American

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an editorial. . . .

Where Do Flowers Come From?

Almost everyone of us has a world in his garden. Our marigolds, dahlias, cosmos, zinnias, and others come from Mexico and Central American countries. The mountains of China have sent us the regal lily, abelia, and various peonies, and from Japan we grow bleeding heart, the delightful Japanese iris, Japanese wisteria, flowering cherry, and Japanese azaleas. The jungles of South America have yielded morning glories, nasturtiums, cypress vine, canna, and the giant-leaved Victoria waterlily. Australia has sent strawflowers, Swan River daisies, blue lace-flower and eucalyptus. Africa's contributions include the pelargoniums (mistakenly called geraniums), gladiolus, the fringed hibiscus, gerbera, gazania, the African-violet which is not a violet and more. These lists are the merest suggestions of riches brought to our gardens from around the world. In most cases, plant collectors operating as individuals, sponsored by botanic gardens, plant societies, horticultural organizations, or wealthy individuals or governments have set out deliberately to explore a "new" area and to bring back seeds, cuttings, and plants for testing and research. The impatiens from New Guinea that you have read about in recent issues of *American Horticulturist* were brought to this country by plant explorers sponsored by the United States Department of Agriculture and by the Longwood Foundation. Our gardens are richer for this foray, and more fine ornamentals are to come as plant breeders work with this new germplasm to create exciting new cultivars.

Transport yourself mentally to the European gardening scene of the mid-1700's. Linneaus was writing vigorously, introducing a new system for classifying plants. His students, associates, and friends were bashing about distant continents in wooden ships sending home seeds, potted plants, and pressed specimens. European botanic gardens were avid for new, unknown plants from any source. What was one of those sources? It was that vast, newly colonized continent across the Atlantic known as North America. Plant collectors shipped over kalmia, named after Pehr Kalm, rudbeckia, commemorating Olof Rudbeck, collinsonia after Peter Collinson, gerardia, after the great plagerist John Gerarde, and so on and on. Not every new plant was named after a person—some took descriptive names, some geographic, and some were labeled with modifications of native names. A vast flow of plants travelled from North America to Europe for centuries—in fact, the migration still goes on. As the colonies developed in this country people put first things first and planted edibles, some brought from the Old Country, some picked up from friendly indians. As civilization gained a firm foothold there was time for culture, including horticulture. Early shipping invoices of cargo destined for Williamsburg show several annual and perennial ornamentals we still grow today.

And would you believe that some of the plants brought to those early American gardens were improved forms of native American species? This migration also still goes on. Examine the species in several catalogues of first class perennial gardens. You will find that something over fifty per cent of the cultivars trace their origins directly back to this country. We are getting blossoms that are bigger and better than those of their native parents. But in many cases we are getting weaker plants. There is a reason for this. Our American natives were taken to European botanic gardens to be coddled and cossetted. They grew, generation after generation, under the best of growing conditions in relatively mild climates and free of their native pests and diseases. Successive generations lost their toughness and resistance. Then, when the plants come home many generations later, having undergone considerable selection and breeding, they have a hard struggle with harsher North American climates and all the local pests and diseases.

Native American plants are getting scarce as undisturbed habitats diminish. When hurricane Donna swept across Florida a few years back it destroyed the habitat of a small native peperomia and the plant was thought extinct until numerous plants were located in amateur collections, and from these a "wild" population was reestablished. When Table Rock Lake flooded isolated valleys of the White River in southern Missouri at least two rare Ozark plant species were totally destroyed. As woodlands and meadows, mountains and prairies, are concreted over our native flora grows scarce. Where can these wildlings survive? Dr. Ritchie Bell says that the very best place is right where you find them. If that place is about to be stripped bare the next best place is a botanic garden or wildflower preserve where experts understand the requirements of these plants. Talented and knowledgeable amateur gardeners often do a good job of growing at least some of the native species. Unfortunately, many folks dig up native plants with little understanding of what it takes to keep the plants going, move them to their gardens, and lose them.

In this issue of *American Horticulturist* articles from experts on preserving, growing, and landscape gardening with native species, located in various parts of the country, inform us of some of the techniques that lead to successful garden manipulations with native plants. Botanically speaking, our native species have scarcely been exploited. Our wildflowers represent a vast reservoir of germplasm that, properly handled, will yield marvelous new cultivars for our beds and borders in years to come. Come to think of it, many of them make solid citizens in the landscape scheme "as is." Every blooming plant in the world is a potential garden treasure. We members of A.H.S. can take steps to insure the survival of valuable ornamental species in our various neighborhoods.—**JPB**

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IN THIS ISSUE

OUR COVER PHOTO—The soapwort gentian, *Gentiana saponaria*, is one of America's many beautiful native species. A.H.S. past-president Fred Galle took the photo at Callaway Gardens.

GRAPHICS: DOROTHY CHAISSON / PRINTING: GREINER-FIFIELD, KANSAS CITY, KANSAS

A Natural Wild Garden Built to Order

*Oliver J. Stark**

Photos courtesy of Bowman's Hill Preserve Committee, Washington Crossing Park, Pennsylvania

***Sagittaria cuneata*, arrowhead.**

How lovely, how quick, how easy to make a wild garden if we could choose the site. How perfect to have a wooded brookside with its stream flowing through a limestone valley from which a long established meadow and hayfield rise to another tree shaded edge atop a sour, stony knob. Such an ideal situation rarely occurs in newly carved suburbia or freshly renewed center city. Rubble, unwanted construction materials, waste mortar, and heaven only knows what kind of fill attend any construction. Lost top soil, subsoil compacted by recontouring and storm drains are the additional legacy of developments in the suburbs. What plants can face such inhospitality? How can the minimum plant needs be met to create any kind of landscape?

Our native plants have definite acidity preferences, definite moisture requirements and definite light intensity needs. The ideal we imagined provides the whole range from near neutral along the limestone to very sour (acid) atop the knob, wet along the stream to dry at the top, and deep shade in the woods to full sun in the meadow and hayfield. Long established, such soils are high in organic matter near the surface to provide a steady supply of mineral nutrients and

**Botanist, Bowman's Hill Preserve, Washington Crossing State Park, Washington Crossing, Pa. 18977.*

they retain moisture. Over all is a litter layer that holds the surface intact and keeps plant roots cool. Hundreds of species could thrive in such a garden.

Occurring naturally on slightly acid soils are walnuts, yellow and shingle oak, bladdernut, beaked hazelnut, ginseng, mitrewort, shooting star, white adder's tongue, nodding trillium, rue anemone, spring larkspur, queen slipper, yellow lady's-slipper and fringed orchid. As acidity increases, these disappear. The host of others that grow on moderately acid soils, such as the tulip poplar, spicebush and mayapple, continue until the acidity becomes too strong for them and right for the true acid lovers. Here we find spanish and chestnut oak, holly, pinxter bloom, chokeberry, blueberry, pink lady's-slipper, arbutus, eastern lupine, fringetip closed gentian, Aaron's rod and pink catchfly.

Wet soils accommodate marsh marigold, marshmallow, buttercup, lizard's tail, cardinal flower, skunk cabbage, white hellebore, oswego tea and swamp milkweed. At the dry end of the spectrum we find arrowleaf violet, blue curls, stone mint, blazing star, many goldenrods and asters, lavender bergamot and mountain-mint.

Good soils, well supplied with nutrients, provide stands of woodland phlox, giant trillium, Virginia bluebells, Greek valerian, woodland starwort, dutchmen's breeches, black cohosh, giant solomon's seal, queen of the meadow, summer phlox, closed gentian, sundrop, jack-in-the-pulpit and bloodroot. Often the good soils are associated with abundant moisture and little acidity, but not always. Similarly, poor soils are often sour and very

SELECTED EASTERN AMERICAN PLANTS, noted with their design characteristics, and arranged according to their main habitat requirements.

(Flowering times are based on the Philadelphia area. Moisture condition is based on water supply in the summer months. Likewise, light conditions are based on summer levels. Acidity given is the preferred range. These data are all subjective averages based on field observations. The range in each category is wide. Most plants have considerable adaptability. These classifications are not fixed slots that must be followed without change.)

Abbreviations are as follows: roman numerals under Bloom indicate months, e.g., V = May; Capital letters under Color indicate, W = white, Y = yellow, G = green, L = lavender, C = cream, R = rose (also pink), B = blue, P = purple, O = orange, R = red; Height and Spread figures are given approximately in inches; Form symbols are: ▮ = rectangular, ▽ = fan, | = linear, ● = globular, — = horizontal, ⋎ = vase, ◡ = bowl; Line symbols are: || = vertical, v = intermediate, ⌒ = arching, ⌒ = curving, ⌐¬ = horizontal; Texture symbols are: ▒ = fine, ▒ = medium, ▒ = coarse.

DRY

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
Deep Shade pH 4.0-5.0 Usually open, peatty or sandy soils							
Chimaphila maculata, Pipsissewa	VI	W	4	colony	▮	v	▒
Gaultheria procumbens, Teaberry	VI	W	3	colony	▮	v	▒
Light Shade pH 4.0-5.0 Usually open, sandy or shaley soils							
Asclepias quadrifolia, Whorled Milkweed	V	W	24	8	▮	||	▒
Baptisia tinctoria, False Indigo	VII	Y	36	18	▽	⌒	▒
Comptonia peregrina, Sweet-fern	V	G	30	18	▮	⌒	▒
Hieracium venosum, Rattlesnake-weed	VI	Y	18	6	|	||	▒
Hypoxis hirsuta, Stargrass	V	Y	8	4	▮	⌒	▒
Solidago bicolor, White Goldenrod	IX	W	24	6	|	||	▒
Stokesia laevis, Stokesia	VI	L	18	18	●	⌒	▒
Tephrosia virginiana, Goat's-rue	VI	C&R	18	24	▮	v	▒
pH 5.0-6.0 Usually open, but finer textured soils							
Agrimonia parviflora, Agrimony	VIII	Y	24	12	▮	⌒	▒
Aquilegia canadensis, Columbine	V	Y&R	15	10	▮	v	▒
Arabis laevigata, Rock-cress	IV	W	4	6	▮	⌐¬	▒
Aralia nudicaulis, Wild Sarsaparilla	VI	G	30	18	▮	⌒	▒
Asclepias purpurascens, Purple Milkweed	VI	P	30	10	▮	⌐¬	▒
Baptisia australis, Blue False Indigo	V	BL	36	30	▮	v	▒
B. leucophaea, Large-bracted False Indigo	VI	C	24	30	—	⌒	▒
Campanula rotundifolia, Harebell	VI	BL	12	6	▮	||	▒
Chrysogonum virginianum, Chrysogonum	V	Y	8	12	▮	⌐¬	▒
Collinsia verna, Blue-eyed Mary	IV	W&B	12	4	▮	||	▒
Collinsonia canadensis, Horse-balm	VIII	Y	36	24	▮	v	▒
Gillenia trifoliata, Bowman's Root	VII	W	30	24	▽	⌒	▒
Heuchera americana, Alum-root	V	G	20	12	▮	||	▒
Krigia biflora, Dwarf-dandelion	VI	O	18	8	▮	v	▒
Polygala paucifolia, Fringed Polygala	V	R	3	colony	▮	⌐¬	▒
Scutellaria incana, Hoary Skullcap	VII	L	30	20	▮	v	▒
Sedum ternatum, Wild Stonecrop	V	W	4	colony	▮	⌐¬	▒
Silene stellata, Starry Campion	VII	W	24	10	▮	v	▒
pH 6.0-7.0 Usually open, but finer textured soils							
Dicentra canadensis, Squirrel-corn	IV	W	8	6	●	v	▒
Jeffersonia diphylla, Twinleaf	IV	W	12	8	▮	v	▒
Mitella diphylla, Coolwort	V	W	12	4	▮	||	▒
Phlox ovata, Mountain Phlox	VI	L	12	6	▮	v	▒
Scutellaria elliptica, Hairy Skullcap	VI	BL	24	6	▮	v	▒
Sun pH 4.0-5.0 Usually open, but finer textured soils, sometimes as "barrens"							
Anaphallis margaritacea, Pearly Everlasting	VIII	W	18	10	▮	v	▒
Antennaria neglecta, Pussy's-toes	V	W	4	colony	▮	⌐¬	▒
Apocynum androsaemifolium, Spreading Dogbane	VII	R	30	12	▮	v	▒
Artemesia stellariana, Beach Wormwood	VIII	Y	15	20	◡	⌒	▒

