauren Brown, author of *Grasses, An Identification Guide*, recommends switchgrass, *Panicum virgatum*, as "a great accent plant." With its large, airy, golden-glowing



panicles of ripe seed on stems up to six feet tall or more, says Brown, “with a lot of space and a lot of sun, it can be absolutely beautiful.” Switchgrass is native to most of the country east of the Rockies.

Smaller but also striking at maturity is bottlebrush grass, *Hystrix patula*, so named because of the long bristles or “awns” that spread outward from the tip of the flowering spike. Brown says she thinks of bottlebrush grass as short-lived, but has found that it seeds in readily and transplants very easily. “A very forgiving plant,” she calls it, “that seems to thrive on minimal care.” The species is found throughout most of the cooler East and Midwest. (However interesting and attractive, long awns can be a liability. Martin notes that bristles on needle-and-thread grass [*Stipa comata*] can stick to clothing and pets, and that in the hands of children, those of porcupine grass [*S. spartea*] can be dangerous toys.)

For soggy soils, the sedges offer a wide variety of seed and seed cluster types. Brown recommends lurid sedge, *Carex lurida*, for its little-pinkie-shaped, closely packed seed spikes—several to the plant. It’s common throughout the eastern half of the country. Fringed sedge, *C. crinita*, a species found in the East and southern Midwest, carries its pendant, pencil-thin, separate male and female spikes on gracefully arching stems above a fountain of foliage. I think it’s one of our best-looking natives.



Cottongrass, top, is a fascinating addition to a wetland, but doesn’t like heat. Indian grass, above, native to the eastern half of the United States, produces feathery spikes.

Among wetland grasses, the seed spikes of rattlesnake grass, *Glyceria canadensis*, are stand-outs. Each branch of the very open panicle, its seeds arranged like drops of water frozen one after the other in mid-drip, dangles from a delicately drooping stem. Rattlesnake grass is native to our northern states, east of Minnesota, and to parts of the Appalachians and the Ohio River valley. Soft rush, *Juncus effusus*, is probably the most notable native in its genus. Its three-foot-long, needlelike, deep green clumping leaves are interrupted

two-thirds of the way up by a fireworks-like spray of bronze seeds. Soft rush is found everywhere east of the Mississippi River valley. It looks its best in consistently saturated soils, but I’ve seen it growing in intermittently moist ruts in a road. It has a fascinating cultivar, ‘Spirilis’, called corkscrew rush because of its coiling foliage.

Other attractive seeds are those of the bluestems: the silver-bristled plumes of big bluestem, *Andropogon gerardii*, a native of high-calcium soils east of the Rockies; the reflective plumes of little bluestem, *Schizachyrium scoparium*, which is native to the same large region, and the similar broomsedge, *Andropogon virginicus*, native from the eastern plains to the East Coast; and the “beards” of silver beardgrass, *A. saccharoides*, native to California and the dry Southwest.

Enjoy the white woolly tops of cottongrass, *Eriophorum* spp., in wetland plantings in the northern and mountainous states; the dangling spikes of fowl meadow grass, *Glyceria striata*, in wetland gardens in the East and South; the foot-long plumes of Pacific dune grass or giant wild rye, *Elymus condensatus*, in California coastal ranges; the bright yellow spikes of prairie cordgrass, *Spartina pectinata*, from the central and northeastern parts of the country (beware of its cutting foliage); spikerush, *Eleocharis* spp., whose stems appear to be capped with toy tops, in wet-

MISCREANT *MISCANTHUS*, PESTILENT PAMPAS

If beauty and versatility weren't reason enough to try native grasses, there's another argument: Some of our favorite ornamental imports are escaping into the wild and taking over natural areas. Rick Darke, curator of plants at Longwood Gardens and author of *Royal Horticultural Society Manual of Grasses*, raises the issue in an article on grasses in the fall issue of *Arnoldia*, published by the Arnold Arboretum. "The popular *Miscanthus sinensis*," he writes, "is rapidly naturalizing coastal areas and bottomlands in the mid-Atlantic and southeastern United States." The development of earlier blooming cultivars, able to set seed as far north as Connecticut and New York, will accelerate the process, he believes.

"There's no doubt about it being invasive," he tells us. "There are places along the Tennessee bottomlands that look like parts of Japan." Near Longwood, he says, where a 20-foot hedge of it was planted on an old estate, the grass now covers what he estimates as 20 acres. On his own property of one-third acre, he is in his third year of trying to get rid of it.

Darke says there are now 110 *Miscanthus* cultivars on the market, with some species and cultivars more invasive than others. When he lectures on the topic, Darke says he recommends *Miscanthus purpurascens* as one that shows no signs of invasiveness and, as a substitute for *Miscanthus*, *Panicum virgatum* 'Cloud Nine', a new selection of a native.

In his article, Darke says that while grasses tend to be free of pests and diseases, a mealybug introduced into the United States in the late 1980s is beginning to attack *Miscanthus*.

On the West Coast, naturalists are fighting *Cortaderia jubata*, usually called purple pampas grass. (Horticulturists say that another pampas grass, *C. selloana*, is well-behaved and shouldn't be tarred with the same brush.) Likewise, some species of *Pennisetum* will naturalize readily from seed in the right situation, according to John Greenlee in *The Encyclopedia of Ornamental Grasses*. Gardeners can prevent reseeding by removing flower heads, he notes, but "you might be missing out on beautiful fall and winter effects by doing so."

In 1993, the federal Animal and Plant Health Inspection Service asked nursery owners to voluntarily stop selling another popular grass, *Imperata cylindrica* 'Red Baron'. The species, commonly called cogon grass, is on the federal list of noxious weeds. Darke says that the garden variety is a temperate form of the species while cogon grass is a green tropical form. But there are questions about under what circumstances the red form might revert to the more aggressive form, or the two might cross.

In Greenlee's book, he reports that the red form will undergo a genetic mutation if propagated through tissue culture, losing both its color and restraint.

Doria Gordon, an ecologist with The Nature Conservancy in Florida, compares cogon grass to common reed, *Phragmites australis*, which chokes out other water plants along the Eastern Seaboard. Some naturalists believe it became invasive when an exotic form crossed naturally with a native form.

"There is evidence that viable seed is produced by some of the genetic material" of 'Red Baron', she says. "If it's capable of crossing with the invasive species, it could be our next *Phragmites*."
—Kathleen Fisher, Editor

land plantings across the North; and the fluffy bronze spikes of wool grass, *Scirpus cyperinus*, in wetland gardens east and north of Oklahoma.

Many species suited as accents in the garden also make excellent meadow plants. The bluestem grasses are quintessential American prairie grasses. All have foliage infused at some stage with a bit of blue, silver-fluffed seeds, and fall color that ranges from warm golden to burnished orange. As with many other graminoids, bluestem seeds are an important source of

food for songbirds such as sparrows and other finches and some small mammals, especially in the winter months. (This grass tribe flowers and sets seed late in the season.) And, says Martin of The Nature Conservancy, little bluestem is also a larval food source for the rare Dakota skipper butterfly, a candidate for addition to the federal endangered species list.

The long, narrow leaves of northern or prairie dropseed, *Sporobolus heterolepis*, form thick, fountainlike clumps that turn golden in autumn. It's native to most of the

prairie states and to scattered eastern locations. I know it from the droughty, infertile, and occasionally toxic soils of the serpentine barrens of southeastern Pennsylvania and northern Maryland.

In sunny wet meadows, plant cotton grass, *Eriophorum* spp., which sports unmistakably woolly white terminal seed clusters. The genus is found in peaty and boggy locations across northern and mountainous parts of the country. Blue joint grass, *Calamagrostis canadensis*, which, with its varieties, is native to most of the country except for the Southeast and arid Southwest, and the aptly named tussock sedge, *Carex stricta*, a northeastern and midwestern native, will grow well in moist soils in either sun or shade.

If you're dealing with brackish water, try salt-meadow cordgrass, *Spartina patens*, which forms what Brown's book aptly describes as "cowlicks."

Other good meadow species include blue grama, *Bouteloua gracilis*, and side-oats grama, *B. curtipendula*, for the prairie states; and California gray rush, *Juncus patens*, for California and Oregon.

Some graminoids can substitute for more common turf grasses because their growth is so low or so slow that they rarely need mowing. And they will conserve water and reduce air pollution in the process. For those reasons, among others, says Greenlee, "we're pretty excited about grasses that will make a natural lawn." Highest on his list for gardeners from Oregon to Texas is *Carex praegracillis*. His nursery has selected a variety they call 'Laguna Mountain', which he says is slowly creeping, evergreen, needs very little water, and can be mowed or left unmowed. Greenlee also recommends the evergreen Berkeley sedge, *C. tumulicola*, for heavily trafficked areas in sun or shade and dry or moist conditions in its native northern California.

Martin says that in the prairie states, "people use blue grama quite a bit for a low-management turf grass." Its wiry leaves seldom grow taller than six inches, but its seed stalks, which look a little like a smoky-purple caterpillar-on-a-stick, may reach a foot or more. Buffalo grass, *Buchloe dactyloides*, he says, is often added to the seed mix for a turf that needs mowing only about once a year. Although only two species, combined they create an unusually varied ground cover, since buffalo grass takes three forms—a male plant with small, inconspicuous seed heads; a fe-

male plant with large seed clusters; and a vegetative form with long, purplish stolons interrupted every three or four inches by short bunches of leaves.

Other ground cover graminoids include broad-leaved sedge, *Carex platyphylla*, a blue-tinted evergreen native to eastern and Appalachian forests; California meadow sedge, *C. pansa*, as its name indicates, a West Coast native; Pennsylvania sedge, *C. pennsylvanica*, for shady lawns and gardens east of the Rockies (its botanical variety, *pacificum*, will substitute on the West

state or regional floras to confirm that your candidate indeed grows in your area, and in the habitat you're designing.

The more native the source, too, the better. "If you don't use local sources, the plants might not survive," says Martin. "Or you could contaminate the local gene pool"—with consequences that no one can yet predict. But although more and more nurseries are growing native plants, native graminoids are not at all commonly available. Author Sara Stein says she's had to turn to midwestern suppliers for

borious, so consider, too, the possibility of "collecting" hay, as some restorationists do. Ask your local utility if you can mow that power line right-of-way grown over in buffalo grass when its seed has ripened, or find out when the highway department plans to cut those dry road shoulders full of broomsedge.