***Polygala paucifolia*, gaywings.**

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
Asclepias tuberosa, Butterfly-weed	VII	O	24	12		V	
Aster linariifolius, Narrow-leaf Aster	IX	L	24	18		V	
A. spectabilis, Showy Aster	IX	L	24	24		V	
Boltonia asteroides, Boltonia	VIII	L	48	24		II	
Cassia fasiculata, Partridge-pea	VII	Y	15	8		V	
Chrysopsis mariana, Golden-aster	VIII	Y	18	10			
Hedeoma pulegioides, Mock Pennyroyal	VIII	L	12	4		V	
Helianthemum canadense, Frostweed	VIII	Y	12	6		V	
Lespedeza capitata, Bush-clover	VIII	W	36	12		II	
Liatris graminifolia, Blazing Star	VII	RL	36	6		II	
Lupinus perennis, Wild Lupine	V	B	20	24			
Monarda punctata, Horsemint	VIII	L	24	8		V	
Parthenium integrifolium, Wild-quinine	VIII	W	48	30		V	
Sericocarpus linifolius, White-topped-aster	VII	W	15	6		V	
Silene caroliniana, Carolina Catchfly	V	R	6	6		V	
Trichostema dichotomum, Bastard Pennyroyal	VIII	L	10	4		V	
Viola sagittata, Arrow-leaved Violet	V	V	6	4		V	
pH 5.0-6.0 Usually open, but finer textured soils, sometimes as "barrens"							
Aster patens, Spreading Aster	IX	B	30	15		V	
Cassia hebecarpa, Wild Senna	VII	O	60	30		V	
Cerastium arvense, Field-chickweed	V	W	15	8			
Corydalis flavula, Yellow-harlequin	IV	Y	10	6		V	
Cunila origanoides, Common Dittany	IX	L	15	12		V	
Eupatorium perfoliatum, Thoroughwort	IX	W	50	20		V	
Euphorbia corollata, Flowering Spurge	VIII	W	30	12		II	
Helianthus giganteus, Giant Sunflower	VIII	Y	70	30		V	
H. tuberosus, Jerusalem-artichoke	VIII	Y	48	20		V	
Liatris spicata, Gayfeather	VIII	RL	30	12		II	
Lysimachia quadrifolia, Whorled Loosestrife	VI	Y	24	12		V	
Monarda fistulosa, Wild-bergamot	VII	L	48	18		V	
Oenothera missouriensis, Missouri Evening-primrose	VI	Y	15	18		V	
Opuntia humifusa, Prickly-pear	VI	Y	12	24			

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
Penstemon hirsutus, Beard-tongue	V	L	18	12			
Phlox subulata, Moss Phlox	V	R	8	colony			
Pycnanthemum incanum, Gray Mountain-mint	VIII	W	24	12			
Rudbeckia deamii, Deam's Coneflower	VII	Y	30	18			
R. laciniata, Wild Golden-glow	VIII	Y	60	24			
Rudbeckia triloba, Small Coneflower	IX	Y	30	12			
Ruellia strepens, Wild-petunia	VII	L	15	10			
Talinum teretifolium, Fameflower	VI	R	8	4			
pH 6.0-7.0 Usually open, but fine textured soils							
Corydalis sempervirens, Rock-harlequin	V	R	24	18			
Echinacea purpurea, Purple Coneflower	VI	R	30	20			
Liatris scariosa, Blazing Star	VIII	RP	36	18			
Lithospermum canescens, Puccoon	VI	Y	20	8			
Opuntia calcicola, Prickly-pear	VI	Y	12	24			
Penstemon grandiflorus, Beard-tongue	VI	L	30	10			
Phacelia dubia, Scorpion-weed	VI	L	6	4			
Sedum telephioides, Stonecrop	VIII	R	15	18			
Silphium perfoliatum, Cup-plant	VII	Y	80	50			
Verbena bipinnatifida, Dakota Verbena	VI	L	18	24			
MOIST							
Deep Shade pH 4.0-5.0 Usually open, peaty, cold soils							
Clintonia borealis, Bluebead-lily	VI	Y	12	12			
Cornus canadensis, Bunch-berry	VI	W	6	colony			
Dentaria laciniata, Toothwort	IV	R	15	6			
Disporum lanuginosum, Yellow Mandarin	V	Y	20	16			
Galax aphylla, Wandflower	V	W	10	colony			
Goodyera pubescens, Rattlesnake-plantain	VII	W	4	6			
Hepatica americana, Liverleaf	IV	L	8	6			
Linnea borealis, Twin-flower	VI	R	4	colony			
Maianthemum canadensis, False Lily-of-the-valley	V	W	6	colony			
Medeola virginiana, Indian Cucumber-root	V	Y	12	6			
Melanthium virginicum, Bunchflower	VI	C	24	12			
Mitchella repens, Partridge-berry	VI	W	2	colony			
Oxalis montana, Wood-sorrel	VI	L	8	4			
Polygonatum biflorum, Solomon's-seal	V	G	24	12			
Pyrola secunda, One-sided Wintergreen	VI	W	10	4			
Saxifraga virginiensis, Early Saxifrage	IV	W	10	4			
Shortia galacifolia, Oconee Bells	IV	W	8	10			
Smilacina stellata, False Solomon's-seal	V	W	18	6			
Streptopus roseus, Rose Mandarin	V	R	15	12			
Tiarella cordifolia, Foamflower	V	W	12	colony			
Tipularia discolor, Cranefly Orchis	VIII	R	15	4			
Trientalis borealis, Star-flower	V	W	15	6			
Trillium undulatum, Painted Trillium	V	WR	12	6			
Viola blanda, White Violet	V	W	6	colony			
V. rotundifolia, Yellow Violet	V	Y	6	colony			
pH 5.0-6.0 Usually rich soils with high humus levels							
Actaea pachypoda, White Baneberry	V	W	30	18			
Allium tricoccum, Wild-leek	VIII	W	15	3			
Aralia racemosa, Spikenard	VII	G	36	20			
Arisaema triphyllum, Jack-in-the-pulpit	V	G	18	12			
Asarum canadense, Wild-ginger	V	P	6	colony			
Chimaphila umbellata, Pipsissewa	VII	R	10	colony			
Cimicifuga americana, American Baneberry	V	W	48	20			
C. racemosa, Black Cohosh	VII	W	48	20			
Claytonia caroliniana, Spring Beauty	IV	R	6	4			
C. virginica, Spring Beauty	IV	R	6	4			
Dentaria diphylla, Toothwort	IV	W	10	4			
Dicentra cucullaria, Dutchman's-breeches	IV	W	10	4			
Erythronium americanum, Yellow Trout-lily	IV	Y	8	4			
Geum canadense, Avens	VI	W	15	8			
Habenaria psycodes, Small Purple-fringed Orchis	VII	RP	20	6			
Hydrophyllum canadense, Waterleaf	VI	W	15	12			

dry or wet, but not always. Poor lands are homes for hepatica, windflower, bird's-foot violet, golden aster, stiff aster, columbine, stonecrop and pennyroyal.

The newly made suburban plot or center city garden often has raw ground with little organic matter, no natural litter, limited acidity and moisture ranges, and no shade other than that cast by neighboring buildings. Further, exposure to sun and drying wind is severe. To provide even minimum growing conditions in such a situation, adjustments are necessary. Any kind of organic matter as a mulch will duplicate the litter layer, but a test is necessary to determine the soil acidity and nutrient level. For a small fee your county extension service will test your soil samples, or you can do your own with a kit sold in many garden centers. Before any amendments are made, the type of soil should be identified. Some idea of this can be gained by excavating a vertical sided trench about two feet deep and examining the exposed layers. (This may also show what happened to your top soil!) Feel the fineness or grittiness of each layer and examine with a hand lens the spread of particle size. Very fine, floury soils are likely clay, very fine grittiness indicates silt, and course grittiness shows sand. Clays retain water and drain very slowly, but more open soils may have poor drainage from puddling of the surface or compaction of the subsoil. You can make some guess about speed of percolation by observing how long puddles remain in low spots after a rain of an inch or more when the ground is already moist. A two-day puddle would indicate poor drainage, a problem for many plants.

***Podophyllum peltatum*, mayapple.**

Once you have a fairly good assessment of your soil, there are several possible actions to follow. You may decide to work with conditions just as they are and select plants accordingly. If site and soil are too limiting, you can expand the choice of plant materials with relatively simple alterations. You may want some wet land plants but have only sandy, well drained soil. A tub set in below ground level with surface drainage directed to it will accommodate arrowroot, pickerelweed, arrow-arum, cattails and lizard's-tail. Two parts of sedge peat mixed with one of fine sand, supplemented with a three-inch pot of bone meal per cubic foot, is a good mixture for these. The same arrangement, but using sphagnum peat instead and no fertilizer supplement, will give proper conditions for bog plants—goldenclub, pitcher-plant, meadow beauty, lance-leaf violet and golden milkwort. Limey bogs are a fascinating anomaly with interesting plants growing in them. If you want to accommodate nodding lady-tresses, grass-of-parnassus, purple avens, spreading globeflower and fringed gentian, add one four inch pot of limestone chips per cubic foot to the mixture described for arrowroot.

Perhaps your soil is too wet for most species. Any arrangement to elevate growing areas eight to twelve inches above the surrounding ground will provide sufficient drainage. In the raised beds use two parts of good top soil, one part of leafmold or sedge peat, and one part coarse sand as a growing medium for the plants preferring a medium acidity range. For those that grow naturally

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
H. virginianum, John's-cabbage	V	W	12	10	▮	V	
Liparis lilifolia, Lilia-leaved Twayblade	VI	L	10	8	▮	⟙	
Mertensia virginica, Virginia Bluebells	IV	B	24	12	▮	V	
Monotropa uniflora, Indian-pipe	VII	W	10	4	▮	||	
Oxalis violacea, Violet Wood-sorrel	V	RL	10	6	▮	V	
Pedicularis canadensis, Lousewort	V	YG	15	12	●	V	
Podophyllum peltatum, Mayapple	V	W	18	colony	▮	—	
Polygonatum canaliculatum, Solomen's-seal	VI	W	36	20	▽	⟙	
Pyrola rotundifolia, Wild Lily-of-the-valley	VI	W	10	5	▮	V	
Saxifraga pensylvanica, Swamp Saxifrage	V	G	30	8	▮	||	
Scutellaria incana, Hoary Skullcap	VII	BL	30	16	▮	V	
Smilacina racemosa, False Solomon's-seal	VI	W	24	16	▽	⟙	
Stellaria pubera, Star-chickweed	V	W	10	8	▮	V	
Stylophorum diphyllum, Celandine-poppy	IV	Y	18	18	▮	V	
Trillium cuneatum, Trillium	IV	P	12	8	▮	V	
T. luteum, Yellow Trillium	IV	Y	12	8	▮	V	
Valeriana pauciflora, Valerian	VI	L	18	6	▮	||	
Viola affinis, Violet	V	V	10	14	▮	—	
V. canadensis, Tall White Violet	V	W	12	8	▮	V	
V. hastata, Halberd-leaved Yellow Violet	V	Y	8	4	▮	V	
V. hirsutula, Violet	IV	V	6	3	▮	V	
V. pensylvanica, Smooth Yellow Violet	IV	Y	12	8	▮	V	
pH 6.0-7.0 Usually rich soils with high humus levels							
Aconitum uncinatum, Wild Monkshood	IX	V	12	36	▮	—	
Actaea rubra, Red Baneberry	V	W	24	15	▮	V	
Anemonella thalictroides, Rue-anemone	IV	W	6	4	▮	V	
Caulophyllum thalictroides, Blue Cohosh	V	Y	24	15	▮	V	
Erigenia bulbosa, Harbinger-of-spring	III	W	3	2	▮	V	
Erythronium albidum, White Dogtooth-violet	IV	W	8	4	▮	⟙	
Hepatica acutiloba, Liverleaf	IV	L	10	8	▮	V	
Hydrastis canadensis, Golden-seal	V	W	18	10	▮	V	
Orchis spectabilis, Showy Orchis	VI	R	10	8	▽	⟙	
Panax quinquefolius, Ginseng	VI	G	18	12	▮	V	
Polygala senega, Seneca-snakeroot	VI	W	12	4	▮	||	
Polygonatum pubescens, Solomon's-seal	V	G	24	12	▽	⟙	
Trillium cernuum, Nodding Trillium	V	W	12	8	▮	V	
T. grandiflorum, Large-flowered Trillium	V	W	15	8	▮	V	
T. nivale, Snow Trillium	III	W	4	3	▮	V	
T. stylosum, Trillium	V	R	15	8	▮	V	
Viola conspersa, American Dog-violet	V	L	6	4	▮	V	
V. rostrata, Long-spurred Violet	V	L	6	4	▮	V	
V. triloba, Three-lobed Violet	V	V	12	6	▮	V	
Light Shade pH 4.0-5.0 Usually open sandy or gravelly soils							
Amianthium muscaetoxicum, Fly-poison	V	W	36	10	▮	||	
Anemone quinquefolia, Wood-anemone	IV	W	3	colony	▮	—	
Aster macrophyllus, Large-leaved Aster	IX	BL	48	20	▮	V	
A. novi-belgii, New York Aster	IX	BL	30	16	▮	V	
Calopogon pulchellus, Grass-pink	VI	R	24	4	▮	||	
Cypripedium acaule, Common Lady's-slipper	V	R	15	6	▮	||	
Dalibarda repens, Star-violet	VI	W	4	colony	▮	—	
Epigaea repens, Trailing Arbutus	IV	W	4	colony	▮	—	
Gentiana andrewsii, Andrew's Gentian	IX	B	15	10	▬	⌒	
G. linearis, Narrow-leaved Gentian	VIII	B	15	10	▬	⌒	
G. saponaria, Soapwort Gentian	IX	B	18	8	▮	V	
Geum aleppicum v. *strictum*, Avens	VI	Y	15	6	▮	V	
Houstonia serpyllifolia, Thyme-leaved Bluet	VI	L	2	colony	▮	—	
Iris verna, Dwarf Iris	V	V	6	3	▮	||	
Lilium philadelphicum, Wood Lily	VII	O	24	8	▮	||	
Rhexia mariana, Meadow-beauty	VIII	L	24	8	▮	V	
pH 5.0-6.0 Usually rich soils with high humus levels							
Allium cernuum, Nodding Onion	VII	L	18	6	▮	||	
Amsonia tabernaemontana, Blue Star	V	B	30	18	▮	V	
Anemone virginiana, Thimbleweed	VI	W	30	12	▮	||	

on slightly acid soils, add one four-inch pot of limestone chip per cubic foot. For a very acid growing mixture, use equal parts of white sand-box sand (New Jersey silica sand, *not* gypsum sand), sphagnum peat, and sandy loam. If you wish to grow the rock outcrop and "barrens" plants, available nutrient supply is drastically reduced by adding large amounts of inert material. For slight acidity, use twenty parts of the limestone chip to one of the slightly acid mix described above; for medium acidity, twenty parts of shale chip to one of the medium mix; for strong acidity, twenty parts of quartz gravel to one of the very acid mix. Even on well drained soils, barrens plants should be in elevated beds. Growing areas of widely differing soil reactions are best maintained by using some impervious material between them so that leaching and worm activity do not blend the growing mixes.