Shelly Stiles has been a staff botanist for an ecological restoration firm and is currently director of a southwest Vermont conservation organization.



DAVID CAVAGNARO

Highly adaptable side-oats grama is drought-tolerant and a good meadow grass.

Coast); the evergreen plantain sedge, *C. plantaginea*, for shady areas in the Appalachian, northeastern, and north central states; and pikerush.

Whatever graminoid you grow for whatever reason, the more native the species the better. Greenlee points out that, for example, many grasses found in northern California have no place in the San Diego area. Habitat—chaparral, high meadow, streamside, and so on—is just as important as regional distribution. Before choosing species for your garden, check

some of the species she wanted for her New York meadow. Greenlee reiterates the chicken-and-egg dilemma of the nursery trade: "Nobody grows plants that nobody asks for, but nobody asks for plants that nobody grows. We've got to keep asking for these plants, saying 'I want American plants in my garden.'"

Division of a friend's garden plants, or from nearby meadows where you have obtained permission of the property owner, is a partial solution. Most graminoids, says Greenlee, are easily propagated from division, usually in spring or fall, and a nearby property owner may let you help yourself.

"Never be digging plants out of the wild," says Greenlee. "But nipping a little bit of seed is not a bad idea in my opinion." The "10 percent rule" offers some guidance here: Collect no more than 10 percent of the seed crop in a given year from a given population, assuming the species or population isn't threatened or in some way unusual. Advises Martin: "I would try to collect from areas that are already disturbed, like a railroad bed or an old field."

Though satisfying, collecting seed for more than a specimen planting can be la-

SOURCES AND RESOURCES

The Encyclopedia of Ornamental Grasses by John Greenlee. This 186-page hardcover book describes 250 grasses, including many natives, with color photographs of many, landscape uses, propagation, and culture. Contains a full page of sources. AHS member price: \$23.95.

Grasses, An Identification Guide, by Lauren Brown. This 240-page paperback contains botanical drawings of 135 grasses to help you identify them in the wild. AHS member price: \$9.85.

Country Wetlands Nursery, P.O. Box 126, Muskego, WI 53150, (414) 679-1268. Catalog \$1.

Environmental Concern, Inc., P.O. Box P, 210 W. Chew Avenue, St. Michaels, MD 21633, (410) 745-9629. Catalog free.

Greenlee Nursery, 301 E. Franklin Avenue, Pomona, CA 91766, (714) 629-9045. Catalog \$2.50.

High Altitude Gardens, P. O. Box 4238, Ketchum, ID 83340, (208) 726-3221. Catalog \$2.

Prairie Nursery, P.O. Box 306, Westfield, WI 53964, (608) 296-3679. Catalog \$3.

My new neighbors were horrified. Within a week of moving to my new house in May 1993, chain saws felled eight half-dead Siberian elms. Vast swaths of lawn succumbed to a sod cutter, while a truck deposited a mountain of compost. Twelve four-foot-deep craters appeared in the middle of the former lawn. One man spent an inordinate amount of time on his roof, surreptitiously adjusting his antenna, no doubt wondering what on earth had happened to the neighborhood.

I can understand their trepidation. I was making a new garden, and my plan was only slightly less ambitious than the Normandy invasion. I'd mapped it out in my head while making endless trips back and forth from our old house with boxes of dishes and clothes, and pots of perennial divisions of rare and sentimental favorites.

I felt sentimental about leaving my old

garden, too. About the size of two city lots, it had been a horticultural adventure, situated in the urban canyon of apartment buildings that had sprung up around my little cottage. I felt like a painter who had worked on the same canvas for 10 years—with constantly decreasing light. I was ready for a fresh start.

Experts always advise waiting a year before doing much gardening on a new property, the better to study the lay of the land before making changes. But I knew what I wanted to do—build borders. With nearly an acre of land surrounding a handsome turn-of-the-century house, I now had the space to do it. Just as important, I had real soil, which I'd discovered on my first visit. Although a century ago my northwest Denver neighborhood was known for its orchards and vegetable farms, today sandy loam is rare in this city. I didn't see the point in waiting. My partner, David Macke, was as eager to start work as I.

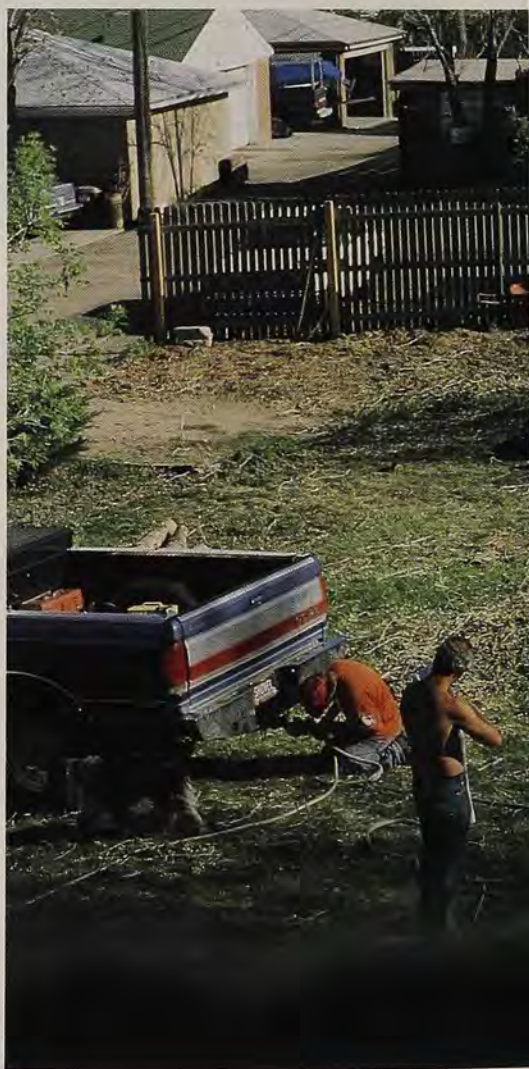
I suppose some people assume all Colorado residents live among blue spruce and columbines on rugged ridges, singing care-free John Denver songs as we hand-feed the wildlife. Although the city of Denver is nestled against the foothills of the Rocky Mountains, it is essentially flat. We're regarded as a USDA Zone 5 climate, blessed with abundant sunshine and low humidity. It's a land of opportunity for a gardener.

I wanted my new garden to both complement the house and give me space to grow thousands of species of perennials, annuals, and bulbs, knowing that a vast collection of plants doesn't always translate into a beautiful garden. Because of the relatively formal look of the late Victorian Italianate house, I chose a strong, geometric layout of long borders. Occasional half circles soften the straight lines. Within this framework, I indulge in the controlled chaos that we associate with traditional herbaceous borders.

Classic Composition

At last, he had almost an acre. And he knew exactly what he wanted to do with it.

STORY AND PHOTOGRAPHS BY ROB PROCTOR



I suppose some might wonder why I'd choose to make "English" borders. Why not berms of aspen and columbines, and all those other Rocky Mountain natives? The climate of the plains is much hotter and drier than that of the mountains, and most of our high country plants, including our beloved state flower, Rocky Mountain columbine, suffer horribly when grown in the city. However well intentioned, the "natural" garden often looks as out-of-place in an urban environment as clipped boxwood parterres would be in a mountain meadow. Classic borders and the artistic legacy of their creators can be adapted to any place and any personal style, assuming that the plants within them suit the climate.

Another decision was to group plants by their cultural needs and with a commitment to water conservation. I opted not to install a sprinkling system, since it would be nearly impossible to program it to ac-

commodate the varying irrigation needs of each border. I've hauled hoses my entire life, and I decided to concentrate high water use close to the house, especially on the east and west sides, where mature maples, crabapples, Englemann and blue spruce, and apple trees shade the house. Most shade perennials are not known for their drought tolerance. A shady glen with understory trees such as redbud and Allegheny serviceberry, underplanted with pulmonaria, ferns, and cowslips, makes a dramatic contrast to the sun-drenched plantings south of the house.

In that large portion of the property—where the Siberian elms bit the dust—I carved the lawn into two enormous rectangular beds, 16 by 60 feet, with an eight-foot-wide grass path between them. I designed a dividing backdrop of 12 brick columns, six in each bed, connected by latticework. The brick mason built them on three-foot concrete footings, assuring me

that they would never shift or lean; it will probably require dynamite if I ever redesign. These rows of columns cut the beds in half, creating four eight-by-60-foot borders.

The columns and lattice provide structure. The brick matches that of the house, suggesting that they've been here for many years. More important, they substitute for a living backdrop such as a hedge, for which I wasn't willing to wait. Borders of herbaceous plants—no matter how artfully combined—benefit from a dramatic, unifying background. As the latticework weathers to silver gray and clematis scramble through it, I also get the pleasure of their blooms.

An enormous existing beauty bush (*Kolkwitzia amabilis*) deserved preservation, so the westernmost border turns at its feet in an arc. The border continues to the west and along the boundary, framing a small lawn. I despise lawn care and the



The author quickly caught the attention of his new neighbors when he had eight ailing Siberian elms cut down, left. The foundation of a long-gone building, above, is now the site of a sunken garden that provides a protective microclimate.

overuse of water-guzzling turf that is draining our western reservoirs, but I like this one open space in our garden; I'm considering taking up croquet. This turf is not pampered, however, surviving on an inch of moisture each week (which encourages the roots to delve deeply into the soil), and I set the mulching mower on high. The taller blades shade the roots and slow evaporation.

There are other features in the garden. A deep, 15-foot border along most of the southern edge of the property requires the least water. It's planted with xeric plants that survive and thrive on our scant rainfall, such as penstemons, tulips, bearded iris, sunroses (*Helianthemum nummularium*), sea kale (*Crambe maritima*), and Mediterranean soapwort (*Saponaria ocyroides*). It must also block the view of the alley, so it contains drought-tolerant trees and shrubs, such as fernbush (*Chamaebatiaria millefolium*), sumac, an upright juniper, and cutleaf sumac.

A brick-paved patio along the entire south side of the house holds several hundred potted plants. While plants from the Mediterranean and South Africa are of course not winter-hardy for me, a Colorado summer is not unlike one in southern California. (In fact, my enthusiasm for agapanthus and succulents popular there has gotten so out of hand that a friend declared that our patio has begun to resemble a Los Angeles highway median strip.) We constructed a simple, raised goldfish pond to add the soothing sound of splashing water to the patio.

On another patio that we laid on the shaded west side of the house, we enjoy outdoor dining and the sound of the irrigation ditch that cuts through the north-west corner of the lot. This patio adjoins our sunken garden, the only area that we didn't plan.

One weekend, while digging up self-sown tree-of-heaven saplings, we kept hitting brick. We determined that it was the foundation to a building, about 15 by 10 feet. Friends joined us for some urban archeology as we excavated it, finding hundreds of patent medicine bottles, broken china, and a waffle iron designed for the top of a wood stove. The foundation may have supported a summer kitchen or an earlier house, perhaps a farmer's. We stopped digging at about four feet and, exhausted, decided our sunken garden was deep enough. We mixed in extra-rich compost to nurture the shade-lovers we in-

tended to plant there. Protected from hot breezes and burning sun, the brick enclosure is planted with perennials that ordinarily would not thrive here, such as candelabra primroses, astilbe, *Lobelia siphilitica*, and even voodoo lily (*Saurumatum venosum*), which is supposed to quit at least two zones farther south. I'll be experimenting for years in this unique microclimate.

If this all sounds ambitious, I must admit it surprises even me. We hired help for some of the jobs beyond the average gardener's skills, such as tree removal and pruning, and masonry work, but the rest we did ourselves with low-tech equipment such as rakes, spades, and a wheelbarrow (although we did borrow a friend's rototiller). We joked about making "a garden a week," tackling one border at a time.

Borders are like paintings. Each one starts as a blank canvas. Working with a palette of plants, rather than paints, the possible combinations are limitless. The twin borders that cut through the middle of the garden contain the colors that I naturally gravitate towards—the blues, purples, and pinks.

There's nothing prettier to my eye than deep blue flowers like anchusa or dwarf delphiniums contrasting with deep pink or magenta blossoms of coneflowers, Asiatic hybrid lilies, or *Geranium psilostemon* or *G. cinereum*. I like to add touches of straw yellow, such as the blossoms of *Digitalis lutea* or *Cephalaria alpina*, as well as gray-leaved foliage plants. One of my new interests is in using vines as ground covers, letting them intertwine with perennials. Golden hops vine (*Humulus lupulus* 'Au-



reus') and gold-net honeysuckle (*Lonicera japonica* 'Gold Net') quite literally weave a planting together; they can be easily trimmed back if they show kudzulike ambition. The golden hops vine needs little encouragement to thread through five or six feet of pink and blue flowers in this border, providing fresh, almost springlike foliage even in midsummer. The variegated leaves of gold-net honeysuckle create a refreshing tapestry in our pastel borders with true-blue cupid's dart (*Catananche caerulea*), *Monarda* 'Croftway Pink', the classic old yellow 'Hyperion' daylily, and of course, Asiatic lilies.

I've always had trouble integrating red flowers into a planting. At the end of one of these borders, I decided to give into temptation and go with a smoldering color theme. Deep red and maroon flowers such as *Knau-*

tia macedonica, peonies, Oriental lilies, *Clematis* 'Niobe', China pinks, and border carnations ignite the purples and blues of *Geranium platypetalum*, Siberian iris, monkshood, meadow rue, and veronicas.

Foliage is just as important to pull off this unusual scheme, and I play down green in favor of purple leaves, such as those of red orach (*Atriplex hortensis* 'Rubra'), bronze fennel, tender 'Blackie' sweet potato, and *Salvia officinalis* 'Purpurea'. A young smoke bush will make an even more dominant presence as it grows, as will the red-leaf rose, *Rosa glauca*, which has burgundy tones on the undersides of its gray leaves.

This area's diametric opposite is our border of white and silver. Many gardeners have planted an homage to Sissinghurst, for good reason. It's a stimulating exercise.

Mine incorporates many herbs that would normally inhabit a garden of their own, and I like contrasting thymes, valerian, garlic, and catmints (*Nepeta* spp.) with campanulas, iris, and boltonia. Just throwing together every white flower in the book doesn't guarantee an effective result. Contrast and complement are vital. What I enjoy, especially at twilight, are luminous white blossoms set against the gleam of finely cut silver leaves. Three artemisias are knockouts here—*Artemisia* 'Powis Castle', *A. ludoviciana* 'Valerie Finnis', and *A. stelleriana* 'Silver Brocade'.

Grasses such as blue fescue, *Miscanthus* 'Morning Light', and bulbous oat grass (a tiny clump with a very big name, *Arrhenatherum elatius* subsp. *bulbosum* 'Variegatum') wave their glistening leaves and seed heads, setting off bold foliage like that of *Crambe cordifolia*, *Salvia argentea*, or Scotch thistle (*Onopordum acanthium*). It's a constant joy to view small white flowers against larger beauties, such as a froth of snow daisy (*Tanacetum niveum*) enfolding white Asiatic lilies. Important annual additions to the white and silver scheme include white lavatera, sweet alyssum, *Zinnia angustifolia* 'Tropic Snow', dusty miller, milk thistle (*Silybum marianum*), portulaca, and cleome.

Another border is outrageously gaudy, incorporating hot colors and wild combinations. If the others draw their color schemes from a Monet painting, this one is pure LeRoy Neiman. Orange, red, purple, gold, and hot pink flowers run riot. We sometimes call this the "Madonna" border after the often shocking pop star. My wild creative impulses are given free rein, and it's cheaper than seeing a mental health professional. In spring, pink hyacinths bloom with purple rock cress (*Aubrieta deltoidea*) in front of chartreuse cushion spurge (*Euphorbia epithymoides*). A bit later, red and yellow Canadian columbine (*Aquilegia canadensis*) combines with deep purple and golden yellow bearded iris, purple-clustered bellflower (*Campanula glomerata* 'Joan Elliot'), a host of brilliant lilies such as the waxy, deep orange *Lilium pumilum*, and orange geum.

As summer heats up, so do the colors. A deep purple butterfly bush backs up seaside goldenrod (*Solidago sempervirens*), purple ironweed (*Vernonia noveboracensis*), sweet coneflower (*Rudbeckia subtomentosa*), *Monarda* 'Violet Queen', magenta ice plant (*Delosperma cooperi*), and an assortment of annual additions



Brick columns and lattice divide huge rectangles into four borders, above. Those in the center feature the author's favorite pastels, such as the penstemon, iris, geranium, and sunrose combination, far left. Another border features white flowers and foliage, including sea kale, rose campion, and artemisia, center. On one end of a border is a daring combination of reds and purples, including *Knautia*, China pinks, veronica, and Mexican feather grass, near left.



On the south side of the house, a patio holds several hundred pots of Mediterranean and South African plants.

such as chartreuse euphorbialike *Bupleurum rotundifolium*, purple-top clary (*Salvia viridis*), and even hot-colored cannas. Like a comedian who'll do anything for a laugh, I stop at nothing to make my "tasteful" friends gasp.

A liberal dose of bronze foliage from red-leaf barberry, castor bean, red orach, and *Ligularia dentata* 'Othello' adds a deep, somber tone. I definitely have a thing about plants with bronze or purple leaves, or for that matter any leaves—gray, gold, or variegated—that break the monotony of green. They are as important as flowers, although I try to keep a balance. I once visited a garden whose owner had a passion for variegation and golden leaves, which she used to excess. The whole garden appeared sickly and chlorotic—I had the urge to return at night and spray it with high-nitrogen fertilizer. That was an important lesson for me, and I always try to temper my enthusiasm for beautiful leaves with an understanding of how many are necessary to make my point.

The beauty bush, its pale pink blossoms tinged with coral, inspired the color

scheme of the surrounding plantings as the border turns to the west. Flowers with that unusual coral hue, I've decided, make for fascinating combinations. Asiatic lilies, red valerian (*Centranthus ruber*), red sunroses, the new hybrid *Nicotiana* 'Salmon Pink', coral bells, *Geranium* 'Biokovo', and new forms of sea pinks are vibrant and lively with complements of white and cream, as well as the lime green of *Nicotiana langsdorffii* and the hybrid 'Nikki Lime', and chartreuse foliage such as the variegated sage *Salvia officinalis* 'Icterina' or golden elder (*Sambucus racemosa* 'Plumosa Aurea'). Unifying these sunset colors is more bronze foliage, including *Lysimachia ciliata*, *Penstemon digitalis* 'Husker Red', and the uncommonly admirable red stalks of common rhubarb. I've always thought rhubarb an attractive plant; its broad leaves and tall spikes of pink-tinted cream flowers add weight to an otherwise frothy grouping.

I have no idea what possessed me to devote an entire border to autumn-blooming plants, but I'm glad I did. Japanese anemones, colchicum, autumn crocus, northern sea oats, *Salvia patens*, golden-

rod, and asters would be among my favorites no matter when they bloomed. There's considerable interest at other times of the year from spring bulbs, annuals, and foliage plants, but the main emphasis is on fall flowers. They lose their impact when tucked in here and there, but really pack a wallop when grouped together for a glorious finale.

Annuals that bloom well into the autumn, such as cleome, cosmos, heliotrope, *Gomphrena haageana* 'Strawberry Fields', and gloriosa daisy are even more valuable with their fall companions. I especially like the effect from a variegated hops vine—another of my "vines-as-ground covers" experiments—planted close to the edge and twining its way through purple asters, *Origanum laevigatum*, *Rudbeckia triloba*, and nearly every other plant within reach.

The most lavish touch here is a lavender river of *Crocus speciosus* near the front of the border that runs most of its 60-foot length, and continues as it turns to frame the lawn. The crocuses pop up through low-growing annuals and perennials such as plumbago and creeping zinnia (*Sanvitalia procumbens*).

The most recent in our string of projects has been what friends call my "folly." It's a simple gazebo with a flat deck on top. Built on the foundation of the old carriage house, it sits at the far end of the double pastel borders on the south boundary line. The long grass path between the borders leads to the folly. Not only does it anchor that end of the garden, but it provides a destination point and a shady spot to sit.

Climbing the folly's spiral staircase, it's possible to view much of the garden from above. That's a thrill for me, seeing my plan come to life. The lush look of the garden—just entering its third season—belies its age. Good soil preparation was the key to getting the divisions and young perennials (most were transplanted from what nurserymen call a "two 'n' a quarter" pot) off to a quick start. The neighbors are enchanted by the new garden and make excuses to drop by. They'll see it change as we experiment and refine. We have still more projects up our sleeves.