Soil reaction on large areas is changed by broadcasting ground limestone to decrease acidity or ground sulfur to increase acidity. Work these materials into the top inch or so of soil. Use three and one-half pounds of limestone per 100 square feet on sandy soils, five pounds on silts and loams, and seven on clay and clay loams. Sulfur is spread at one pound per 100 square feet on sands, one and one-half pounds on silts, and two on clays. These rates will change the pH one whole number value, e.g. from pH 5.5 to 6.5. Do not use more than those quantities in one year.

The north side of a building, solid fence, or hedge will give the proper light levels for plants that grow in light shade. Those that prefer heavy shade need the sky light cut off as well. Until trees grow, allow

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
Angelica triquinata, Filmy Angelica	VIII	W	36	24			
Arisaema dracontium, Green Dragon	V	G	18	10			
Aruncus dioicus, Goat's Beard	VI	W	60	30			
Cardamine bulbosa, Spring-cress	V	W	12	6			
Clintonia umbellulata, Speckled Wood-lily	V	W	10	8			
Cypripedium calceolus v. *parviflora*, Small Yellow Lady's-slipper	V	Y	18	8			
Dicentra eximia, Turkey-corn	V	R	18	15			
Eupatorium rugosum, White Snakeroot	IX	W	30	18			
Filipendula rubra, Queen-of-the-prairie	VI	R	40	18			
Gentiana clausa, Bottle-Gentian	IX	B	18	12			
Geranium maculatum, Wild Cranesbill	V	L	24	12			
Habenaria ciliaris, Fringed Orchis	VII	O	15	6			
Houstonia caerulea, Quaker-ladies	IV	L	4	3			
H. purpurea, Bluet	V	BL	18	10			
Lilium superbum, Turk's-cap Lily	VII	O	70	15			
Lobelia cardinalis, Cardinal-flower	VIII	R	36	6			
Marshallia grandiflora, Barbara's-buttons	VI	L	16	10			
Meehania grandiflora, Meehania	V	L	6	colony			
Monarda didyma, Bee-balm	VII	R	48	12			
Osmorhiza claytonia, Sweet Cicily	VI	W	24	8			
Penstemon barbatus, Beard-tongue	VI	R	48	30			
Phlox divaricata, Blue Phlox	IV	BL	15	8			
P. maculata, Wild Sweet William	VI	R	30	10			
P. paniculata, Fall Phlox	VII	R	50	20			
P. stolonifera, Creeping Phlox	V	R	6	colony			
Physostegia virginiana, False Dragonhead	VIII	L	30	15			
Polemonium reptans, Jacob's Ladder	V	BL	15	10			
Salvia lyrata, Cancer-weed	VI	V	24	8			
Scutellaria serrata, Saw-tooth Skullcap	VI	P	20	14			
Scrophularia lanceolata, Figwort	VI	Y	36	16			
Senecio aureus, Golden Ragwort	V	O	24	12			
Silene virginica, Fire-pink	V	R	18	12			
Solidago caesia, Blue-stem Goldenrod	IX	Y	28	12			
Thalictrum dioicum, Early Meadow-rue	V	P	28	12			
Tradescantia virginiana, Snake-weed	VI	B	24	12			
Trillium erectum, Stinking Benjamin	IV	P	12	8			
Veratrum viride, White-hellebore	V	G	50	24			
Veronicastrum virginicum, Culver's-root	VIII	W	36	24			
Viola striata, Cream-violet	IV	W	12	6			
Waldsteinia fragrarioides, Barren-strawberry	V	Y	4	colony			

pH 6.0-7.0 Usually rich soils with high humus levels

Aplectrum hyemale, Putty-root	VI	L	10	3			
Chamaelirium luteum, Devil's-bit	V	W	30	12			
Cynoglossum virginianum, Wild Comfrey	V	B	24	12			
Cypripedium calceolus v. *pubescens*, Large Yellow Lady's-slipper	V	Y	24	12			
Delphinium tricorne, Dwarf Larkspur	V	V	15	6			
Dodecatheon meadia, Shooting Star	V	L	16	4			
Geranium robertianum, Herb-robert	V	R	12	10			
Lilium canadense, Meadow Lily	VI	O	60	15			
Lobelia siphilitica, Great Lobelia	VIII	BL	30	15			
Panax trifolius, Dwarf Ginseng	IV	W	8	5			
Sanguinaria canadensis, Bloodroot	IV	W	12	8			
Senecio obovatus, Ragwort	V	Y	24	12			
Triosteum aurantiacum, Wild Coffey	VI	Y	36	12			
Uvularia grandiflora, Merry Bells	V	Y	24	10			
Xanthorhiza simplicissima, Shrub-yellowroot	V	Y	30	18			

Sun pH 4.0-5.0 Soils often sandy or gravelly

Epilobium angustifolium, Fireweed	VIII	P	30	10			
Potentilla tridentata, Cinquefoil	VI	W	6	colony			
Solidago puberula, Goldenrod	IX	Y	24	10			
S. sempervirens, Seaside Goldenrod	IX	Y	48	18			
Viola pedata, Bird's-foot Violet	V	L	4	3			

Trientalis americana, **starflower.**

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
pH 5.0-6.0 Usually rich soils with high humus levels							
Actinomeris alternifolia, Wing-stem	VIII	Y	70	36	▮	V	
Allium canadense, Wild Garlic	V	W	15	6	▮	V	
Anemone canadensis, Anemone	VI	W	18	colony	▮	V	
Aster novae-angliae, New England Aster	IX	P	48	18	▮	V	
Coreopsis tripteris, Tall Coreopsis	VIII	Y	70	30	▮	V	
Elephantopus carolinianus, Elephant's-foot	VIII	BL	24	18	▮	V	
Eupatorium coelestinum, Mistflower	VIII	B	36	18	▮	V	
E. fistulosum, Joe Pye-weed	IX	P	70	30	▮	V	
Helenium autumnale, Sneezeweed	VIII	Y	36	12	▮	V	
Heliopsis helianthoides, Ox-eye	VIII	Y	48	20	▮	V	
Heracleum maximum, Cow-parsnip	VI	W	70	30	▮	||	
Hypericum pyramidatum, Great St. John's-wort	VI	Y	50	30	▮	||	
Iris cristata, Crested Dwarf Iris	V	B	8	colony	▮	⌐¬	
Lysimachia punctata, Garden Loosestrife	VI	Y	24	18	◡	◠	
Oenothera perennis, Evening-primrose	VI	Y	24	12	▮	V	
O. tetragona, Sundrops	VI	O	24	12	▮	V	
Phlox pilosa, Prairie Phlox	VI	R	18	10	▮	V	
Rudbeckia hirta, Black-eyed Susan	VII	Y	24	12	▮	V	
R. laciniata, Wild Golden-glow	VIII	Y	70	30	▮	V	
Sisyrinchium angustifolium, Blue-eyed Grass	V	B	12	4	▮	||	
Solidago speciosa, Showy Goldenrod	IX	Y	50	24	▮	V	
Specularia speculum-veneris, Venus's Looking Glass	VI	L	18	6	▮	||	
Thalictrum polygamum, Tall Meadow-rue	VI	W	50	18	▮	||	
Thermopsis caroliniana, Bush-pea	VI	Y	50	18	▮	||	
Verbena hastata, Vervain	VIII	P	50	24	▮	||	
Vernonia noveboracensis, Ironweed	VIII	P	40	24	▮	V	
Zizia aurea, Golden Alexanders	V	Y	36	24	▮	V	

some branches from nearby shrubs or hedge to overhang the shade lovers. Lacking this, use netting or slatting above them or a network of prunings pushed into the soil so that the branches overhang. Remember that light in the temperate deciduous forest is almost as intense as on open ground before leaves begin to grow in early spring. By the first of june these light levels have diminished to less than ten per cent of the earlier value. Therefore, shade must be provided after this time for the early flowering woodland plants which continue growth —trillium, bloodroot, mayapple, jack-in-the-pulpit and ginger.

The accompanying tables provide information on acidity preferences, moisture requirements and necessary light levels. All the plants listed are available from reputable dealers, plant societies, or are generally grown by wildflower enthusiasts. Within the large metropolitan complexes, native plants are too limited now to permit collecting from the wild except in front of the bulldozer blade.

Successful plantings are the building blocks of a landscape. The theme of the landscape should fit its setting. For example, a bog is out of place on a windswept knob, unless as the Japanese do, a whole grand vista is recreated in miniature. For the landscape to be satisfying, elements of design need consideration. Centers of interest, movement and rhythm, unity, and balance make the esthetic impact. Color, time of bloom, aspect, texture, line and form of the individual species used are arranged to accomplish these four ends. Providing for plant needs in a satisfying design creates a natural landscape.

NAME	BLOOM	COLOR	HEIGHT	SPREAD	FORM	LINE	TEXTURE
pH 6.0-7.0							
Gerardia purpurea, Gerardia	IX	P	30	18	▽	⟙	▒▒
Sabatia angularis, Bitter-bloom	VIII	R	24	10	▮	||	▒▒
WET							
Deep Shade pH 4.0-5.0 Usually cold, peatty northern soils							
Arisaema stewartsonii, Jack-in-the-pulpit	VI	W	8	3	▽	⟙	▒▒
Coptis groenlandica, Goldthread	VI	W	4	colony	▮	⌒	▒▒
Gaultheria hispidula, Creeping Snowberry	V	W	3	colony	▮	⌒	▒▒
Smilacina trifolia, False Solomon's-seal	VI	W	6	4	▮	||	▒▒
pH 5.0-6.0							
Symplocarpus foetidus, Skunk-cabbage	III	P	24	24	▽	⟙	▒▒
Light Shade pH 4.0-5.0 Usually peat bogs and wet, sphagnous areas							
Arethusa bulbosa, Swamp-pink	V	R	8	4	▮	||	▒▒
Calla palustris, Wild Calla	VII	W	8	4	▽	⟙	▒▒
Drosera intermedia, Sundew	VII	W	3	2	●	⌒	▒▒
Iris prismatica, Slender Blue Flag	VI	BL	20	12	▮	||	▒▒
Mimulus ringens, Monkey-flower	VII	L	30	10	▮	||	▒▒
Pogonia ophioglossoides, Pogonia	VI	R	18	6	▮	||	▒▒
Sanguisorba canadensis, Canadian Burnet	VIII	W	40	18	▮	V	▒▒
Sarracenia flava, Huntsman's-horn	VI	Y	28	8	▮	||	▒▒
S. purpurea, Pitcher-plant	V	P	10	12	▬	⌒	▒▒
Spiranthes cernua, Ladies'-tresses	VIII	W	15	5	▮	V	▒▒
Viola primulifolia, Primrose-leaved Violet	V	L	8	5	▮	V	▒▒
pH 5.0-6.0 Usually rich, wet meadows							
Caltha palustris, Marsh-marigold	IV	Y	15	12	▮	V	▒▒
Chelone glabra, Snakehead	VIII	W	36	24	▮	V	▒▒
Cicuta maculata, Water-hemlock	VII	W	48	20	▮	V	▒▒
Impatiens capensis, Jewelweed	VI	O	48	20	▮	V	▒▒
I. pallida, Pale Jewelweed	VII	Y	48	20	▮	V	▒▒
Iris versicolor, Blue Flag	V	BL	30	15	▽	⟙	▒▒
Ranunculus septentrionalis, Swamp Buttercup	V	Y	12	colony	▮	⌒	▒▒
Saururus cernuus, Lizard's-tail	VII	W	24	10	▮	||	▒▒
Sun pH 4.0-5.0 Usually peat bogs and wet, sphagnous areas							
Aletris farinosa, Unicorn-root	VI	W	24	10	▽	||	▒▒
Habenaria blephariglottis, White Fringed Orchis	VI	W	30	10	▮	||	▒▒
Nymphaea odorata, Fragrant Water-lily	VII	W	8	colony	▮	⌒	▒▒
Polygala lutea, Yellow Milkwort	VI	O	10	4	▮	V	▒▒
Rhexia virginica, Meadow-beauty	VIII	R	24	12	▮	V	▒▒
Stenanthium gramineum, Featherbells	VII	W	30	15	▮	V	▒▒
Viola lanceolata, Lance-leaved Violet	V	W	6	4	▮	V	▒▒
Xyris caroliniana, Yellow-eyed Grass	VII	Y	18	6	▮	||	▒▒
pH 5.0-6.0 Usually rich, wet meadows or ponds							
Acorus calamus, Sweetflag	V	G	30	12	▽	⟙	▒▒
Asclepias incarnata, Swamp Milkweed	VII	R	36	24	▮	V	▒▒
Camassia scilloides, Wild-hyacinth	V	B	18	5	▽	V	▒▒
Hibiscus palustris, Marsh-mallow	VII	P	50	30	▮	V	▒▒
Iris pseudacorus, Yellow Iris	V	Y	30	15	▽	⟙	▒▒
Peltandra virginica, Arrow-arum	V	G	18	8	▮	||	▒▒
Pontedaria cordata, Pickerelweed	VII	B	24	12	▮	||	▒▒
Sagittaria latifolia, Duck-potato	VIII	W	30	12	▽	⟙	▒▒
Typha latifolia, Cattail	VI	Y	60	colony	▮	||	▒▒
Viola cucullata, Violet	V	L	6	4	▮	V	▒▒
pH 6.0-7.0 Usually poor meadows, tight soils							
Gentiana crinita, Fringed Gentian	IX	B	24	8	▮	||	▒▒
Parnassia palustris, Grass-of-parnassus	VIII	W	18	8	▮	V	▒▒
Trollius laxus, Spreading Globe-flower	VI	Y	18	10	▬	⌒	▒▒

Photo by Author.