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Inspiring Spireas

Disease resistance and colorful foliage are just two reasons to look again at these old standbys.

BY TERRY SCHWARTZ

The word “spirea” may bring to mind the sprawling form of the old-fashioned bridal-wreath variety, used as a backdrop while you posed in Easter finery for a family photograph. Or maybe you envision the graceful arch of *Spiraea × vanhouttei*, faintly perfuming the air at graduation time, its lime green foliage swaying in the early morning breeze. At countless old homesteads scattered around the countryside, you can still find them, guarding the memories of more relaxed and innocent times.

There are more than 70 species of spirea, a member of the rose family, primarily from Asia, although there are a handful of species and natural hybrids occurring in North America. *S. salicifolia* was brought to Europe from Asia more than 300 years ago, and throughout the 19th century explorers continued to introduce new species to the trade.

It would be a bit of a stretch to say that there has been a spirea “revolution” or that breeders are working around the clock on new hybrids. But there has been a great deal of fine-tuning as the result of natural mutations or sports that originate in a nursery or arboretum. There is enough natural variation within members of this genus to allow growers to select new shapes and colors for use in the garden.

Gardeners who think spireas begin and end with plants they knew from their childhood need to revisit these reliable shrubs. No longer are all spireas huge gangly



TERRY SCHWARTZ

The graceful but rust-prone Vanhoutte spirea has been improved in a new selection, ‘Renaissance’.

plants with white flowers and nondescript green leaves.

The best known of all spireas is doubtless *S. prunifolia* 'Plena', or bridal-wreath spirea. Today it produces a "ho-hum" reaction in all but the most doggedly sentimental. The popular double-flowered form, introduced by Phillip von Siebold in 1845, can grow up to nine feet tall. Vase-shaped in habit, its deep blue-green foliage is very susceptible to rust, and by midsummer the lower half of the plant is generally bare. It has been and still is used too frequently. It's time to give this plant a rest.

The source for many of our exciting hybrids and selections has been the pink-flowered *S. japonica*, a particularly variable species. Its genetic flexibility is evident from its range of natural habitats, from the mountains of Japan and Korea west into China and the Himalayas. In cultivation it readily produces sports from which new cultivars can be selected. Its offspring include the extremely popular *S. × vanhouttei*, introduced in the 1860s. Like the bridal wreath, it can develop rust to the point that it almost defoliates, but its otherwise rugged constitution, fountainlike habit, and profuse blooms make it deserving of its long popularity.

One of the most interesting plants to come along in a while is *S. japonica* 'Shibori'. Sometimes listed as *S. japonica* 'Shirobana', it produces blossoms of both white and deep pink, sometimes on the same flower but often separately. It's a good idea to buy one while it's in bloom because this trait can be unstable, even though the shrub is always propagated from cuttings. The gardening public may despair of its fickle ways, although recurrent blooming makes it additionally rewarding when it behaves as expected.

You may never have thought of a spirea as a rock garden plant, but in fact the daphne spirea, *S. japonica* 'Alpina', is a frequent choice for that purpose. Covered with light pink flowers in early summer, this dainty selection will grow only eight to 12 inches tall and two to three feet wide, so that it can also be used as a ground cover shrub. It retains its shape without spreading or suckering, which makes it a low-maintenance plant.

A cultivar often confused with the daphne spirea is *S. japonica* 'Little Princess', which originated in Holland. It gets a bit bigger, however, forming a shapefully mound about 30 inches high and three feet wide, and its early summer flowers are



PAMELA HARPER



TERRY SCHWARTZ

a little darker. The mint green foliage is free from disease and turns a nice red in fall. 'Little Princess' is excellent as either a specimen plant or en masse. It prefers to grow in full sun but is rare among spireas in tolerating light shade.

Even experts may still scratch their heads if asked about the Norman spirea, *S. japonica* 'Norman'. It's a relative newcomer, and those books that do list it call it a dwarf. In the fields of Bailey Nurseries here in Minnesota, however, it has reached three feet in only three years. 'Norman' has a deeper red flower than most spireas, but its most noteworthy feature is probably its burgundy red fall leaves—a knock-out color that makes size almost irrelevant. Between flowering and fall, its slightly textured foliage gives it additional interest.

You won't find a creature called *S. × bumalda* in most European catalogs and references. The original was a hybrid of *S. japonica* and *S. albiflora*, the Japanese white spirea, but many authorities are now calling all of the cultivars formerly in that category *S. japonica*. Since most American books and nurseries still use the old name,

it seems less confusing to do the same here.

The lesser known of these two parents, *S. albiflora*, which can also be listed as *S. japonica* 'Alba' or 'Albiflora' (did I say we were trying to avoid confusion?), has been cultivated since the mid-19th century. It is still worth growing for the exceptionally rich, forest green foliage that sets off its thick clusters of white (appearing here in Minnesota in early June). And at only two feet high, it can easily be used in a mixed border with other perennials or at the base of taller shrubs.

The many cultivars of *S. × bumalda* attest to its genetic instability. Selected in one part of the country, they may behave differently when planted in another. Although some have unique characteristics that make them worth growing, others are so similar I would be surprised if their own introducers could distinguish them.

One of those that seems to show a great deal of variation is the century-old *S. × bumalda* 'Anthony Waterer'. It can grow four feet tall, although here in the Midwest the most common height is two to three feet. An upright plant, its new growth is



The author thinks that 'Goldflame', top left, is overused, but praises 'Little Princess', left, for fall color and shade tolerance. 'Froebelii', above, is an especially cold-hardy, pink-flowering spirea.

reddish turning to blue-green. 'Anthony Waterer' is most noted for its rose-pink flowers that in cooler climates bloom most of the summer.

The presence of a virus will often give this cultivar leaves that are variegated with yellow or cream. Some listings report this matter-of-factly, as though this variegation is a plus. But the pattern is highly irregular with some multicolored leaves and some pure yellow branches, and those seeing it in a garden center often assume that it's diseased. A French firm, Sapho, has recently developed one that is virus free.

S. × bumalda 'Coccinea' was selected in Holland around 1950 for its darker crimson flowers. All its other features are so similar to 'Anthony Waterer' that, in our growing fields, they are almost impossible to tell apart. I suspect that in warmer climates the flower color of 'Anthony Waterer' will wash out faster than that of 'Coccinea'.

Another twist on 'Anthony Waterer' is a sport of that plant, *S. × bumalda* 'Dart's Red', which was introduced by Darthuizer Nursery in Holland. It has carmine red

flowers that gradually fade to rosy pink.

A more literal twist is provided by *S. × bumalda* 'Crispa', which has curling, deeply incised leaves that are unique among these cultivars. The new growth is an attractive burgundy red, absolutely stunning when accentuated with dew on a spring morning. The pink flowers are similar to those of 'Anthony Waterer'.

The big advance of *S. × bumalda* 'Froebelii' is that it is definitely hardier than 'Anthony Waterer' here in the upper Midwest. It is also coarser and somewhat larger, at three to four feet tall, with a more upright growth habit. It has attractive deep pink flowers and dark green foliage.

There is a dwarf form of this plant, *S. × bumalda* 'Gumball', which grows to only two to three feet, although I have noticed in our fields that it seems to grow faster than many dwarf shrubs. Its eventual size may depend somewhat on the region in which it is grown.

If I could use one word to describe *S. × bumalda* 'Goldflame', it would be "overused," at least here in the Midwest. It seems that every house built within the last 10 years has at least one in its foundation plantings. With rather nondescript pale pink flowers, its real claim to fame is its spring and early summer foliage color. For anyone who likes yellow, gold, and bronze foliage, this three-foot-tall plant has it all. But even author Pamela Harper, who has written about creatively combining these colors with many other plants, has written of being "appalled" and "challenged" when the flowers and new foliage occur simultaneously.

There are two spireas with unusual foliage that haven't yet suffered from overexposure. 'Goldmound', a hybrid of 'Goldflame' and *S. japonica* 'Alpina', was introduced by Tony Huber of W. H. Perron & Company Ltd. of Quebec. Its flowers are also pale pink, but the foliage is a lemon or golden yellow. A sister plant is 'Limemound', introduced by Monrovia Nursery in California, which has leaves that open yellow in spring and turn lime green as they mature. At only two feet tall and three feet wide it's a useful plant, although its leaves tend to sunburn badly here in the Midwest.

In 1988 W. H. Perron & Company published descriptions of 10 other new spirea cultivars chosen primarily for unusual leaf colors, but they are still unavailable in the American market.

A feature of spireas too rarely mentioned

is the way the branches of some wave in the slightest breeze. One of the best for bringing this appealing movement to the summer garden is *S. × arguta* 'Compacta'. This is not to overlook the profuse, pure white blooms that cluster along the branches, giving these plants the appearance of clouds drifting by on a spring day. Sometimes called the dwarf garland spirea, it grows to three feet tall and, as its cultivar name implies, is very compact.

If you have room for only one of this type of spirea, especially if you live in the North, you will want to look for *S. × cinerea* 'Grefsheim', a Norwegian introduction that has considerably less winter dieback. It brightens the landscape before many other shrubs begin their spring resurgence, about two weeks earlier than *S. × arguta* here in Minnesota. It is also larger, with an ultimate height of four to five feet. Its long, delicate, arching branches and very fine-textured, soft green foliage give it an especially graceful appearance. *S. × cinerea* is a cross of *S. cana* and *S. hyperi-*

GROWING SPIREAS

Spireas may not be the perfect garden plant, but they come close. Most of them aren't particularly thirsty, which is one reason they have outlived their owners around so many old farm houses. The old bridal-wreath and Vanhoutte types are prone to rust, which defoliates but doesn't kill them.

With the possible exception of 'Little Princess', they need full sun. The best soil will be neutral or slightly acidic and well-aerated enough to keep their feet dry, although they will tolerate soils that contain considerable amounts of sand or clay.

A good hard pruning will rejuvenate spireas that get leggy. The Japanese spirea and its hybrids bloom on the current season's growth and will benefit by being pruned back, by two-thirds or even to the ground, in early spring. (One advantage of our Minnesota cold is that it will sometimes do this pruning for us!) Early spring bloomers should be pruned immediately after flowering. —Terry Schwartz

NATIVE SPIREAS

If you have been trying to grow more natives in your garden, we have good news and bad news regarding spireas. The good news is that there are a number of species and natural hybrids native to much of the East and the Northwest. The bad news is that they're extremely difficult to find for sale.

Larry Mellichamp, an associate professor of biology at the University of North Carolina at Charlotte, is working with native species of another "old-fashioned" shrub, the mock orange (*Philadelphus* spp.). But spirea is one native plant that no one seems interested in, he says. "I don't know if there's any reason that they haven't caught on, other than random neglect," Mellichamp says.

According to Alice M. Coats' book *Garden Shrubs and Their Histories*, the East Coast's steplebush or hardhack, *Spiraea tomentosa*, was introduced into the trade in 1736. British plant hunter David Douglas brought back a western species, *S. douglasii*, in 1827. *The Hillier Manual of Trees and Shrubs*, from the famous English nursery, calls the latter "a rampant, suckering shrub. . . . Not recommended for shallow chalk soils." The former, it appears, is merely "vigorous" and suckering. Both produce purple-pink flowers in dense terminal panicles in mid- to late summer. There are also natives with white flowers. Those of *S. alba*, which occurs as far west as Missouri, are also in panicles, while those of *S. corymbosa* are in flat-topped clusters.

We found only two sources for native spireas (see "Sources," below). Country Wetlands Nursery and Consulting, Ltd., in Muskego, Wisconsin, carries seeds of some eastern species. Owner JoAnn Gillespie acknowledges that even the most avid gardeners aren't terribly familiar with them. "They're bog plants," she says, "and most people don't spend a lot of time walking around in bogs."

Forestfarm in Williams, Oregon, which carries a large selection of the Asian spirea species and cultivars, also carries natives from both coasts. "The eastern ones tend to be tall and very different from *bumalda* and *japonica*," says co-owner Ray Prag. "The western ones are a little lower and more useful." The western plants are from the mountains, rather than bogs, but all like acid soil and "an even amount of water through the season," he adds. "They're easily revived, but their leaves will turn dry and crispy" in a drought.

Richard Lighty, who works with many natives as director of the Mount Cuba Center for the Study of Piedmont Flora in Greenville, Delaware, says native spireas in the wild are often "scruffy, with little ornamental value. If you suggested that breeders work with them, they would probably say, 'Why?'" Yet there is enough variability in the natives, like their Asian cousins, that selections might be made for heavier bloom or more regular growth, he believes. "I have one in my garden now from a cutting that a friend made in the wild, but I'm not ready to commit yet," Lighty says.

"Although there is a lot of talk about native plants for the landscape," says Terry Schwartz of Bailey Nurseries, "there is still the lack of demand, which of course limits production in nurseries."
—Kathleen Fisher, Editor

cifolia that originated in the late 1800s.

Also reliably hardy through USDA Zone 3 is *S. fritschiana*, introduced from China in 1919 but only recently found in garden centers. In spring it produces yellow or orangish new shoots before opening its clusters of flat white blooms, and the color continues in fall with a pleasing burgundy red. Its summer foliage is dark green and the habit is a wide mound, up to five feet across but only two to three feet tall.

S. nipponica 'Halward's Silver' was introduced by the Canadian Ornamental Plant Foundation, ensuring its cold hardiness in most areas of the United States. Small and compact at two to three feet tall

and three feet wide, it has very fine-textured, mint green foliage and is covered with white flowers in spring.

Less cold hardy than 'Halward's Silver' is *S. nipponica* 'Snowmound'. Native to the island of Shikoku, Japan, it was introduced by the Royal Botanic Garden, Hamilton, Ontario, and named for the masses of white flowers that cover its dark green foliage in the spring. Noteworthy for its profuse blooming as well as nicely arching branches, it makes a beautiful specimen plant. Although some books say it is hardy to Zone 3, here in St. Paul it seems to be at its northernmost reaches. In any year it seems to have a lot of dieback and, in a severe win-

ter, can be killed outright. If you want to try it in Zone 3, plant it where it will receive warmth from a wall or other protection.

Another spirea from Canada, and one of the few new introductions from a controlled cross, is *S. trilobata* 'Fairy Queen'. It is a hybrid between *S. trilobata* and *S. trichocarpa* developed by Frank Leith Skinner in Dropmore, Manitoba. Introduced in 1961, it is a prime example of how long it takes for some plants to become known to the home gardener. It is still underused, although I consider it one of the best dwarf spireas on the market today. 'Fairy Queen' grows to about three feet tall and is very compact, disease resistant, and a profuse bloomer.

I don't think I'm biased in including among the best spireas on the market a natural selection introduced by us here at Bailey Nurseries in the early 1980s. *S. × vanhouttei* 'Renaissance' is an excellent replacement for the old rust-prone Vanhoutte spirea. It has heavier, chocolate-brown canes, thicker leaves, blooms as heavily, and retains its foliage all summer.

There are many more species and cultivars not mentioned here, but these are among the most widely available. Whether you want a plant that's large or small, blooms early or late in pink or white, provides movement or fall color, you can find it in the world of spireas. Work one into a perennial border or plant some dwarf varieties as ground covers. You can choose from an array of spireas Grandma never dreamed of—try using them in different ways as well!

Terry Schwartz has been on the staff of Bailey Nurseries for more than 20 years.

SOURCES

Aubin Nurseries, Ltd., Box 1089, Carman, Manitoba R0G 0J0, Canada, (204) 745-6703. Catalog free.

Country Wetlands Nursery, P. O. Box 126, Muskego, WI 53150, (414) 679-1268. Catalog \$1.

Forestfarm, 990 Tetherow Road, Williams, OR 97544, (503) 846-6963. Catalog \$3.

McKay Nursery Company, P.O. Box 185, Waterloo, WI 53594, (414) 478-2121. Catalog \$3.50.

Arthur Weiler, Inc., 12247 Russell Road, Zion, IL 60099, (708) 746-2393. Catalog free.

The Reintroduction Myth

Trying to save endangered plants by transplanting them fails as often as it succeeds.

BY WILLIAM H. ALLEN

When he was coordinator of the Endangered Plant Program for the California Department of Fish and Game, biologist Ken Berg would repeatedly get frantic phone calls from developers who needed his approval to continue with a subdivision project. It was and still is a common scenario in the mitigation wars, the struggle to reduce damage to endangered plants: a developer would learn from state biologists that the land on which he was building was the habitat of an endangered plant.

Berg would meet with the developer, who would spread out project blueprints five years in the making and ask to know quickly what he had to do to comply with endangered species laws. The clock was ticking on loans and investments that the developer already had sunk into the project. As the negotiations began, the pressure was on Berg to reconcile the long-term realities of ecology with the short-term imperatives of the economic bottom line. "Anything I would try in terms of mitigation to reduce the ecological impact was seen as taking profits out of his pockets," says Berg, who is now program manager for special-status plants with the Bureau of Land Management in Washington, D.C.

When negotiating a mitigation, the participants may trade off an existing population of plants or habitat for creation or protection of a population elsewhere. As law, politics, economics, and science play out, mitigation may mean that to keep the



DORIA GORDON/COURTESY OF THE NATURE CONSERVANCY

Terry Henkel of The Nature Conservancy plants Apalachicola rosemary, a rare shrub in the mint family, in a conservancy preserve in the Florida panhandle.

plant viable, the developer cannot build on all the lots. Or it may mean he has to pay to transplant the plant population to an area beyond the boundaries of the subdivision. After all, conservation biologists have learned how to reintroduce plants into old habitats or new areas. Or have they?

Reintroduction is an uncertain tool in need of a scientific underpinning, researchers concluded in April 1993 at a conference entitled "Restoring Diversity: Is Reintroduction an Option for Endangered

Species?" The St. Louis meeting was sponsored by the Center for Plant Conservation (CPC), which is headquartered at the Missouri Botanical Garden.

Biologists at the conference agreed that reintroduction can only be considered complete when a species is safely reestablished in its ecological and evolutionary context. But they need a sound method to measure success of reintroduction efforts.

Today, reintroduction techniques still cannot be considered much more than ex-



perimental, biologists warn. They admit that they know relatively little about endangered plants and how to restore them in their natural areas, much less move them successfully to new areas. But as biologists increasingly apply reintroduction techniques, they wonder whether they have opened a Pandora's box that could speed the demise of endangered plant species.

Reintroduction, sometimes loosely used to describe any movement of plants in a conservation context, more specifically refers to planting plants where they occurred historically. The field also now includes three more specific types of plantings. First, in enhancement, a population of plants on the brink of disappearing is boosted by the addition of plants of the same species but from different areas. Enhancement increases population numbers and diversifies the gene pool.

Second, in introduction, a more drastic step, a species is planted in areas where it is not known to have occurred, although the plants still remain within their normal range, or ecological envelope. These sites sometimes are protected as part of a strategy to prevent the species' extinction.

Third, translocation, or relocation, is the most dramatic of the reintroduction techniques and the one where success is the most uncertain, especially for species that are rare or restricted to rare habitats. Translocation requires completely remov-



California Department of Fish and Game ecologists succeeded in reintroducing more than 4,000 plants of the Santa Cruz tarplant, above, to Wildcat Canyon Regional Park in the San Francisco Bay area, top, but failed in their efforts to establish the plant elsewhere.

ing naturally occurring mature plants from one spot and reestablishing them elsewhere. The other methods can be done with seeds or with propagated material. Most mitigations currently do not involve translocation of species. However, if biologists can learn enough about how and when to use these techniques, conservationists may no longer be limited mainly to protecting shrinking pockets of natural land from development.

"The overwhelming apprehension about mitigation among people committed to conserving diversity has been that it's been treated as something we know how to do with a high degree of confidence, when in fact it's surrounded by uncertainty and partial success at best and failure more frequently," says Don Falk, former executive director of the CPC and now executive director of the Society for Ecological Restoration, which is based in Madison, Wisconsin. "At its worst, mitigation can be a charade, a fairy tale."

Yet, mitigation is also one of the few ways biologists have to address the loss of diversity. "At its best, it is a healing art of ecology," Falk says. "It is the art of the possible."

Reintroduction is already under way in many parts of the country. Approximately one-fourth of all the recovery plans aimed at bringing back plants under the Endangered Species Act include some form of reintroduction, say Falk and Peggy Olwell,

manager of CPC's conservation programs. The exact number of reintroductions is not known, but they reach into the thousands and involve hundreds of plant species.