Reddish peperomia in a hanging basket. The dappled shade under a tree seems to be the best growing site in frost-free areas.

Peperomia humilis
The Not Extinct Species

*George E. Allen**

The basic concept of preserving our native flora by preserving the natural habitat of a particular species or plant community has a validity that cannot be argued. Preservation, however, need not, in fact should not, stop there. A case in point is the reddish peperomia, *Peperomia humilis* Vahl., a species once thought to have been extirpated by a hurricane. *P. humilis* has been reported as indigenous to only two rather widely separated areas of Florida. Areas, curiously enough, quite opposite in several respects.

John Kunkle Small, in a chronology of a trip through Florida in the spring of 1922 *(From Eden to Sahara)*, reported it inhabiting the tropical hammocks along the Saint Lucie Sound, south of Fort Pierce, Florida. Here, he said, it occupied the highest and driest portion of the sand ridge, far from standing water. Any rain falling here would rapidly drain into the deep, loose sand. Yet the plant evidently grew luxuriantly here at that time. We can find no mention of *P. humilis* being observed in that area more recently. The other location where it once grew is a low wet mangrove-buttonwood area now encompassed by Everglades National Park. Here it grew on rotting logs and in the humus-filled crotches of

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the buttonwood trees *(Conocarpus erecta)*. This is an area often flooded during the rainy season of summer and fall.

P. humilis is a very attractive little plant with soft pubescent, opposite leaves. Color can vary from pale silvery-green to a distinctive reddish-green, depending somewhat on light levels. The leaves on the newer shoots are oval, rather succulent and without noticeable veination. Older leaves are thinner and distinctly three-veined. The plant is much branched with reddish succulent stems.

Both lateral and terminal branches have flower spikes. These may be from two to four inches long, but at most, only one-sixteenth of an inch in diameter. Individual flowers are so tiny as to be almost indistinguishable to the naked eye. They are greenish-yellow and separated on the spike. The fruits are about one half the diameter of the spike, set on short pedicels, and are rugose.

You may have noted the use of the past tense in describing the habitat of the plant in Everglades National Park. For the whole story let us regress to the time prior to the founding of the park in 1947. A local orchid grower, who was both interested and knowledgable in local flora, had collected *P. humilis* there and kept a few pots in his orchid house. Then came the time when the nearly one and one-half million acres were set aside to be protected and preserved for future generations to enjoy. No longer could plants such as *P. humilis* be removed from the park. Fire would be controlled—every effort made to keep the area inviolate. But man's puny efforts are no match for nature on the rampage!

In September of 1960 hurricane "Donna" moved in from the southeast, across Florida Bay, with a sustained wind velocity of 140 m.p.h., gusting to 180 m.p.h. Slow moving, it blew for nearly thirty-six hours. Tides of twelve feet above normal covered the entire buttonwood-mangrove area with salt water. Tremendous damage was done to Park flora and fauna. The patterns of destruction through the buttonwood-mangrove area were erratic. The area of buttonwoods and mangroves in which our *P. humilis* grew survived to once again flourish. But—no *P. humilis* could be found! Tender and succulent, it had not survived the salt water and turbulance.

A few years later Dr. Frank C. Craighead, a retired U.S.D.A. entomologist who had spent ten years working on the botany of the park, mentioned that one

Terminal shoot of *P. humilis* showing the leaf veination and flower spikes. Mature leaves average about one and one-half inches in length by three-quarters inch wide. Flower spikes are two to four inches in length. The tiny flowers can hardly be seen.

Old buttonwood *(Conacarpus erecta)* trunks. These trees are still living. The knotholes and fissures in the trunks are where *P. humilis* grew before the hurricane. The area is not under water during the winter and spring dry season.

of the tragedies of the storm was that *P. humilis* had been extirpated. So it had—in the wild. But because of what became known as "Johnny Appleseed Conservation" hundreds of plants had been grown, passed around to interested horticulturists, sold at Men's Garden Club plant sales, and so dispersed in cultivation. This attractive native peperomia was not extinct after all but was thriving in many tropical gardens in South Florida. Some of it has been returned to the wild, to areas similar to where it once thrived, a reestablishment project by members of the Men's Garden Club.

P. humilis has a shallow, tender root system, making transfer to logs and tree crotches quick and easy. We took tree fern slabs, such as are used to support epiphytic orchids, cut them into approximately two- by four-inch pieces, made holes with an ice pick, and stuck three or four cuttings in each piece. They readily rooted into the tree fern. (Incidentally, we placed the slabs in used cafeteria trays, then kept a quarter-inch or so of water in the tray to provide constant moisture.) In a few weeks plants were rooted and ready to go.

Here is a case where a maximum effort to preserve and protect a plant habitat would have failed to prevent extirpation of a species had there not also been some propagation at "grass roots" level.

In cultivation, as in nature, *P. humilis* will survive a variety of treatments. It may be grown simply as a potted plant. It also will do nicely rooted into a slab of tree fern and hung in a greenhouse or under a tree in a frost-free area. But it is perhaps at its best as a hanging basket specimen. A wire basket lined with sphagnum moss, or a tree fern basket filled with loose soil mix to provide good drainage (we use peat moss and perlite, with an occasional dose of liquid fertilizer) will produce a plant such as the one in the accompanying illustration. *P. humilis* will adapt to varying degrees of shade, but not full sun, at least in subtropical Florida.

It is very pleasant to grow this interesting native peperomia in a tropical garden or greenhouse; it was even more thrilling to be able to re-stock a habitat where nature almost wiped out a species in spite of a governmental effort to preserve a large area.

Hurricane Donna still is remembered!

Tulipa lownei

Centaurea variegata

Gagea peduncularis

Onobrychis cornuta

Romulea nivalis

High Mountain Flora of Israel

*Michael Balick**

The mention of Israel, often conjurs up a vision of a harsh and barren countryside, but this land in reality embraces green mountain slopes, some large expanses of fertile plains and swamps as well as deserts. All of these burst into bloom during the late winter rains. Not the least fascinating life zone is that found high on the slopes of Mt. Hermon, Israel's tallest mountain, 2100 meters above the level of the Mediterranean Sea. This mountain, the scene of so much violence, in recent years, is located in the northern corner of Israel, within sight of Lebanon and Syria. Last year, I had the great fortune to make several collecting trips to the mountain, to observe the flora there.

Like many high mountain areas, the top of Mount Hermon lacks any vegetation over one-half meter in height. One of the reasons for this is the strong wind and oftentimes snow that buffets the peaks, stunting all plants that attempt to grow. The plants, instead, form dense mats, weaving together loose stone and gravel, beneath which lies a hard, compacted soil. As spring approaches, the winter snowline begins slowly to recede. The trickles from this melting snow meet to form many shallow, swiftly moving rivulets which flow down the side of the mountain, and seem to give life to everything they touch.

As the snow cover melts into the ground, softening it, the plants that were hidden beneath it begin to flower, each in its turn. The geophytes, because they have a stored supply of food, and often form their flowers buds the previous fall, flower first. Next come the herbaceous and woody plants which bloom on the previous year's growth. The annuals which must germinate, grow, form their buds, and bloom during the current year, bring up the rear of this parade of bloom, which lasts until July. The amazing variety of species to be found in bloom at any one spot on the mountain results from the presence of a multitude of microclimates.

The tiny geophytes of this mountain seem more than a little presumptuous as they push their delicate leaves and flower stems through the crusty soil and rocky litter as quickly as the snows retreat. Two particularly beautiful species, the snow romulea, *Romulea nivalis,* and the leafy gagea, *Gagea peduncularis,* can be found immediately below the melting snowline, often rising from pools of clear, cold water. The snow romulea is a miniature member of the Iris family. Its snow-white petals, veined with purple, highlight the deep golden centers of the flower. They rise from a tuft of crocus-like leaves, and never exceed five centimeters.

The leafy gagea, a yellow flowered member of the Lily family, produces two to six flowers on a stalk arising from a rosette of four small,

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Scorzonera lanata

Cerasus prostrata

Astragalus pinetorum

Erysimum purpureum

Lamium striatum

Bellevalia hermonis

hairy leaves. The blossoms are held high and, with the snow romulea, help to transform the bleak landscape into a sparkling garden.

The Hermon tulip, *Tulipa lownei,* is found a little further from the melting snowline. From each bulb, a single whitish-pink flower, with a yellow center arises, and grows to a height not exceeding ten centimeters. Because of its delicate color and small size, this tulip is the most delicate and unusual of its tribe found in Israel. On Mount Hermon it blooms in June and July.

A related plant is the Roman squill, *Bellevalia hermonis,* a dwarf not growing more than eight centimeters tall. It is found next to rocks, and blooms the same time as the above tulip. Purple buds on hyacinth-like racemes open to reveal violet-white, tubular flowers. The dull green straplike leaves are about twice the length of the blossom head, and their edges are curled upward. Of all the flowers I saw atop Mount Harmon, this species was probably the most worthy candidate for a place in the American garden today. The form, color, and overall beauty of this flower are magnificent.

Two low growing, woody plants form the permanent "vegetal backbone" of the top. The first of these, the wild cherry, *Cerasus prostrata,* is a low growing, heavily branched member of the Rose family. A mature plant may occupy several square feet which, when it blooms, becomes a mat of pink flowers each fifteen millimeters across. The fruits that form are pea-shaped and about five millimeters in diameter.

The second woody species, the horned onobrychis, *Onobrychis cornuta,* is a first cousin to the Scotch brooms. On Mount Hermon the plant forms a dense, thorny mat no higher than thirty centimeters and bears short racemes of rich pea-like blooms, close to its spiny petioles. The masses of bloom that cover the plant give way, as spring progresses, to small green linear or oblanceolate leaves. The thorns are long and savagely sharp and can easily bloody the admirer trying to examine the plant too closely.

While not often as spectacular as the woody or bulbous plants, the dwarf herbaceous perennial plants of Mount Hermon certainly constitute a significant portion of the vegetation and must be mentioned here. The wooly-oleander, *Scorzonera lanata,* is a dandelion-like flower usually found tucked amongst the rocks. It follows the bulbs in bloom, and holds its golden heads above the silvery tufts of leaves, which are often slightly curled.

In contrast to the many large and bushy *Astragalus* species found throughout Israel, the pine milk vetch, *A. pinetorum,* found on the mountain, rarely gets to a height of over fifteen centimeters. This milk vetch, a perennial member of the Pea family, has racemes of three to five yellow flowers which appear as soon as the ground dries out. Pea-like pods form after the flowers shrivel up, and elongate to eighteen millimeters. The leaves are pinnate and are covered with small hairs.

Like the geophytes and the subshrubs, all of these perennial herbs must do the bulk of their growing, blooming and seed production during the short period between the melting of the snow and the almost complete drying and baking of the summer.

A weedy relative of the Siberian wallflower, the bitter cress, *Erysimum purpureum,* makes small dense masses near the top of the mountain. As is true with most members of the Cabbage family, cool conditions are required for its growth. This stubby perennial has a semi-woody base and ascending herbaceous stems. The long, thin leaves form a mass topped by spikes of pinkish flowers which are characteristically cross shaped.

The striped deadnettle, *Lamium striatum,* which is also found in other parts of Israel, is a member of the Mint family. On Mount Hermon it is usually found at the edges of large rocks. The whorls of six to eight pink striped flowers are held erect and remain in bloom over a long period of time. The striped deadnettle is so showy that at its peak the foliage is hidden from sight.

The grey centaury, *Centaurea variegata,* is a member of a tall stately genus found throughout Israel. On Mount Hermon however, this perennial member of the Daisy family stays below ten centimeters. The greyish, hairy leaves are oblong and stand upright from the base. The four centimeter flower heads are light blue and in comparison with the tiny plant, look quite large and showy.

The author collecting near the melting snow line. (Note stakes driven in near snow to measure rate of melting).

When all the snow has finally melted and the lifegiving rivulets of water no longer flow down the sides of the mountain, the parade of bloom comes to a halt. Seeds ripen, the tufts of foliage dry up, and bulbs seem to pull their leaves back underground. The bright reds, yellows, blues and whites of the spring are too soon replaced by the single, dominating, dusty green of the summer foliage. As these plants are exposed to snow and freezing temperatures during most of the year, there is a possibility that many would overwinter successfully in various areas of the United States, and would therefore make good additions to our American gardens.

WATER CONSERVING

*Lloyd Rooke**

Water is a dwindling resource in the arid West. As much as seventy per cent of the water supply is used outside the home. Persons involved in water management who study possible solutions to water shortage problems are looking at landscape design that copies lawns, borders, and shrubberies done in the conventional non-desert style. The Department of Conservation and Natural Resources, State of Nevada, in a report referring to Las Vegas, states: "Watering lawns and other green areas accounts for the bulk of this outside use, and it is in these areas of water use where the greatest curtailment can be realized." The message is clear. Conventional landscaping, particularly lawns, should be replaced by plants and maintenance methods that conserve water. In the implementation of this change there is abundant creative opportunity for the plant breeders, propagators, landscape architects, and others concerned with horticulture.

People who live in the desert often seek, rather than resist, such drastic change in garden appearance. Lawn-substitute landscaping is underway now by residents seeking escape from the arduous task of maintaining a desert oasis. Heat, wind, low humidity and droughty, salty, alkaline, shallow soils are some of the problems faced by the desert gardener. Exasperation has forced many to asphalt, concrete, brick, plastic, or gravel ground coverings. To break this monotony a few cacti or yuccas may be transplanted from the desert. Here is a challenge now for horticulture to provide materials and methods to achieve this transi-

***Dalea fremontii* blossom. These flowers will hold up for a month in a vase. A potential ornamental shrub to five feet that can be transplanted.**

***Opuntia basilaris*.**

An overturned, translucent pebble near extremely dry Death Valley reveals algal growth resulting from water vapor condensed on its underside. A "greenhouse" to the desert soil scientist.

Photos furnished by Author.

**Soil Scientist, U.S.D.A. Soil Conservation Service, 1410 E. Telegraph Street, Carson City, Nevada 89701*

tion in a desirable and artistic manner.

Use of native and introduced plants that harmonize with their environment seems to be the basic reason for the landscape reputation of communities like San Francisco, Victoria, and Honolulu. These pleasant vistas, the tourists so eagerly seek, also seem to require a minimum of care because the vegetation is at home. The eye-appeal seems to be a spontaneous creation. It appears then that, in the arid west, one solution to the water shortage (and distinctively picturesque landscaping, with a minimum of frustrating struggle) lies in the use of materials naturally available.

What sort of plant materials could be made available for the purpose? Xerophytes, plants that naturally occupy the critically water short desert environment, are numerous. They include members of many common plant families known and used by man. There are annuals and perennials, woody and herbaceous, weed-like and exotic, colorful and obscure, fragrant and foul-smelling shrubs, trees, and vines. Only a few have found a place in landscaping. These are mostly lilies such as the joshua tree and other yuccas, or agaves, and cacti. These were found to be successfully transplantable from the native state in years past. But, the great majority of potential ornamentals in this category remain untried, unused—overlooked by horticulture.

The variety of xerophytes is not obvious to the desert traveler. Impressionably black, rust, white or chartreuse ferns, for example, must be sought. Many attractive desert species are few in number and may be on the brink of

LANDSCAPES for the ARID WEST

Leaf cross-section of *Atriplex hymenelytra*, desert-holly. Green chlorophyll is protected by the white scurf. The scurf can obtain moisture from the atmosphere to carry on life functions.

***Atriplex hymenelytra* as a row crop. Through selective breeding the grower was able to create a monoecious strain from this normally dioecious plant. Plant breeding can improve the available plants.**

Dalea fremontii **roots.**

Example of a lawn-substitute landscape. If the machine planed surface had been broken by hillocks it would help reduce soil-heat penetration.

extinction. Leaf and stem modification, means of survival in the dessicating habitat, are many and well documented. These sometimes provide unique appearance useful for landscape gardening. Colors and textural appearance are widely variable.

The history of our xerophytes should be understood. Research has shown that they occupied the same area during glacio-pluvial epochs. Thus it is indicated that they have evolved over millenia of alternating humid and arid environments. Genetically these plants should therefore retain characteristics like plants presently growing under more humid conditions. It may be said that they have the remarkable ability to tolerate rather than require their present habitat. Here then is a remarkable gene pool for a group of plants about which we know little concerning propagation, culture, and use. During long periods of drought the xerophytes appear to be in a state of torpidity like hibernating or estivating animals. Given their infrequent ration of water they are transformed with a rate of growth unequalled in the plant world. Leaves, shed for water conservation, reappear and even bloom may occur at any season. What other group of plants can change the scene so dramatically, so quickly with, say, the occasional turn of a faucet?

The natural habitat of desert plants provides clues for cultural needs. About two-thirds of the species in nature occupy only stony terrain. The stones conserve soil moisture and perhaps add to that provided by precipitation by capturing rising water vapor from unknown sources. Another factor, perhaps of greater importance, is soil-heat control. When exposed by excavation and erosion, roots are found mostly on the north or shady side of most plants unless stones are present. With the great variety of shape, color, and size of rocks a garden designer can create this important microenvironment with artistic simulation of nature. He can also reduce heat penetration by reducing the hours of direct sun exposure on the soil by shaping the land surface in various ways, all of which help break up the monotony of the planed surface. Plants that thrive in a stoney area may die in a stone-free environment as indicated by this experience. A few years ago a civic minded group undertook a highway beautification project; they were permitted to transplant native joshua trees to a highway median passing through their town in southern Nevada. The trees were planted on bare ground and watered periodically. The soil was better than that from which they were uprooted, Most perished. The survivors occupied positions near culverts or pavement which provided some relief from the soil-heat problem.

The living plant adjusts to sun exposure by providing more insulation. Even the hardy barrel cactus can be blistered and killed if it's shaded side is reversed in transplantation. Containers for the plants should indicate their original orientation with the sun as by marking the north side. Glare off bright fences, walls, or rock fragments should be avoided.

Full utilization of xerophytic plants, heeding microenvironmental needs, can provide a variety of aesthetic, low maintenance, water conserving, healthy landscapes. Rocks to cool and protect soil from erosion are easily obtainable in various colors, shapes, and sizes throughout the desert. We have the technology to develop and propagate cultivars from the array of already spectacular desert plants and thus enlarge our plant list of xerophytes. Because of their heritage many of these plants could find use in other environments, thereby extending the market. We need to propagate a variety of these plants and make them readily obtainable by the public. Retail nurserymen report that there is a market for such plant materials now and that for them the public is willing to pay two to three times the price paid for the conventional plants.

Landscape architects should produce some picturesque examples of water conservation landscaping. Education materials on the characteristics of the marketable plants and their uses should be prepared and encouraged. In this manner a solution to the water crisis can be beautifully accomplished.

The North Carolina Botanical Garden a Natural Garden of Native Plants

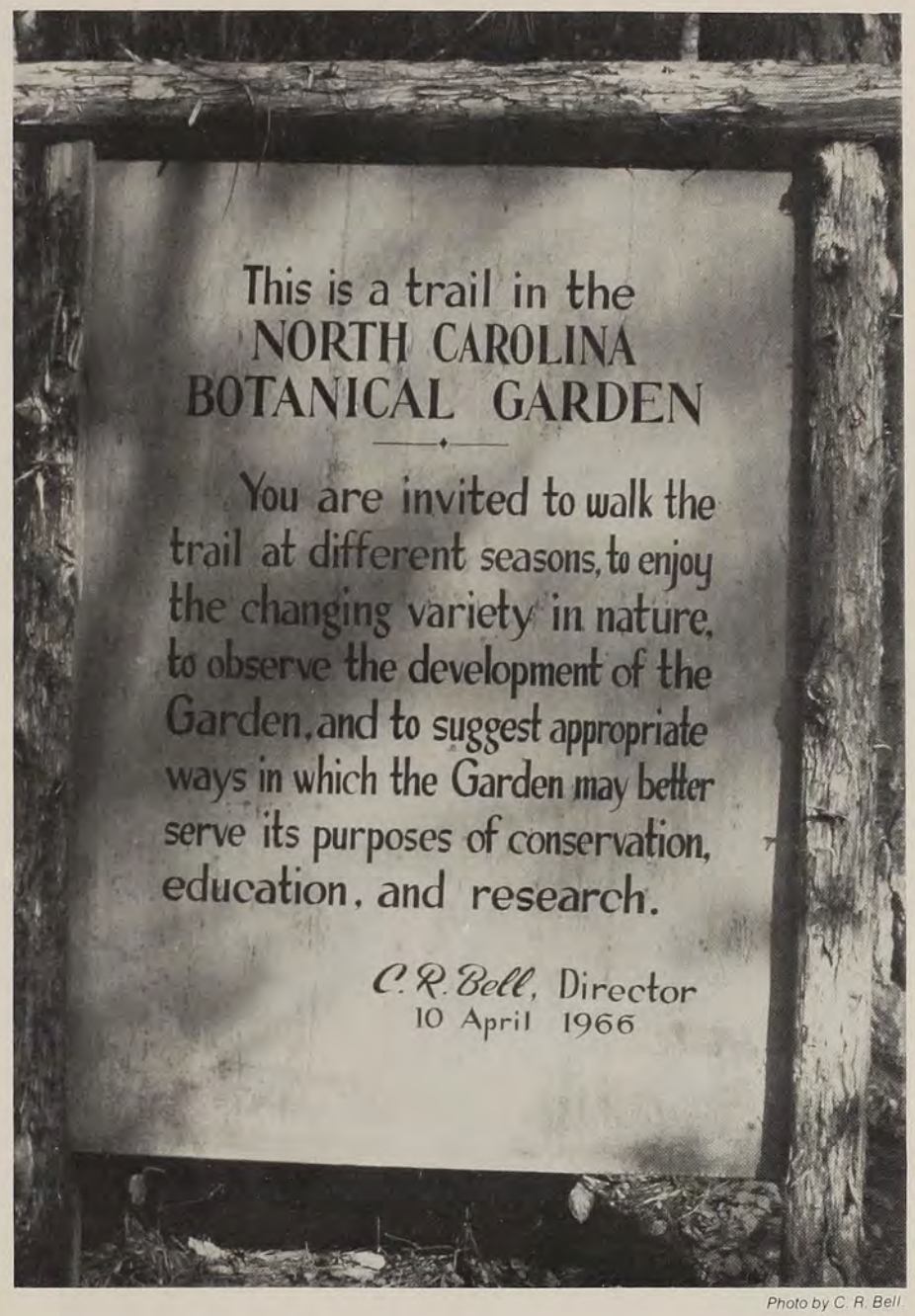


Photo by C. R. Bell

*J. Kenneth Moore and C. Ritchie Bell**

Native plants are the primary reason for the development of the North Carolina Botanical Garden. The Garden promotes the enjoyment, study, conservation and preservation of native plants through research, the establishment of natural habitat plantings, maintenance of native species in containers, and education of the general public, in appreciation of our native flora and in realistic conservation techniques. People are slowly becoming aware of the fact that the best place to grow native plants is right where you find them in nature! Unfortunately this is not always possible as man's progress continues to "develop" our woodland and meadows. When plants must be moved, they will likely do better in an established botanical garden than in a garden or other unnatural environment.

The North Carolina Botanical Garden is a 329 acre area of natural forests, open fields and creeks at the south edge of the University of North Carolina campus at Chapel

**J. Kenneth Moore, Garden Staff Member and C. Ritchie Bell, Director, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, N.C. 27514.*

A late spring snow contrasts with the maroon flower of the toad trillium, *Trillium cuneatum*, in the Garden.

The male flowers of blazing star or devil's bit, *Chamaelirium luteum*, are much more showy than the female flowers.

The weedy evening-primrose, *Oenothera biennis*, blooms in the Garden from June until frost.

Photos by Ann Hawthorne.

Wild geranium, *Geranium maculatum*, transplanted to the Garden blooms as if in its native mountain woods.

Hill. Four tracts of land make up the Garden: the Mason Woodlands, 160 acres of low pine lands, open fields, and steep deciduous wooded slopes and ravines from the historic Mason estate long owned by the University; the William Lanier Hunt Arboretum, 125 acres of steep wooded slopes, rhododendron bluffs and creek bottom all under contract to be donated to the Garden by regional horticulturist William L. Hunt; the Coker Pinetum, thirty-six acres of pinelands and ravines given to the University for Botanical Garden use by the late Dr. W. C. Coker and Coker College; and the Gray Bluff Garden, an additional eight acres of rhododendron bluffs and wooded slopes generously donated by Mr. and Mrs. Edward Gray. The variety of habitats and plant communities represented in these tracts, plus the eight acre pollution-free pond constructed on the Mason Farm tract several years ago, provide an almost unlimited potential for the Garden's eventual development of extensive plantings of native trees, shrubs, wild flowers and other plants from many different habitats. Unfortunately, most of the Garden area is unfenced and thus vulnerable to public abuse. However, several miles of woodland trails have been developed with labels on some of the common trees, shrubs, and herbaceous species. The trails are open every day during daylight hours.

Within the fenced nursery and greenhouse area, two small demonstration "habitat groups" have been developed. Since the garden is located in the eastern piedmont, these demonstration gardens represent mountain and coastal plain habitats and thus offer visitors and students the opportunity to study interesting and characteristic plants of each of the state's three physiographic provinces.

North Carolina Mountain Collection

The section designated for the mountain plants was cleared of shrubs, most of the subcanopy, and

Catesby trillium, *Trillium catesbaei.*

Skunk-cabbage, *Symplocarpus foetidus.*

Jack-in-the-Pulpit, *Arisaema triphyllum.*

Photos by Ann Hawthorne

some canopy species. Shrubs and wild flowers typical of the North Carolina mountain counties were planted in this area in raised beds. White pine, hemlock, and red spruce were planted for subsequent replacement of some of the dominant piedmont pines. Within the mountain habitat area is an established planting of cranberry bog species including sphagnum, cranberry *(Vaccinium macrocarpon),* bogbean *(Menyanthes trifoliata),* cotton-grass *(Eriophorum virginicum),* and white beak rush *(Rhynchospora alba),* which are all typical northern plants otherwise found naturally this far south only in a few localities in the North Carolina mountains.

In another area of the "Mountain Garden" there is a collection of mountain fern species established in a naturalistic setting designed and executed by two of the Garden's enthusiastic and invaluable volunteers.