Despite their popularity, reintroductions are not 100 percent successful. Of 45 reintroduction projects in California in the past decade, four were completely successful, 15 partly successful, and 10 failed, where success is defined as the ability of the population to survive and reproduce. It is too soon to tell for the rest. In a 1991 British Nature Conservancy Council study of 144 plant reintroduction attempts, only 22 percent were deemed successful. More than half appeared to have failed.

Among mitigation successes so far is the reintroduction of running buffalo clover, *Trifolium stoloniferum*, to some of its native habitat in Missouri. The white-flowering clover with creeping stems once flourished from West Virginia to Kansas in the moist, shaded habitats along streams and animals trails. The clover has disappeared from many states and in 1983 made the federal list of threatened plants.

Running buffalo clover once occurred across two-thirds of Missouri, but it could not be found in the state as recently as the 1980s. Biologists with the Missouri Department of Conservation and the Mark Twain National Forest discovered seedlings along a stream near St. Louis in 1990 and, with the help of the Missouri Botanical Garden, propagated specimens and transplanted them to selected sites in the national forest. They have survived in some sites but died in others.

As the case of the Santa Cruz tarplant illustrates, only time can tell whether any effort is successful. The tarplant, *Holocarpha macradenia*, is representative of many mitigation failures. The tarplant is a summer-blooming annual native to flat, coastal grasslands in part of the San Francisco Bay area, as well as the central coast region around Santa Cruz. Unfortunately for the plant, those grasslands are popular sites for development.

Not listed as an endangered species at the time, the plant was all but eliminated by the early 1980s. Neil Havlik, a biologist with the East Bay Regional Park District, realized the situation and mounted a last-ditch effort to save it. Havlik, along with family and friends, conducted a series of 22 translocations, "which admittedly were quite Johnny Appleseed in nature," says Ann Howald, a plant ecologist with the California Department of Fish and Game

On Craggy Pinnacle along the Blue Ridge Parkway, many rare high-elevation species, such as Geum radiatum, below, were damaged by hikers. Using soil-filled bags, conservationists from the North Carolina Arboretum, the University of Georgia, and the National Park Service succeeded in replanting several pockets of these plants on rock outcrops, bottom.



PHOTOGRAPHS COURTESY OF THE NORTH CAROLINA ARBORETUM

in Yountville, California. They scattered the plant widely and without a plan. Havlik is now with the Solano County Farmlands and Open Space Foundation in Fairfield, California.

Annual monitoring data had indicated that the plant could survive without much problem if transplanted. But something went wrong. "In 1990, the populations crashed," Howald says. "We don't know exactly why, possibly because of drought or grazing." One population in Wildcat Canyon Regional Park in the San Francisco Bay area survived to grow more than 4,000 plants in 1993, but only a few of the other introduced populations hang on in groups of a few dozen or a few hundred. A survey by Howald in August 1993 found no remaining natural populations of the tarplant in the area. (A small, remnant native population in the Bay area, which is the tarplant's northern range, appeared to be unaffected by whatever killed the transplants. However, this native remnant was destroyed in 1993 to make way for a shopping development.)

A separate reintroduction project failed in the plant's southern range, in the Santa Cruz region, but there are at least two remaining natural populations: one in northern Monterey County on land protected by The Nature Conservancy, and the other, discovered in 1993, along runways at Watsonville Airport in Santa Cruz County.



“What we’ve learned here is that the time needed to evaluate these projects is a lot longer than what many of us had thought in the beginning,” Howald says. “It may not be known for a decade or even more whether a particular translocation is going to work.”

Even if they have good prospects for success, some mitigation projects may have enemies even within the conservation community. Consider the strange case of the missing Mead’s milkweed, *Asclepias meadii*, a federally listed threatened species. The plant, a relative of the common butterfly weed, is a native of the tall-grass prairie of the Midwest.

Mead’s milkweed is now extinct over a large part of its range. Most of its larger remnant populations grow in Kansas and Missouri, and a few small populations hang on in Illinois and Iowa. However, Barbara Schaal of Washington University in St. Louis has found that even large populations of the milkweed can have low genetic diversity.

When biologists with the Morton Arboretum, in Lisle, Illinois, transplanted a few Mead’s milkweeds in 1991 into the Shawnee National Forest in southern Illinois, they thought they were rescuing a rare plant on the verge of extinction in the region. But someone who disagreed violently ripped the plants out of the remote spot where they had taken root and made

Tim Smith, left, and Michael Woodring of the Missouri Department of Conservation prepare to replant running buffalo clover at the Drury-Mincy Wildlife Area in Taney County, Missouri. With the help of the Missouri Botanical Garden, Smith has led efforts to reintroduce the plant to several sites around the state. After five years, the results are mixed.

off with them. Botanists, who declined to be identified, suspect that the unknown culprit may have been a scientist or environmentalist who believed that bringing in Mead’s milkweeds from another area was not what nature had intended.

Among some biologists, the uncertainty of this new art has gained mitigation a reputation as an “unsavory practice,” Berg says. “Society accepts the concept of doctors practicing medicine and of lawyers practicing law,” he says. “I hope it can accept the concept of conservation biologists practicing mitigation.”

Some conservationists are leery of mitigation partly because it may give a false sense of security and because it violates a central doctrine of conservation: do no harm. “Theoretically, mitigation can be a loaded gun pointed at any natural area, even ones we think are securely protected. In essence, if mitigation tradeoffs begin to be used in very many situations, then hypothetically nothing would be off limits,” says Falk.

That skepticism is compounded by the perception that people who most strongly advocate mitigation often have a different agenda: the economic bottom line. If botanists become proficient in restoring endangered plant populations in old and new habitats, it may encourage developers to push for moving rare plants out of the way of subdivisions, shopping centers, and other development. The result may be a kind of domino effect of natural habitat destruction in which conservationists are forced to tamper with nature on many more fronts than they find acceptable.

“Is this a Faustian bargain?” asks Edward Guerrant, conservation director of the Berry Botanic Garden in Portland, Oregon. “If we develop the technology to do this, will it be used to destroy habitat later?”

Implicit in biologists’ concerns is apprehension about the dearth of data on the organisms and ecosystems at issue. “With many endangered plants, there’s more unknown than there is known about them,” says Howald. “For example, many times we know nothing about their pollination systems or germination requirements.”

Moving plants around to novel habitats, including areas outside their historic ranges, also may interfere with natural variation and evolution. Some biologists are concerned that gene pools that were previously separated by natural boundaries will mix.

“The weight of opinion tends to be that this is not a good thing,” says Howald. “But

whether it has a positive or negative effect on the species is still a subject of debate.”

Reintroductions need to establish ecosystem functions, not just a few individuals of a target species, say Joy Zedler of San Diego State University and Donald Waller of the University of Wisconsin at Madison. This would require working out a self-sustaining population size, pollinators, mycorrhizal symbionts, seed dispersal agents, nutrient cycles, and hydrology.

Thus, conservation biologists need to go “beyond gardening” to restore plants in their ecological matrix, Waller says. Biologists in relevant fields should be consulted when reintroducing, for instance, a plant that is dispersed by a particular ant species or a plant that gains protection from herbivores by supporting a particular kind of repellent fungi.

In many cases, going beyond gardening will take decades, and therein lies a time-scale problem. The scale of mitigation (months) is dramatically different from that of ecology (years to centuries).

“Developers may not want to wait 25 years until we know if a reintroduction really works,” says Falk. “But what we as ecologists are saying is, it may take that long to have a reasonable idea if we’ve established anything of lasting biological value.”

Lest the conservation biology community push the panic button, some biologists remind their colleagues that there is still time for thought, research, and deliberate planning based on scientific knowledge. “Reintroduction is appropriate in certain circumstances, but it must be carried out carefully,” says Peter White, director of the North Carolina Botanical Garden and professor of biology at the University of North Carolina. “If the world was really going to hell in a hand basket, we’d be out there like Johnny Appleseed throwing caution to the wind,” doing something desperately, even if it were not based on science.

Among those who are skeptical that mitigation will succeed over the long run is George Gann-Matzen, an ecological consultant with Ecohorizons, Inc., in Miami, Florida. Gann-Matzen has worked on several plant restoration projects for private contractors in Florida, particularly projects involving wetlands.

“Mitigation has serious functional problems in the political and economic context that will cause it not to achieve success,” Gann-Matzen says. Among those problems are the traditional American belief in private property rights and the lack of a legal



PHOTOGRAPHS BY KENNETH D. KIMBALL/COURTESY OF THE APPALACHIAN MOUNTAIN CLUB



The alpine zone of the White Mountain National Forest in New Hampshire is the only known home of Potentilla robbinsiana, above. The tiny population was further reduced by private and scientific collecting and, later, by back-country hikers. The habitat was closed to the public, and, after more than a decade of work by the Appalachian Mountain Club and federal conservationists, the plant's status may be downlisted from endangered to threatened. Top, Melissa Iszard Crowley of the Appalachian Mountain Club and Bill Brumback of the New England Wildflower Society, who helped enhance the population by propagating the potentilla from collected seeds.

framework that recognizes biological complexity in areas threatened with or recovering from development.

“Mitigation is great for learning—I’ve learned a lot,” says Gann-Matzen. “But as for no net loss? Forget it. We’re losing everything. We might as well recognize it for what it is.”

Responding to cautions like this, some biologists have called for colleagues to get more involved in policy-making. These biologists say that even if research eventually answers the biological questions about reintroduction, that will not be nearly enough to overcome the hurdles ahead. Advances in reintroduction science and technology may change the landscape of the battleground over endangered species, but the greater need is for a political and legal framework to guide the conflict between conservationists and developers.

“We’re up against the second-oldest profession in the world: land speculation,” Berg says. The land-use planning that surrounds development and endangered species is a complex, multidisciplinary issue. Such planning is “90 percent politics and 10 percent biology,” he says. “And biology is usually the easy part.”

William H. Allen is a science writer for the St. Louis Post-Dispatch. This article is reprinted with permission from the February 1994 issue of Bioscience.

A Little Light on Nightshades

As ornamentals, the solanums are anything but sleep inducing.

B Y J A C K H E N N I N G

Among the numerous members of Solanaceae, or the nightshade family, are a number of our best loved ornamentals. The familiar brodiaea, nicotiana, and petunia play an important role in many a bedding scheme. Nightshades are major players in the vegetable garden, too, with tomatoes, peppers, potatoes, and eggplants being but the best known examples. But the nightshade family also has a dark side. Some of its members, such as mandrake (*Mandragora officinarum*), are steeped in mythology and superstition. Others, such as deadly nightshade (*Atropa belladonna*), thorn apple (*Datura* spp.), and henbane (*Hyoscyamus niger*), are notorious members of the “mur-

der mystery” genre of plants containing powerful alkaloid-based chemicals that, if ingested, can cause symptoms ranging from hallucinations to convulsions, delirium, and death.

It’s not altogether surprising then, that the entire genus *Solanum*, which accounts for about half of the nightshade family, is sometimes regarded with disdain or even malevolence. A “weedy” reputation based on prodigious seed output has also caused some gardeners to shy away from the genus as a whole (see sidebar, page 42). But with anywhere from 1,000 to 3,700 species to choose from, depending on which authority you consult, even the most skeptical can find a solanum to brighten their borders.

The majority of solanums are endemic to



PHOTOGRAPHS BY DAVID CAVAGNARO

Among the solanums you can find the delicate white flowers of the potato vine, opposite, and the two-inch purple blossoms of Solanum wendlandii, above.



the tropics of Central and South America, but some representative of the genus can be found on every continent except Antarctica. Solanums can be found in all shapes and sizes, occurring as herbs, shrubs, vines, and, occasionally, trees. Their alternate leaves are often covered with soft hairs, particularly on the newer growth. In many species, however, that downy look masks wicked spines that coat the stems and the undersides of the leaves. Many solanums give off a rank, sour smell, particularly when their leaves are bruised, a characteristic shared with other members of the nightshade family. One of the keys to identifying the genus is the flower structure. The flowers range from white or yellow to blue or purple, and generally have a flat, star- or wheel-shaped corolla with yellow stamens clustered cone-like around the style. Packed with tiny seeds and often maturing throughout the growing season, the round to slightly oblong berry fruits come in a beautiful array of colors that range from green or yellow to red, purple, or black.

Solanums also share the nightshade family reputation for having medicinal, narcotic, or toxic qualities. The genus name, *Solanum*, is believed to be a derivative of the Latin word *solamen*, which translates as “a consolation” or “quieting,” possibly in reference to the sedative effects associated with some species. The origin of the common name, nightshade, shared by the genus and family, also appears to refer to the ability of some plants to “draw the shades of night” temporarily or permanently over those who ingest them. Modern chemistry has borne out what the ancients suspected; many nightshades contain various combinations of powerful alkaloid chemicals, including steroidal alkaloids, commonly known as steroids. Synthesized steroids are used to produce anti-inflammatory drugs and contraceptives, among other things, but overdoses of raw steroidal alkaloids can slow the heart, reduce body temperature, and cause delirium, convulsions, and even death. Some members of the genus are still being analyzed for additional medicinal or pharmaceutical qualities. Harvard ethnobotanist Richard E. Schultes says the “genus is rich in potentially biodynamic principles.”

One solanum that has made a switch from medical treatises to garden catalogs is an import to the U.S. from Europe and Asia, *Solanum dulcamara*, the original bittersweet. (European immigrants to America apparently named our native *Celastrus*

scandens “bittersweet” based on a tenuous resemblance to *S. dulcamara*.)

Used medicinally at least since the time of Theophrastus—a third-century B.C. Greek botanist whose *Enquiry into Plants* is the first known attempt at a systematic classification of all plants—*S. dulcamara* was said to alleviate skin disorders and to disperse congealed blood. Gerard’s *Herball* (1597) notes “the juyce is good for those that have fallen from high places, and have been thereby bruised.” Linnaeus described it as a febrifuge and a rheumatism treatment.

Naturalized now throughout much of North America, *S. dulcamara* is of no more than passing appeal in the garden. Besides being considered invasive—its pea-size red fruits, which appear throughout the growing season, are popular with birds and other wildlife—the plant’s leaves and fruit are toxic. Hardy to USDA Zone 4, bittersweet climbs to 15 feet with grayish-tinged yellow stems. Its four-inch-long arrowhead-shaped leaves usually have two basal lobes and are dark green with a pale reverse. The drooping clusters of violet flowers with yellow stamens are small and strongly fragrant, imparting what garden writer Louise Beebe Wilder calls a “heavy uninviting redolence.” A handsome variegated form is the preferred choice, the leaves puckering with a liberal splash of creamy yellow on the edge. Green reversions and the occasional all-yellow shoot need to be pruned out to maintain the clone.

A counterpoint to bittersweet is the more refined, but no less toxic, *S. jasminoides*, commonly called the potato vine. Clambering to 21 feet courtesy of twining leafstalks, *S. jasminoides* has willow-shaped leaves of a shiny forest green, one to three inches long. The older leaves usually develop compound lobes. The vine becomes frosted with branched clusters of one-inch flowers in late summer. The species’ flowers are white tinged with lilac or blue, but a chalk white cultivar, ‘Album’, is more commonly seen for sale. A handsome variegated form is also available, the leaf edges gilded with lime green and gold patterns. All bloom continuously until cold weather sets in. Native to Brazil, *S. jasminoides* is understandably tender above Zone 8 to 9, but warrants annual inclusion in any garden because the plants grow so easily from cuttings.

Another solanum vine easy to grow from cuttings is *S. crispum*. Hailing from the mild climate of Chile, *S. crispum* has slender leaves up to four and a half inches long with slightly wavy edges. Clusters of fra-



GREG CRISCI: PHOTOMATS

grant flowers—lilac-blue and topped with the typical cone of yellow stamens—appear at the ends of the new growth late in the summer. Semi-evergreen into Zone 9, *S. crispum* also has a slightly hardier (Zone 8) cultivar, ‘Glasnevin’, noted for its larger clusters of rich purple flowers. The 15-foot vine needs support and becomes semi-woody with age.

Other nightshade vines, widely cultivated in the tropics and hardy in Zone 10 or the greenhouse, are *S. seaforthianum* and *S. wendlandii*, both with lacy pinnate leaves. A winter bloomer, *S. seaforthianum* makes the more slender plant of the two, growing to 20 feet with clusters of up to one-inch flowers that vary from blue to white in color. *S. wendlandii* is broad growing, almost shrubby in appearance, its flowers lilac to purple and nearly two and a half inches across. In contrast to *S. crispum*, which benefits from a couple of years’ growth to show its true worth, both species will bloom in one season.

One of the best of the shrubby solanums is the sweetly scented *S. rantonnetii* ‘Royal Robe’ (reclassified as *Lycianthes rantonnei* but commonly sold by its former name), an improved color selection from the paler cultivar ‘Grandiflorum’. The semi-woody



JACK HENNING



DAVID CAVAGNARO

Known to everyone for their tubers, potato plants have fragrant pale pink flowers, above right, that create quite a spectacle in a farm field, top. You might want to grow *Solanum atropurpureum*, above left, for its deeply lobed foliage, but be wary of the yellow-tipped purple barbs that coat its stems and the undersides of its leaves.

stems of this sprawling Paraguayan native can arch up to six feet while along their length, clusters of satiny, dark purple, one-inch flowers open throughout the season. The four-inch-long oval leaves have a wavy surface. 'Royal Robe' is trainable into a large standard form. Imagine it as a riveting accent in the center of a yellow border. It's only hardy to Zone 9, but the softer new growth is readily rooted for seasonal use.

The shrubby kangaroo apple, *S. laciniatum*, is also suitable as an annual. Flaunting two-inch indigo flowers, *S. laciniatum* is equally noted for its handsome over-sized foliage. The stout purple-flushed stems bear shiny, deep green leaves that range from lance-shaped and smooth-edged to broadly oval with many deeply lobed divisions. These leaves can be up to a foot long and six inches wide. From a seedling, *S. laciniatum* will shoot up six to eight feet in one season, making a formidable backdrop for the lesser denizens of the garden. Its egg-shaped green fruits, once used by settlers of New Zealand to make preserves, mature to a yellow-orange.

Other solanums that impress are the prickly Mexican *S. lanceolatum*, a shrub that grows to eight feet in Zone 10 and

SOLANUMS TO SIDESTEP

Although most solanums are unlikely to become invasive in temperate climates, the genus has a few attributes that should make horticulturists and gardeners wary, notably the ability to produce large quantities of seeds packaged in attractive fleshy fruits that are popular with birds and small mammals.

A draft list of invasive exotic plants being compiled by the Exotic Pest Plant Council (EPPC) contains seven solanums, including bittersweet, *Solanum dulcamara*, which has shown invasive tendencies in natural areas and gardens in Maryland and Massachusetts. Other solanums considered invasive in temperate regions are *S. carolinense*, the horse nettle, native to the southeastern United States but listed as invasive in Iowa and Tennessee, and *S. rostratum*, buffalo-bur, native to Mexico and the southern United States but now listed as invasive in Idaho.

Of greatest concern at the moment, however, is *S. viarum*, the tropical soda apple. A shrubby perennial with nasty prickles, the soda apple apparently entered the United States in grass seed in the 1980s and is spreading rapidly in pastures in Florida and Mississippi, carried in the stomachs of cows or in bags of manure. The EPPC and other concerned groups are trying to get the plant listed as a noxious weed by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, so organized control measures can be instigated. The other solanums listed as invasive are *S. diphyllum*, *S. tampicense*, and *S. torvum*, all of which are problematic in Florida.

Although most of the preceding solanums would never be considered ornamental, the number of solanums on the invasive list indicates a genus with a built-in capacity to spread when conditions are right. —David J. Ellis, Assistant Editor

bears profuse lilac-blue flowers, and the mammoth *S. wrightii* (syn. *S. macranthum*) from Brazil. This bold treelike presence produces large purple flowers and grows up to 30 feet in the tropics, although it seldom reaches more than eight feet in the greenhouse. For western gardeners, the more diminutive two-foot *S. xantii* from California is a drought-tolerant shrubby perennial with purple to lavender flowers scented of wild roses. Another western native suitable for desert and semi-desert environments from California to New Mexico is *S. umbelliferum* var. *incanum*, a perennial that forms a mound of softly pubescent gray foliage with blue or occasionally white flowers.