Coastal Plain Collection

An adjacent area, developed as a coastal plain bog and savannah habitat, was left flat and a few trees were removed in order to allow more sunlight to reach the plants. Longleaf pines *(Pinus palustris)* have been set out to replace the shortleaf pines *(Pinus echinata)* and thus give a more natural setting for the coastal plain shrub and herbaceous layer. Several species of fringed orchid *(Habenaria)* give color to the flat area during late summer. Four species and several natural hybrids of the insectiverous *Sarracenia* have been successfully established, as well as sundews *(Drosera),* butterworts *(Pinguicula),* and the popular Venus fly-trap *(Dionaea muscipula).*

These and other typical savannah species such as yellow-eyed grass *(Xyris spp.),* pipeworts *(Eriocaulon spp.),* meadow beauty *(Rhexia spp.),* and milkwort *(Polygala lutea),* and a number of interesting grasses and sedges, are maintained by burning the area during dry periods in the winter; this duplicates, in effect, the natural fire control of these habitats in the coastal plain region. Bordering this savannah and bog habitat are the various evergreen and semi-evergreen coastal shrubs, which would naturally become invasive and choke out many of the herba-

Grass-pink Orchid, *Calapogon pulchellus.*

Photo by W. L. Hunt.

University work-study student setting out characteristic native species in newly prepared coastal plain habitat area.

Yellow-fringed Orchis, *Habenaria ciliaris*, one of the characteristic late summer species in the established coastal plain habitat area.

Photo by Ann Hawthorne.

Yellow-fringed Orchis, *Habenaria ciliaris*.

Photo by C. R. Bell.

Cardinal-flower, *Lobelia cardinalis*.

ceous species without control by fire (and some selective pruning!). This shrub group includes wax myrtle *(Myrcia cerifera)*, leatherwood *(Cyrilla racemiflora)*, red bay *(Persea borbonia)*, and sweet bay *(Magnolia virginiana)*. In addition to being of general interest to the public, the coastal plain section, with its emphasis on the fire-maintained savannah community of plants, is a popular spot for school groups, with special appeal for teachers who wish to demonstrate ecological principles.

On the edge of the coastal plain habitats several wet depressions originally utilized for bog plants, now provide sufficient depth of water to support common species of plants characteristically found along pond edges and in shallow roadside ditches. Among these are swamp potato *(Sagittaria latifolia)*, arrowleaf *(Peltandra virginica)*, lizard's tail *(Saururus cernuus)* swamp mallow *(Hibiscus moscheutos)*, water-lily *(Nymphaea odorata)*, cow-lily *(Nuphar luteum)*, and the spectacular yellow lotus (Nelumbo lutea).

These small habitat gardens within the nursery work area perform two invaluable functions: they are of specific interest to the public interested in the identity of native plants and in plant community associations, and they continue to provide a wealth of basic information concerning particular restrictions and requirements related to the cultivation of individual species of our native plants. When protective fencing and sufficient financial support become available, additional special habitat plantings will be developed on a much larger scale throughout the Garden.

Plants From Rescue Missions

The primary sources of most of the Garden's native plants are the many construction sites across the state. Student workers and volunteers from the Garden's "plant rescue team" essentially relocated a community of bog plants from a coastal plain area projected for drainage and subsequent residential development. Early this past summer the N.C.B.G. staff

Photo by Hugh Morton.

The entire Garden staff (including the Director and the secretary) on a lucrative plant rescue operation on Grandfather Mountain.

and a number of volunteers participated in a large-scale plant rescue "dig" at a golf course site at Grandfather Mountain. Personnel from other gardens also took part in the "dig" with the result that thousands of mountain wild flowers and shrubs that would have been lost to the bulldozer are now relocated and conserved not only in the Botanical Garden at Chapel Hill but also in the native plant collections at the University Botanical Gardens of U.N.C. at Asheville, the Durham Museum of Life and Sciences, and the Sarah P. Duke Memorial Gardens. As a public service the Garden's plant rescue team is also available to aid area residents in the identity of native species on their wooded lots, pointing out particularly those species desirable as ornamentals and thus worthy of being moved, or marked to save, and not be need-

Photo by Anne Harris

Garden volunteer Jimmy Wadsworth with a school group at the North Carolina Botanical Garden.

Photos by Ken Moore.

A group of pitcher plants, *Sarracenia flava*, rescued from a fill area in northern Florida, in a display bed by the greenhouse.

A flat of six month old pitcher plant seedlings growing in sphagnum. These plants will take three to five years to reach blooming size.

lessly bulldozed in the course of lot clearing and residential construction.

In addition to saving and relocating native plants from areas being destroyed, a major effort is being made at the Garden to learn more of the cultural requirements and propagation, by seed or cuttings of many of our rare, interesting, or desirable native plants. Flats of seedlings of Venus fly-trap and pitcher-plants, and rooted cuttings of native ornamental shrubs are a popular attraction for groups visiting the Botanical Garden. This gives the Garden an opportunity to demonstrate to the public that many native plants can be propagated with relative ease and that plants should never be dug from their natural habitat unless endangered by mans' encroachment upon their environment. Seedlings of various easily cultivated natives such as Cardinal flower *(Lobelia cardinalis)* and blazing star *(Liatris spicata)* are sometimes given to members of visiting garden clubs and individuals interested in the ornamental value and cultivation of native plants.

The Portable Native Plant Garden

Several years ago the Botanical Garden began a program of collecting native plants for cultivation in containers. This collection now includes wild flowers, shrubs, and small trees maintained in containers varying from large coffee cans to wooden boxes. Large heavy duty plastic crates (used to ship baby chicks) are utilized as portable planters for many smaller plants. The most satisfactory containers for larger plants have been two-gallon, 10-inch plastic pots and 12-inch by 20-inch by 8-inch rectangular boxes, which are constructed of treated ¾-inch boards. When filled with soil and a good sized plant the boxes are heavy, so sturdy metal handles are put on each end to facilitate lifting and transport. These container-grown plants are easily carried to various locations for garden club or classroom demonstrations or other display use. Frequently these planters, perhaps containing representatives of all of North Carolina's insectivorous plants or some other specific group or type of plants, are carried directly into school rooms or laboratories to help illustrate reports given by the students or special topics being given by the teacher. The Garden's container collection even includes a group of all of the native poisonous sumacs which are similarly transportable, though requiring more care! Plants maintained in containers also greatly facilitate the

staging of plant displays at garden and flower shows. Plants may be grouped in many different ways, including natural designs that are then mulched with leaves or pine bark to hide the containers and give a woodland effect. By this method the same plants have been displayed year after year in many demonstrations and exhibits, without the useless sacrifice which often occurs when plants are freshly dug and burlapped for a single event.

The Garden further teaches conservation as part of its growing program of special interest extension courses and workshops dealing with native plants and their ecology. These courses and workshops are offered to the public in communities throughout the state. During these field courses, staff members emphasize that propagation of native plants by seeds and cuttings is "conservation through cultivation." The Garden is fortunate to have another group of dedicated volunteers who supplement the educational and public service efforts of the small staff by leading interested groups on interpretative walks through the small habitat areas or along the forest nature trails and by manning the Garden gates to keep the demonstration areas of the Garden open to the public on weekends.

As concern for native plants increases with concern for the natural environment, and as interest in the many actual and potential uses of native plant materials continues to grow, the conservation, teaching and research programs of the North Carolina Botanical Garden will become of increasing regional as well as state importance and value. A Garden Center, made possible in large part by a recent generous bequest from Dr. Henry Roland Totten and his wife Addie Williams Totten, will be the first building in the long-range plans of the Garden to continue its public services, programs, and activities dealing with the many fascinating, important, and often colorful and attractive native plants of the southeast.

Photos by Ann Hawthorne.

Student-worker Pat McArthur taking a load of native plants in containers for classroom use.

Ken Moore explains to a visiting school group how a pitcher plant leaf traps and digests insects. In the background are five plants with their flowers in pollination cages, made of milk cartons and nylon netting, that are part of a research project.

Photo by Peter Stollmack

Photo by Mary Auer.

Photo by Henry M. Mayer.

Spring beauty growing in a mass at the foot of a tree. Above right. Great white trillium, *Trillium grandiflorum*, and spring beauty, *Claytonia virginica*, complement each other.

Gardening With Native Plants in Northeastern Ohio

*Mrs. Paul Martin**

A hillside of great white trillium, flood plains misty with Virginia bluebells or a bank of ferns, these were once commonplace sights. Now things have changed and as more and more natural areas disappear the urge to have some of these wildlings for one's own has increased.

This trend has been reflected by the nurseries. Many who have never done so before are now offering wildflowers and ferns for sale. To buy and plant native flora without knowledge of their requirements will surely lead to disappointment. However if approached with intelligence and foresight gardening with native plants can be a conservation measure as well as providing a deep source of satisfaction for the gardener.

Ohio is a state rich in native plant species and many of these can be grown very well in native plant gardens.

Generally speaking there are two different kinds of soil in northeastern Ohio. Extending in from Lake Erie several miles in breadth is the lake plain. This comparatively level land was once the bottom of glacial lakes. Sandy soil with some gravel is prevalent here. Back from the plain rises the lake plateau with varying terrain and cut by frequently deep river valleys. The soil of this highland, also glacial in origin, is for the most part clay loam. It is with this second area that we shall be most concerned. Since the two areas share much the same climate the rules can be adjusted to include both.

Lake Erie alters the extremes of weather in these areas so that temperatures seldom drop below zero in winter or rise above ninety in summer. Precipitation is adequate being around thirty-five or forty inches per year. Since it is not equally distributed dry periods do occur.

**The Holden Arboretum, R. D., Sperry Road, Mentor, Ohio 44060.*

Above. Fairy-candles, *Cimicifuga racemosa*, make a good background for other plants in a large garden.

Left. Given a wet situation in spring, Marsh-marigold, *Caltha palustris*, will withstand some dryness later.

The selection of a site for a native plant garden, when there is a choice, is most important. It should be well drained with wooded sections protected either by terrain or undergrowth from cold north winds in winter and drying winds is summer. The soil should be good and may vary from neutral to very acid. The largest portion of wild plants will grow in slightly acid soil so this should predominate. In wooded areas undisturbed soil with a covering of leaf mold is desirable.

The garden may be large or small, only a tiny protected corner or several acres. When deciding upon size, however, remember that a native plant garden, contrary to what an inexperienced gardener might think, will require just as much work as a cultivated garden.

A stream running through the garden is fortunate. Aside from the fascination of water more species of plants can be grown and a small waterfall or pool can be created to add interest.

The species of trees growing in the prospective garden will give you a clue to the acidity of the soil. Beech-maple is the predominant climax forest in northeastern Ohio and the soil under these trees will be neutral or slightly acid. Oaks or conifers scattered through the area will produce a more acid soil. Avoid a woodland composed entirely of conifers. Few plants grow here because of extreme acidity and lack of light.

It is a good idea to take a few soil tests to determine the pH of the soil in different locations in the garden. The variation is often surprising. These tests can be done accurately enough by anyone using soil testing kits purchased in a garden shop. Set stakes and keep records of your findings. It will help when it

Photo by Mary Auer

Turk's-cap lily, *Lilium superbum*, is ideal for the open garden in the sun.

Photo by Author

Bloodroot, *Sanguinaria canadensis*, leaves are almost as attractive as the flowers.

comes to selection and placement of plants. Many species are quite tolerant but there are some that must have their requirements met or they will not grow.

As soon as the site is selected preparation of the garden should commence. Disturb the woodland floor as little as possible. The humusy leaf mold that collects there is vital to the plants and if not present must be supplied.

Preserve beech, oaks and some conifers when possible since the leaves decay rapidly. Conifers and oaks also help to retain acidity in the soil. Saplings may be pulled or cut off at ground level. Never burn refuse in the garden area.

Retain desirable native shrubs such as spicebush, witch-hazel and maple-leaved viburnum. Do not discard rocks, well rotted wood or logs. These are valuable in creating a natural appearance. Hollow logs planted with natives are charming and provide an excellent habitat.

Gardens of generous size should have winding paths revealing a new vista at each turn. Along the top of a rise paths should be shored with logs to prevent them from slipping into the growing area. They may be compacted soil, wood chips, bark or stepping stones for small gardens. Natural placement of rock and logs will also help to mark the paths.

Before the garden is completed it is wise to arrange for water. If you object to hose strung about on the paths, then plastic pipe with hose outlets at intervals may be buried several inches underground. A valve must be installed so that the line can be drained before winter.

When planning a fairly large garden a rough map should be made and plantings entered in pencil in case of losses.