The subshrub *S. quitoense* is native to mountain valleys of Colombia and Ecuador, where it is known familiarly as "naranjilla" (little orange). The four-to-six-foot plants bear small orange fruits with leathery, hair-covered skin and lime green flesh that yields a tart, refreshing juice. The plant has small white flowers but is more remarkable for its oversized leaves, which can reach 16 inches in diameter. Broad ovals that are lightly scalloped around the edges and covered with short velvety hairs, they are infused with a bluish lilac color and bright purple veins. Unfortunately, *S. quitoense* rarely fruits outside Zone 10 and is vulnerable to nematodes. It can be enjoyed from seed for one season as a foliage accent, the plants topping out at about

three feet by September.

Good foliage is also an attribute of *S. pyracanthum*. Its thistlelike wavy-edged leaves are narrow and about five inches long, a powdery blue on top and fuzzy white beneath. With conspicuous orange-yellow stems, rust-colored spines, and pale violet flowers, the plants lend themselves to an imaginative purple and orange border at Stonecrop Gardens in Cold Spring, New York, paired with statice, ornamental kale, and lace-foliaged marigolds. Native to tropical Africa, the five-foot *S. pyracanthum* acts as a biennial or short-lived perennial in Zone 10. Those growing it as an annual from a rooted cutting can expect two to three feet of growth in a summer.

Solanum atropurpureum also has distinguished foliage, its six-to-eight-inch leaves deeply lobed and glossy green. Its heavy armature, however, might only appeal to lovers of the perverse. Fierce-looking half-inch purple barbs with yellow tips bristle from the zigzag stems and run down the undersides of the leaf midribs. Be careful what you plant close at hand because the lethal spines will shred any neighbor that dares become intimate. A shower of tiny, pale yellow flowers dangle from the undersides of the branches, reveling in the heat of summer, then yielding to full clusters of gray-green marbles. The showy berries ripen to golden orange by October, making for an unusual autumn ornament.

Many solanums are grown for their or-

namental fruits, but care must be taken because some are highly toxic. Among these are *S. capsicastrum*, known as the false Jerusalem cherry, a shrubby plant that grows to two feet and bears white flowers and orange to scarlet egg-shaped fruit. The Jerusalem cherry, *S. pseudocapsicum*, grows to four feet with white flowers and globular yellow to scarlet fruit. A number of cultivars are available, and both plants are popular for winter color in the home.

Although many solanums have poisonous fruits, others, such as *S. quitoense* and *S. melongena*, the eggplant, have edible fruits that have been cultivated by many cultures. Some fruits are toxic when immature but become edible as they ripen—*S. melanocerasum*, the garden huckleberry, for example—but it is not advisable to test out this possibility unless you are certain which species you are dealing with.

The solanum that has achieved greatest commercial success is, of course, *S. tuberosum*, the potato. It is not prized for its fruits, which are poisonous, as are any green parts of the plant, but rather for its underground tubers. One of the most widely grown food crops in the world today, the potato supports a multimillion dollar industry in the United States alone. Its edibility is the result of human intervention—careful selection begun thousands of years ago by the natives of Peru and Bolivia. Some of the ancient varieties still cultivated by the Quechua and Aymara in the high Andes are bitter and slightly toxic and would be considered unpalatable by our standards. Older varieties have larger, more numerous flowers, once considered ornamental enough that Marie Antoinette used them as hair decorations, according to Milton Meltzer's 1992 book, *The Amazing Potato*.

Selection has also changed the eggplant considerably over the years. Believed to have originated in Sri Lanka or India, a wild form still found in Central Asia and Africa is a rather small affair with yellowish one-inch fruits, compared to taller modern forms. The bitter, toxic qualities of the wild-fruited eggplants, like those of the potato, have also been suppressed over time, and breeding has produced a diversity of fruit shapes, sizes, and colors. *S. melongena* var. *serpentinum* produces a peculiar long, slender fruit to 15 inches in length with a curled end, a form often seen in Asian markets. Pretty enough to use in a blue border, the cultivar 'Asian Bride' features violet flowers with white fruits flushed with lavender. A summer annual,



The ornamental red fruits of the Jerusalem cherry, above, make it a popular holiday house plant, but the tomatolike fruits are highly toxic. Commonly sold as *Solanum rantonnetii* but reclassified *Lycianthes rantonnetii*, the blue potato bush, left, is a tender perennial grown as an annual north of Zone 9.

the eggplant needs an especially warm season in order to fruit well.

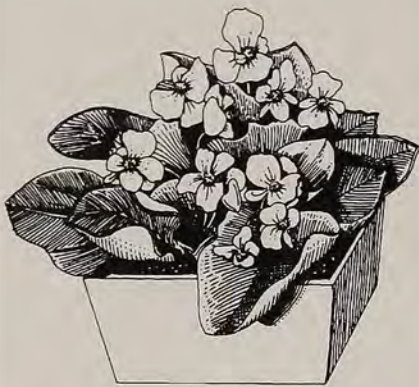
One is hard pressed to generalize the growing conditions for solanums as a whole, since the species come from such diverse backgrounds. Most of the more ornamental types, however, will benefit from being planted in a sunny spot in moist but well-aerated loam. A bit of afternoon shade may be welcome in southern states, as many of the climbing types tend to scorch in hot sun. Conversely, those planted in cooler northern climates will benefit from the use of southern walls to trap and store heat, ripening the plant stems for better bloom. Attention to watering is necessary in more arid areas or when growing solanums as pot plants. Overly dry conditions will be signaled by a profusion of yellowed leaves followed by dramatic leaf drop.

Whether grown for fruit, foliage, flower, or fragrance, the myriad solanums offer an enticing entrée for most any garden. Cast aside your doubts about this "shady" family and welcome the solanums into the light.

Jack Henning works for a landscape design company in New York City.

SOURCES

- Forestfarm, 990 Tetherow Road, Williams, OR 97544, (503) 846-6963. Catalog \$3. *Solanum crispum* 'Glasnevin' and *S. jasminoides* 'Variegatum' plants.
- Glasshouse Works, Church Street, P.O. Box 97, Stewart, OH 45778-0097, (614) 662-2142. Catalog \$2. *S. capsicastrum* 'Variegatum', variegated *S. dulcamara*, *S. jasminoides*, *S. jasminoides* 'Variegatum', and *S. quitoense* plants.
- J. L. Hudson, Seedsman, P.O. Box 1058, Redwood City, CA 94064. Catalog \$1. *S. atropurpureum*, *S. integrifolium*, *S. mammosum*, *S. melanocerasum*, *S. pseudocapsicum* 'Joker' and 'New Patterson', *S. seaforthianum*, and *S. xantii* seeds.
- Las Pilitas Nursery, Star Route BX 23X, Santa Margarita, CA 93453. Catalog \$6. *S. umbelliferum* var. *incanum* and *S. xantii* plants.
- Logee's Greenhouses, 141 North Street, Danielson, CT 06239. Catalog \$3. *S. jasminoides* 'Album' and *S. jasminoides* 'Album Variegatum' plants.
- Thompson & Morgan, Inc., P.O. Box 1308, Jackson, NJ 08257-0308, (908) 363-2225. Catalog free. *S. capsicastrum* and *S. seaforthianum* seeds.



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 LIF-er-um var. in-KAN-um
S. viarum S. vy-AH-rum
S. wendlandii S. wend-LAND-ee-eye
S. wrightii S. RIGHT-ee-eye
S. xantii S. ZAN-tee-eye
Solidago sempervirens sol-ih-DAY-go
 sem-per-VY-renZ
Sorghastrum nutans sorg-ASS-trum
 NOO-tanz
Spartina patens spar-TEE-nuh PAY-tenZ
S. pectinata S. pek-tih-NAY-tuh
Spathiphyllum spath-ih-FIL-lum
Spiraea alba spy-REE-uh AL-buh
S. albiflora S. al-bih-FLOR-uh
S. × arguta S. × ar-JOO-tuh
S. × bumalda S. × boo-MAL-duh
S. cana S. KAY-nuh
S. × cinerea S. × sih-NEE-ree-uh
S. corymbosa S. koh-rim-BOH-suh
S. douglasii S. dug-LASS-ee-eye
S. fritschiana S. frich-ee-AN-uh
S. hypericifolia S. high-per-ih-sih-FOH-lee-uh
S. japonica S. jah-PON-ih-kuh
S. nipponica S. nih-PON-ih-kuh
S. prunifolia S. prew-nih-FOE-lee-uh
S. salicifolia S. sal-iss-ih-FOE-lee-uh
S. tomentosa S. toh-men-TOH-suh
S. trichocarpa S. try-koh-KAR-puh
S. trilobata S. try-loh-BAY-tuh
S. × vanhouttei S. × van-HOO-tee-eye
Sporobolus heterolepis spor-OB-oh-lus
 heh-ter-oh-LEP-iss
Stipa comata STY-puh koh-MAH-tuh
S. spartea S. spar-TEE-uh
Tanacetum niveum tan-uh-SEE-tum
 NIV-ee-um
Tricyrtis hirta try-SUR-tiss HUR-tuh
Tridens flavus TRY-denz FLAY-vus
Trifolium stoloniferum try-FOE-lee-um
 stoh-lon-NIF-er-um
Trillium TRIL-ee-um
Vernonia noveboracensis vur-NO-nee-uh
 no-vay-bor-uh-CHEN-sis
Viola VY-oh-luh
Watsonia wot-SOW-nee-uh
Zantedeschia zan-tuh-DES-chee-uh
Zinnia angustifolia ZIN-ee-uh
 ang-gus-tih-FOE-lee-uh

ATTENTION, CALIFORNIA MEMBERS!

FREE tickets for the San Francisco Landscape Garden Show are available to members of the American Horticultural Society by calling AHS headquarters at (800) 777-7931.

The show is April 26-30 at the Festival Pavilion at Fort Mason Center.

AHS members may *not* be admitted free to the show by presenting their AHS membership cards, as was reported in the March *American Horticulturist*. We regret the error.



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I remember helping my mother in her garden when I was little. I was so proud.

Now, when my daughter, Alexandra, helps me in our garden,
I get that same wonderful feeling, like remembering a dream.

My mother let me feed her plants with Miracle-Gro, a cupful at a time.

Today, I wouldn't use anything else. Like mother used to say,
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