Plants may be secured in a number of ways. In these days of new developments and grading for superhighways one of the best places to collect is in areas

Garden Requirements for Native Plants

(L) Large gardens only (D) Will also grow dry (PS) Will grow in partial shade

Moist Woods pH 5-6.5

Anemone, Rue- (D)	*Anemonella thalictroides*
Baneberry, Red	*Actaea rubra*
Bishop's-cap	*Mitella diphylla*
Bluebell, Virginia	*Mertensia virginica*
Bloodroot	*Sanguinaria virginica*
Cohosh, Blue	*Caulophyllum thalictroides*
Fairybells	*Disporum lanuginosum*
Fairy-candles	*Cimicifuga racemosa*
Foamflower	*Tiarella cordifolia*
Geranium, Wood	*Geranium maculatum*
Ginseng	*Panax quinquefolius*
Golden-seal	*Hydrastis canadensis*
Golden-star (PS)	*Chrysogonum virginianum*
Hepatica, Round-lobed (D)	*Hepatica americana*
Iris, Crested (PS)	*Iris cristata*
Jack-in-the-pulpits	*Arisaemas*
Leek, Wild (D)	*Allium tricoccum*
Mayapple (L)	*Podophyllum peltatum*
Meadow-rue, Early (D)	*Thalictrum dioicum*
Merry-bells, Sessile (D)	*Uvularia sessilifolia*
Shooting Star (PS)	*Dodecatheon meadia*
Solomon's-seals (D)	*Polygonatums*
Solomon's-seals, False (D)	*Smilacinas*
Spring Beauty (D)	*Claytonia virginica*
Stonecrop, Wild	*Sedum ternatum*
Trillium, Great White	*Trillium grandiflorum*
Trillium, Sessile	*Trillium sessile*
Toothworts	*Dentarias*
Trout-lily, Yellow	*Erythronium americanum*
Twinleaf (D)	*Jeffersonia diphylla*
Valerian, Greek	*Polemonium reptans*
Violet, Canada	*Viola canadensis*
Violet, Common Blue	*V. papilionacea*
Violet, Cream	*V. striata*
Violet, Downy Yellow	*V. pubescens*
Wakerobin	*Trillium erectum*

FERNS

Beech-fern, Broad (PS) (D)	*Dryopteris hexagonoptera*
Beech-fern, Long (D)	*D. phegopteris*
Christmas Fern (D)	*Polystichum acrostichoides*
Hay-scented Fern (D)	*Dennstaedtia punctiloba*
Lady-fern	*Athyrium filix-femina*
Maidenhair-fern	*Adiantum pedatum*
Marsh-fern	*Dryopteris thelypteris*
New York Fern (PS)	*D. noveboracensis*
Ostrich-fern (PS)	*Pteretis pensylvanica*
Polypody, Common (PS) (D)	*Polypodium virginianum*
Spleenwort, Ebony- (D)	*Asplenium platyneuron*
Spleenwort, Silvery (PS)	*Athyrium thelypteroides*
Wood-fern, Crested	*Dryopteris cristata*
Wood-fern, Goldie's	*D. goldiana*
Wood-fern, Marginal	*D. marginalis*
Wood-fern, Spinulose	*D. spinulosa*

Moist Woods pH 6-7

Baneberry, White	*Actaea pachypoda*
Columbine, Eastern (PS)	*Aquilegia canadensis*
Dutchman's-breeches	*Dicentra cucullaria*
Hepatica, Sharp-lobed (D)	*Hepatica acutiloba*
Lady's-slipper, Yellow	*Cypripedium calceolus* v. *pubescens*
Lily, Camass-	*Camassia scilloides*
Orchid, Queen	*Cypripedium reginae*
Phlox, Wood (D)	*Phlox divaricata*
Poppy, Celandine-	*Stylophorum diphyllum*
Squirrelcorn	*Dicentra canadensis*
Trout-lily, White	*Erythronium albidum*

FERNS

Bladder-fern	*Cystopteris bulbifera*
Glade-fern	*Athyrium pycnocarpon*
Walking Fern (PS) (D)	*Camptosorus rhizophyllus*

Moist Woods pH 4-5

Most of these are difficult to grow

Bead-lily	*Clintonia borealis*
Goldthread (PS)	*Coptis groenlandica*
Mayflower, Canada	*Maianthemum canadense*
Partridge-berry	*Mitchella repens*
Wintergreen	*Gaultheria procumbens*

Dry Woods pH 4-5

Arbutus, Trailing (PS)	*Epigaea repens*
Orchid, Rattlesnake	*Goodyera pubescens*
Pipsissewa	*Chimaphila umbellata*
Pipsissewa, Striped	*C. maculata*

Wet Areas Near Ponds or Slow Streams pH 5.5-6.5

Arrow-arum	*Peltandra virginica*
Arrow-head, Common (L)	*Sagittaria latifolia*
Blue Flag	*Iris versicolor*
Cardinal-flower (PS)	*Lobelia cardinalis*
Cat-tail, Narrow-leaved (L)	*Typha angustifolia*
Forget-me-nots	*Myosotis*
Iris, Yellow	*Iris pseudacorus*
Loosestrife, Fringed	*Lysimachia ciliata*
Lizard's-tail (L)	*Saururus cernuus*
Mallow-Rose	*Hibiscus palustris*
Marigold, Marsh- (PS)	*Caltha palustris*
Milkweed, Swamp	*Ascelpias incarnata*
Pickerelweed (L)	*Pontederia cordata*
Swamp-candles	*Lysimachia terrestris*
Swamp-buttercup	*Ranunculus septentrionalis*

Moist Open Garden In Sun pH 5-6.5

Alumroots	*Heucheras*
Aster, New England	*Aster novae-angliae*
Aster, New York	*A. novi-belgii*
Beebalm (PS)	*Monarda didyma*
Boneset (L)	*Eupatorium perfoliatum*
Cardinal-flower (PS)	*Lobelia cardinalis*
Coneflowers	*Rudbeckias*
Culver's-root	*Veronicastrum virginicum*
Dogbane, Spreading (L)	*Apocynum androsaemifolium*
Gayfeather, Spiked (D)	*Liatris spicata*
Gentian, Closed	*Gentiana andrewsii*
Goldenrods (L)	*Solidagos*
Harebell	*Campanula rotundifolia*
Ironweeds (L)	*Vernonias*
Joe Pye-weeds (L)	*Eupatoriums*
Lily, Canada	*Lilium canadense*
Lily, Turk's-cap	*L. superbum*
Lobelia, Great Blue	*Lobelia siphilitica*
Mint, Mountain-	*Pycnanthemum virginianum*
Mistflower (L)	*Eupatorium coelistinum*
Obedient-plant	*Physostegia virginiana*
Phlox, Fall	*Phlox paniculata*
Queen-of-the-prairie (L)	*Filipendula rubra*
Snakeroot, White (PS)	*Eupatorium rugosum*
Spiderworts	*Tradescantias*
Sweet-William, Wild	*Phlox maculata*
Vervain, Blue	*Verbena hastata*

Photo by Henry M. Mayer

Maidenhair-fern, *Adiantum pedatum*, is at home in the moisture at the base of a great rock.

Photo by Mary Auer

Butterfly-weed, *Asclepias tuberosa*, will be happy in dry poor soil in a sunny location.

that are to be destroyed. Here it is a conservation project as well as a help to the native plant gardener. Collecting might be done in wild areas but only when the species are plentiful and permission is granted, but never along country roads. Leave these for the enjoyment of passers-by.

Native plant nurseries are found throughout the east and most are reliable. A few very small nurseries which fail to list scientific names do at times make errors in identification.

It is possible to transplant native flora at almost any time if care is taken but the best time in my experience is after the plant has bloomed and finished its period of greatest growth. For spring flowering plants this will be in June or July. Lilies should be transplanted in the fall and autumn blooming plants do best when moved in the spring.

Before transplanting select a site for each species in accordance with its requirements. If an abundance of one species is to be planted try several locations. Plant native flora in groups never singly.

When transplanting dig well under the plant and take a generous amount of soil. Cover with polyethelene or newspapers when transporting to keep stock from drying. Protect from wind breakage. Replant as soon as possible to the depth at which the plant was growing. If the soil is poor or compacted in the planting area place compost or leaf mold in the bottom of the hole. After replacing the soil, water well and mulch with compost or well rotted leaves. New plantings should be watched for a few days and watered if necessary.

Ferns should always be included in the native garden. They add interest and beauty after spring flowering is past. Most of the larger species are easily grown and can be transplanted successfully at almost any time if rules for transplanting previously mentioned are followed.

Photo by Author.

Photo by Mary Auer.

Above. Grown in damp cool shade foamflower, *Tiarella cordifolia*, lives up to its name.

Above left. Look in damp woods in neutral soil for white trout-lily, *Erythronium albidum*.

Choose the first plants for your garden from those most easily grown in your area. In northeastern Ohio the following plants listed would be good selections.

Wildflower Garden Maintenance

After planting if needed and again in the fall the garden should be mulched either with leaf mold or compost. Mulch improves soil textures and somewhat enriches the soil, aerates and protects from freezing. In early spring be sure to check to see if the cover is too thick to allow the plants to come through.

Never use commercial fertilizer. In the fall a light feeding of bonemeal may be applied to plants in neutral and slighty acid areas and cottonseed meal for plants in very acid locations. Trilliums respond to well rotted manure and all plants, especially orchids, appreciate decayed wood.

Never cultivate or dig around plants. Mulch takes the place of cultivation as well as preserves a natural appearance.

Watch closely and water the garden whenever necessary.

Several inclosures for leaf mold and compost will be needed. Oak and beech leaves chopped and compacted into twelve-inch thick layers and watered with a bacterial activator such as "Compost Maker" or "Fertosan" will decay the most rapidly, in about a year. Other leaves may be used.

The compost heap should be at least four or five feet square. Alternate twelve-inch deep layers of organic material consisting of leaves, pine needles, grass clippings and weeds, if not in seed, with two-inch layers of stable manure. Water the whole with a bacterial activator and add a thin layer of good garden loam. Keep damp at all times. Include enough acid organic material to keep the pile slightly acid. Build to a peak and cover with black polyethelene. It will take about a year to break down.

Weeds and plant diseases are not a big problem in woodland gardens but the sunny garden will have an abundance of weedy plants.

Slugs and cutworms spell trouble. Products to combat them may be purchased in garden shops. Applications must be made every week or ten days.

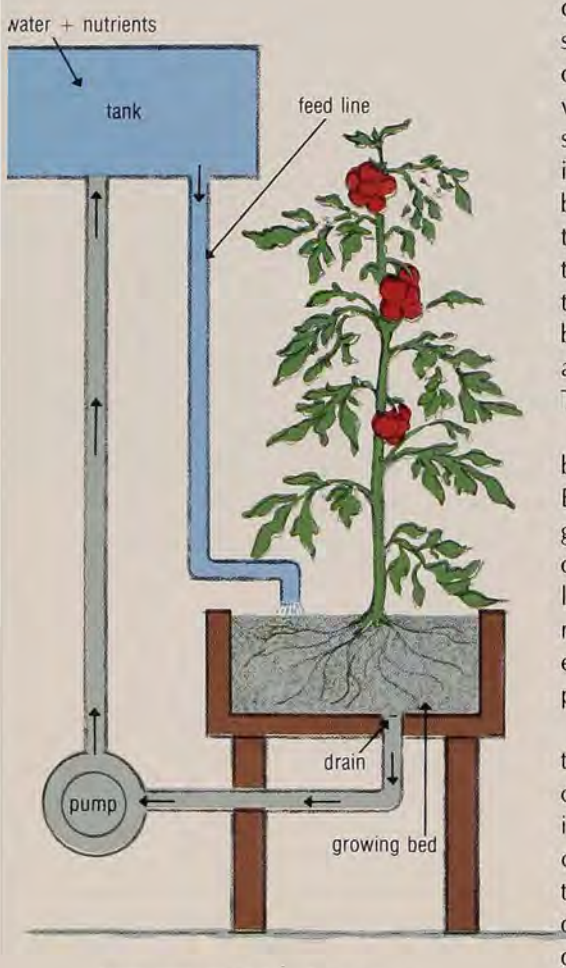
Chipmunks and occasionally red squirrels tunnel under plantings and may totally destroy an area. Catch them in a Havahart trap and transport to a distance place where they can do no harm.

Native plants may be increased by growing from seed, by division, softwood, hardwood and root cuttings and by layering. These cannot be described due to lack of space. Hamblin and Taylor's *Handbook of Wildflower Cultivation* covers them all.

A native flower garden requires a lot of work but it will reward you generously.

Hydroponic Gardening

*Walter H. Phillips**



Conventional Closed System.

Hydroponic gardening seems to be the most practical method of growing vegetables in the Virgin Islands. Hydroponic gardening is not what many people think it is. It is not growing plants in water; they are grown in gravel or crushed stone, or other inert supporting medium, over which water containing the plant nutrients flows.

Hydroponic gardening may be conducted on a large scale or on a small scale. Under the conventional method one or more beds are constructed which are filled with gravel or crushed stone. There is a tank containing water into which soluble plant fertilizer has been added, which is called the nutrient solution. This solution is allowed to flow by gravity onto the bed containing the plants, then it is pumped back into the tank. Water and nutrients are added from time to time as needed. This is a "closed" system.

For the past fifteen years we have been experimenting at the Water Isle Botanical garden with hydroponic growing of vegetables and have developed a method which is easy and much less expensive than the conventional method. Our new technique produces excellent results under the conditions prevailing in the Virgin Islands.

With our method the bed in which the plants are to be grown is filled with crushed stone to a depth of six to eight inches. Plants are planted in this crushed stone and fed the nutrient solution once a week and are watered each day when it does not rain. As all liquids drain away, this is an "open" system. This system is very easy to operate and produces large quantities of delicious and nutritious vegetables.

A number of questions are usually asked, as follows:

1. How big should a hydroponic garden be? It can be of any size—large or very small. It can consist of one or more pots. It can be a bed four feet by eight feet or any desired size of wood or concrete. It must be deep enough to hold from six to eight inches of crushed stone or gravel. It must also contain a drainage hole or holes in the bottom so that the excess water can run off and not stand on the plants, as this would kill them.

2. What medium is suitable for growing? Any inert material will do. As it is difficult to find gravel in the Virgin Islands, the most practical material is crushed stone (blue bit or other hard stone) in the smallest size available. Devcon (Zinke-Smith) has this at their quarry in sizes of three-eighths inch and smaller, which is very satisfactory, and can be purchased in small or large amounts. If available, a small amount of perlite may be added as a topping, and this can usually be obtained locally. Gravel also may be used but it must not contain any coral, as this has too much calcium which affects unfavorably the action of the nutrient solution.

3. What may be grown? Any plants can be grown hydroponically which can be grown in soil. We have had the best success with tomatoes, lettuce, peppers, broccoli, curly endive, and eggplants. Squash, cucumbers, pumpkins, papaya, corn, and in fact anything else may be grown, but many of these will require more space.

4. How should the seeds be started? The seeds should be started in a seed bed which contains peat or rich earth. When of sufficient size, seedlings are transplanted into the hydroponic garden. If desired they can be first transplanted into small pots until they reach larger size. It does no harm if some of the soil clings to the roots when planting in the crushed stone.

5. What is meant by the nutrient solution? This is water which contains soluble nutrients; plants must be fertilized to make them grow. The solution must contain a soluble balanced fertilizer, that is, a proportionate amount of

**Walter H. Phillips, Director, Water Isle Botanical Garden, Box 570, St. Thomas, Virgin Islands 00801.*

in the Virgin Islands

nitrogen, phosphorus and potassium. Soluble fertilizer can be purchased in any garden supply store; the label will read 6-6-6, 10-10-10, or 20-20-20, for example. These figures indicate the amount of salts of the three elements mentioned above in the fertilizer, in the order listed. Dissolve the fertilizer in the water at the strength indicated on the label, usually about one teaspoonfull to one gallon of water.

6. How is the nutrient solution applied to the plants? The solution is poured over the plants about once a week. This may be done with a pitcher, a sprinkler can, or an applicator attached to the end of a hose. This last method is most convenient as you put the required amount of fertilizer in the bottle and water pressure mixes and applies the diluted solution. Make up only enough of the solution to wet down the crushed stone in the bed. Naturally the amount needed will depend on the size of your garden.

7. What else should you do? The plants ought to be watered every day when it doesn't rain. A little dry fertilizer may be sprinkled over the surface of the bed occasionally if desired. About once a month it sometimes is desirable to substitute a high phosphate fertilizer for the weekly feeding of balanced fertilizer—this stimulates fruiting. The label of this fertilizer will show the middle number high—such as 10-39-10. There is a lot of talk about the trace elements. These are essential to plant growth but are required in such minute quantities that most fertilizers contain enough impurities to provide sufficient amounts. But if you like you can substitute an orchid fertilizer for the regular sort—this contains the trace elements but it is more expensive.

8. What are the greatest advantages of growing hydroponically? It takes much less water to grow plants hydroponically than in the ground. In the States it is figured that it only takes one thirtieth of the amount of water to grow by this method. In the Virgin Islands where temperatures are higher and evaporation is greater, the savings may not be as great. Since water is so scarce, this is a big plus. Another advantage is that water and fertilizer are applied directly to the roots of the plant where they will do the most good.

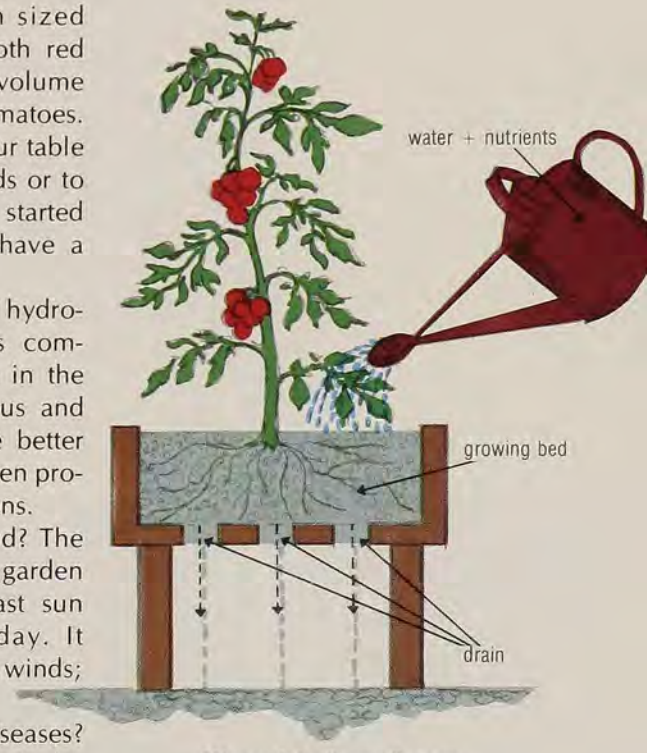
9. What is the one best crop to grow? We have found tomatoes to be the most desirable vegetable to grow. We also have found that the medium sized cherry and plum tomatoes (both red and yellow) produce a greater volume of fruit than the large sized tomatoes. We not only have enough for our table but surplus to give to our friends or to sell. A new crop should be started every three months or so to have a steady supply.

10. How does the quality of hydroponically produced vegetables compare with that of those grown in the soil? They are equally nutritious and the flavor and appearance are better due to the fact that they have been produced under controlled conditions.

11. What about sun and wind? The site selected for the hydroponic garden should get full sun, or at least sun during several hours each day. It should be protected from strong winds; if necessary erect a windbreak.

12. What about insects and diseases? These usually are not a problem in the Virgin Islands. Sometimes leaf miners appear and these can be recognized by tiny wavy white lines in the leaves. An occasional spraying with malathion will control these as well as most other insects, including scale and mealy bugs. On rare occasions fungus may appear, which may be controlled by Physan or other fungicide.

13. What about flowers? Try growing a few of your favorite flowers, particularly for cut flowers. In fact, try any annual plants. You will be surprised at how well they will do. ◈



Water Isle Open System.

vintage compost, 1969 —a good year!

*Hugh A. Johnson**

1969 was an especially good year for compost; it was the first year I added city sewage department sludge. The 1969 compost spread last fall is producing our best vegetables ever. With my composting method it seems to take a minimum of three years, even under ideal conditions, for the decomposition of most fibrous plants. For example, I put our Christmas wreath, the typical wreath sold by the Boy Scouts made of pine boughs on a heavy wire frame, on the bottom of the 1969 compost pile. All that was recognizable was the crumbling, rusted wire and the very butt ends of the pine boughs. Even these were friable.

Many enthusiasts have written about composting but positive emphasis is not placed on the time factor, nor on the part bacteria play in the composition in directions I have read. Contrary to most instructions, I believe several heaps are necessary in order to leave each heap undisturbed during the aging process. And because several heaps are a necessity and since the heaps are not aesthetic in appearance (rotting compost is beautiful to an avid gardener), one must choose a concealed site. A shady spot is best, for moisture is necessary for bacterial action. I have our heaps arranged in a circle. As a layer of plant debris (hedge trimmings, vine pruning, and so on) reaches a depth of perhaps ten to twelve inches, I scatter on a few shovels from the oldest compost heap before adding a layer of soil. This soil is collected from lawn edgings gathered from the edge of the garden. There always seems to be some extra soil on hand, but a yard or two of purchased black dirt would be ideal. I now add sewage department sludge periodically, too. The bacteria necessary for breaking down the fibrous plants (rotting is a better word, but it doesn't seem scientific) are plentiful in decomposing plant matter. The older compost sprinkled on each next layer adds fresh bacteria and hastening the break-down process. It is much like adding

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Entering the concealed compost area.

Although the fencing is filled to the top in the fresh state you can see how much settling occurred in the two year old heap at the near right.

starter to make buttermilk. Moisture is a prerequisite for bacterial action. I need only soak my heaps two or three times a summer, for the predominately fibrous nature of the heaps soaks up water as a sponge does and keeps them moist.

Acquiring sewage sludge is reminiscent of the bootleg days. First, I had to get permission from the city engineer. Even with this, the workers were reluctant to allow me to fill my tubs, treated me as though I was a madman to be humored, told me all sorts of tales about acid added, and more. I am allowed to take it at the point in processing where the sewage resembles a soft, wet clay. It is highly odoriferous. I use six metal bushel containers in order not to leak any of the rich juices into my station wagon.

Once I spread the fresh sludge on the garden, but the outhouse odor was terrifying. I wet it down every few minutes to get it into the ground before the neighbors discovered the source of the odor. Another disadvantage of direct spread is that millions of tomato seeds sprout! Now I dump the baskets quickly and cover the pile with fresh earth. The odor is kept in. Then as sludge is added to the compost it is covered with soil, and the odor does not escape. Several years later when the compost is spread the only odor is that of freshly turned forest loam. A word is indicated here for those not familiar with our friends, the bacteria. And they are our friends. For example, laboratory animals raised under absolutely germfree conditions are stunted, weak and short-lived. We need our intestinal flora to digest our food for absorption and to produce some vitamins. Bacteria got a bad name in the Orient where fresh sewage is spread on vegetable gardens. Composting the sewage destroys all pathogenic bacteria. One runs a greater disease hazard at a cocktail party, I feel, than eating in the Orient.

As an experiment I once added a few tin cans to a compost pile. They were just crumbling rust when the compost was ready for spreading; only the crumbling rims remained as evidence. Even bits of two-by-four timbers are merely crumbling outlines after a while. Unfortunately, most plastics that have been inadvertently added with raked leaves are unchanged. As I shovel my compost into my wheelbarrow prior to spreading, I pick out these undigested bits and add them to the fresh new pile. Some have gone a second time around. It has been kind of fun to see some objects turn up for the second and third time, as child's gun, for example, now barely recognizable as such. I am certain we are getting our trace elements of tin, copper, iron and zinc as this composted trash is taken up by our table vegetables. It is conceivable that some of these elements might account for the virility of our beans or the fabulous growth of our peach tree in a region where peach trees do not flourish.

Photos furnished by Author.

The heap being uncovered was done with snow fencing; the fence bottom rots out by the time the heap is two or three years old.

Adding a few shovels of the aged compost to fibrous material at the bottom of the new heap. The oil drum contains the city sewage and manure with a soil covering to exclude odors.

Next to the kitchen sink we have an airtight aluminum pail. All garbage is put in this, and every Wednesday and Saturday I empty it on the compost pile. It rarely is completely full except, perhaps, in pea season. I carefully cover the garbage completely with fresh dirt so the odor does not attract raccoons, dogs and mice (our good mouser Cyrus, the Persian cat, tends to these). If I am not careful and even a few specks of coffee grounds are exposed, I find garbage strewn around by I assume one of the descendants of Sue, the orphan raccoon nursed and raised by my son a few years back. As I spread compost I often run into vestiges of eggshells. All the binding organic material is gone, and the calcium outline of the shell falls apart when disturbed. It is interesting to see the earthworm holes in a spot of compost that once was garbage.

The construction of our heaps is simple: the enclosure is a circle of fencing about four feet in diameter with several stakes driven in for support. The fencing is tied to these with binder twine. Even this twine has rotted away by the time the heap is used. Arrange the fencing so that access is easy when the time come for spreading, for it cannot be removed except as the compost is taken out.

In summing up, any structural material can be used to retain a compost heap. The piles should be placed in a shady, out-of-the-way spot and arranged so that aging can take place. My compost is best when aged three or four years. Older compost should be added to the new current pile from time to time as the pile builds up in order to enhance bacterial action. The heaps should be soaked several times a year. Moisture is essential for rapid bacterial growth and action.

Our ecological efforts began by necessity when my wife and I were married during World War II. I was earning a pittance as an intern. Saving was essential for our married existence. As we prospered we could not break the habit of not wasting. Facing the energy crisis last year, there was little we could do that we were not already doing; bicycles for all short trips, a thrifty Volkswagen for longer, and making compost. We had long ago found that one can work better and sleep better in a cool house. We have always had a paper burner in the basement. Waste paper is saved in barrels to be burned on cold mornings in the fall. We have always flattened our tins and they are easily buried each Saturday by turning back a spaded square of sod during the months when the ground isn't frozen. We've often wondered if our neighbors have ever noted our pathetic basket of trash, just a few glass jars and bottles, when their tidily-packed rows of trash bags (10 for $1.29—a bargain?) are all neatly lined up at the curb. At Christmas we face a dilemma—a gift for the trash man? Does he deserve one? I might give him a bag of rich, fibrous, compost, but I can hardly stand to part with it! ◈

A bone that has been composted four years is very friable and breaks readily with the fingers.

Supports were necessary on the lower limbs of a peach tree fertilized with compost.

Grapes grown and fertilized with compost. The grape roots are under the walk and sheltered by a large overhanging eave that does not allow them moisture, but in spite of this it is a heavily producing vine.

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STATEMENT OF OWNERSHIP
MANAGEMENT AND CIRCULATION

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7. Owner (if owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.)

The American Horticultural Society, Mt. Vernon, Va. 22121.

8. Known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages or other securities—none.

9. Omitted.

10. The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes have not changed during preceding 12 months.

11. Extent and nature of circulation.

	Average No. copies each issue during preceding 12 months	Actual number of copies of single issue published nearest to filing date
A. Total No. copies printed (net press run)	28,500	28,300
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales	0	0
2. Mail subscriptions	25,510	25,918
C. Total paid circulation	25,510	25,918
D. Free distribution by mail, carrier or other means		
1. Samples, complimentary, and other free copies	40	45
2. Copies distributed to news agents, but not sold	0	0
E. Total distribution (Sum of C and D)	25,550	25,963
F. Office use, left-over, unaccounted, spoiled after printing	2,950	2,337
G. Total (Sum of E & F—should equal net press run shown in A)	28,500	28,300

I certify that the statements made by me above are correct and complete.

(signed) O. Keister Evans

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APRIL 10-17, 1975

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